Course ID and Title: ENGR 499: “Ethics in Engineering Design for Artificial Intelligence Systems”

Units: 2 Credit Hours
Term/Day/Time: Fall Semester--Thursdays 10:00am-11:50am Pacific Time Zone
Location: The Course will be Entirely Online

Instructors:
Chrysostomos L. Nikias, Ph.D.
President Emeritus and Professor
Malcolm R Currie Chair for Technology and the Humanities
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Engagement Viterbi School of Engineering
Department of Electrical & Computer Engineering
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https://viterbi.usc.edu/directory/faculty/Raghavendra/C

Office Hours: Thursdays 9am-10am

Teaching Assistant:
Office, Office Hours, and Contact Info: TBD

Catalogue Description
Explore ethical considerations at the intersection of engineering design and artificial intelligence systems, addressing societal impacts, biases, accountability, and responsible innovation strategies. Ethical frameworks of engineering design systems are also examined.

Course Description
In an era dominated by rapid technological advancements, the ethical implications of artificial intelligence (AI) technologies have become increasingly complex and critical. This course is designed to provide a comprehensive exploration of the multifaceted ethical considerations inherent in the design, deployment, and impact of AI systems across diverse domains. By examining the intricate interplay between engineering designs, AI systems, society, and morality, students will gain a profound understanding of the ethical dimensions shaping design systems and the future of AI innovation.

This course delves deep into the ethical dilemmas specifically within the realm of engineering design and artificial intelligence (AI), elucidating the responsibilities of engineers in mitigating biases, ensuring transparency, and upholding moral integrity. Through case studies and discussions, students will analyze real-world engineering design systems, develop ethical
frameworks, and cultivate the ethical reasoning necessary for navigating the complexities of AI systems with integrity and social responsibility.

**Learning Objectives**

Upon completion of this course, students will be able to:

- Understand the ethical issues surrounding the design of AI Systems specifically within the realm of computer science and engineering.
- Analyze case studies and real-world engineering design examples to identify ethical issues and dilemmas arising from the use of AI systems in various industries and applications.
- Develop strategies for responsible AI design and implementation, including considerations of fairness, transparency, accountability, and privacy through the lens of both modern and ancient ethical approaches.
- Collaborate with peers on interdisciplinary projects to propose ethical guidelines, codes of conduct, or policy recommendations for AI development and deployment.
- Reflect on personal values, biases, and ethical responsibilities as future engineers and technologists working in the field of AI.
- Demonstrate effective communication skills in presenting and defending ethical positions on AI-related issues, both orally and in writing.

**Guest Lecturers**

Throughout the semester we will host in class noteworthy individuals as guest lecturers who by their engineering designs in their corporations have addressed a number of ethical considerations in AI systems. We will have the opportunity to interact with them in Q&A session and discussion.

**Required Readings and Supplementary Materials**


   ISBN: 979-8372570238, Published: January 4, 2023

- Various articles and video clips found on D2L Brightspace. See below.

**Course Notes**

All course information will be available through your Brightspace account. Brightspace is the primary channel of communication for this course so take note of announcements and other email messages you receive. Assignments and grades are posted here as well. To access Brightspace from your web browser use your USC username and password to log in.
**Course Requirements and Prerequisites**

Students will receive two units of credit under the heading of this **letter-graded course**. Course requirements include regular participation in-class discussions, debates, and case studies; timely completion of reading assignments and essays; and participation in midterm and final exams. No other course pre-requisite is required.

**Description of Assignments and How They Will Be Assessed**

**Essays:** There will be a series of questions on a particular essay topic (see schedule below) for the students not only to answer but also provide an in-depth analysis and arguments as well as a conclusion wrapping up their ideas. Typical length of the essay assignments will be four to five pages.

**Case Study Group Projects:** The students will be divided into groups with four members in each group. Each group will be asked to choose an AI Algorithm or AI System in a particular application and address its ethical considerations. Each group of students will present their project in class. The project will be documented with a PowerPoint presentation.

**Grading breakdown:** Breadth and depth of presentation: 25%, Metrics of ethical implications chosen to assess an AI Algorithm application: 40%, Ethical remedies in the design of AI Algorithm: 35%

**Participation**

Participation includes class attendance every week as well as active participation in class discussions and active participation in teamwork for the group projects.

**Final Grading Breakdown**

<table>
<thead>
<tr>
<th>Grading Breakdown</th>
<th>% of Grade</th>
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</thead>
<tbody>
<tr>
<td>Essays</td>
<td>20</td>
</tr>
<tr>
<td>Participation</td>
<td>15*</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>15</td>
</tr>
<tr>
<td>Final Exam</td>
<td>15</td>
</tr>
<tr>
<td>Case Study Group Project</td>
<td>35</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
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</tbody>
</table>

*Participation includes class attendance every week as well as active participation in class discussions and active participation in teamwork for the group projects.

**Weekly Schedule**

*Weekly Class Schedule will also be available on Brightspace as a separate document with detailed description of the topics to be covered, reading assignments and class essays.*
<table>
<thead>
<tr>
<th>Week</th>
<th>Topics/Daily Activities</th>
<th>Readings/Preparation</th>
<th>Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Intro to AI &amp; The Ethics: (Importance, applications and ethical challenges)</td>
<td>See below #1</td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Misinformation &amp; Disinformation (Tackling fake news in different domains)</td>
<td>See below #2</td>
<td>Class Essay 1: Exploring Ethical Considerations of AI-Generated Content: Deepfake Technology, Media Integrity, and Misinformation</td>
</tr>
<tr>
<td>Week 3</td>
<td>Discrimination in AI engineering design systems</td>
<td>See below #3</td>
<td>Class Essay 1: Exploring Ethical Considerations of AI-Generated Content: Deepfake Technology, Media Integrity, and Misinformation</td>
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<tr>
<td>Week 4</td>
<td>Privacy (Privacy preservation in engineering solutions)</td>
<td>See below #4</td>
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<tr>
<td>Week 5</td>
<td>Safety (Challenges in ensuring safety in the use of AI systems)</td>
<td>See below #5</td>
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<tr>
<td>Week 6</td>
<td>Impacts on Industry (Impact of AI systems on different industry sectors)</td>
<td>See below #6</td>
<td>Class Essay 2: Ethical Considerations in the Integration of AI in Autonomous Vehicles: Safety, Accountability, and Decision-Making</td>
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<tr>
<td>Week 7</td>
<td>Decision Making (Ethical decision making in engineering)</td>
<td>See below #7</td>
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<tr>
<td>Week 8</td>
<td><strong>Midterm Examination</strong></td>
<td></td>
<td>Midterm Examination</td>
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<tr>
<td>Week 9</td>
<td>Accountability &amp; Responsibility in Engineering design practices</td>
<td>See below #9</td>
<td></td>
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<tr>
<td>Week 10</td>
<td>Societal Issues (Environmental and healthcare ethics in AI practices)</td>
<td>See below #10</td>
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<tr>
<td>Week 11</td>
<td>Collaboration (Human Beings in AI systems collaboration with the design of ethical engineering solutions)</td>
<td>See below #11</td>
<td>Class Essay 3: Ethical Implications of AI-Driven Surveillance Systems in Urban Environments: Privacy, Civil Liberties, and Social Control</td>
</tr>
<tr>
<td>Week 12</td>
<td>Regulation (Regulatory framework in engineering standards)</td>
<td>See below #12</td>
<td></td>
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<tr>
<td>Week 13</td>
<td>Personal Ethics: Your individual responsibilities as an engineer</td>
<td>See below #13</td>
<td></td>
</tr>
<tr>
<td>Week 14</td>
<td>Group Projects/Case Studies Presentations **Footnote</td>
<td></td>
<td>Group Projects/Case Studies In Class Presentations</td>
</tr>
<tr>
<td>Week 15</td>
<td>Group Projects/Case Studies Presentations **Footnote</td>
<td></td>
<td>Class Essay #6 Due</td>
</tr>
</tbody>
</table>

**Footnote**

**Students are expected to take notes, pose questions, write, and submit a summary or reflection of others’ presentations, especially if they agree or disagree with others’ ethical assessments. Their reflections will be summarized in Essay #4.**
Session 1: Introduction to AI: Importance, Applications and Ethical Challenges

Readings:
   Chapter 1: Introduction to AI ethic; Chapter 2: AI Ethics and AI Values Alignment
   ISBN: 979-8372570238, Published: January 4, 2023
   Chapters 1, 2
3) PPT: What is AI
4) Extra Readings:
   Research Paper: All about AI

Videos:
1) https://www.youtube.com/watch?v=HSsQApXQGsl
   Al and Ethics | Toby Walsh |
2) https://www.youtube.com/watch?v=dRw4d2Si8LA
   AI & The Future of Work | Volker Hirsch|

Session 2: Misinformation & Disinformation: Tackling Fake News in Different Domains

Readings:
   Chapter 8: Ethical AI Monitoring of Unethical AI
   Chapter 20: AI Ethics and AI Political Biases
   Published: 2 November 2022 (Pages 53-61)

Videos:
1) https://www.youtube.com/watch?v=7ORAKULeI4
   How We Can Protect Truth In The Age of Misinformation | Sinan Aral |
2) https://www.youtube.com/watch?v=1ubPQm63_Yc
   How To Recognize Disinformation And How to Stop It | Deb Lavoy |

Session 3: Discrimination: Addressing Discrimination in AI Engineering Design Systems

Readings:
   Chapter 17: AI Ethics and AI Racial Biases
   ISBN: 979-8372570238, Published: January 4, 2023
   Chapters 3, 4, 5
Published: 2 November 2022 (Pages 9-23)

Videos:
1) https://www.youtube.com/watch?v=N9aLNfExgM
   Tech Bias And Algorithmic Discrimination | Courtney Thomas Jr.
2) https://www.youtube.com/watch?v=QpySemFa_tI
   Technology Doesn’t Discriminate | Sabeen Ali

Session 4: Privacy: Privacy Preservation in Engineering Solutions
Readings:
   Published: 2 November 2022 (Pages 25-37)
   ISBN: 979-8372570238, Published: January 4, 2023
   Chapters 6, 7, 8

Videos:
1) https://www.youtube.com/watch?v=2iPDpV8ojHA
   Data Privacy and Consent | Fred Cate
2) https://www.youtube.com/watch?v=PuhifEL5VsU
   Privacy in the Digital Age | Nicholas Martino
3) https://www.youtube.com/watch?v=2GpNhYy2I08
   A Smart Phone is Leaking Your Information | Bram Bonné

Session 5: Safety: Challenges In Ensuring Safety In The Use Of AI Systems
Reading:
   ISBN: 979-8372570238, Published: January 4, 2023
   Chapter 10, 11, 12, 13, 14
   Chapter 3: AI Ethics and the AI Control Problem

Videos:
1) https://www.youtube.com/watch?v=koaGLPhftzs
   Through The Eyes Of An Engineer | Grady Hillhouse
2) https://www.youtube.com/watch?v=cOIJGGgaSIY
   The Art Of Being An Engineer | Philippe Rival

Session 6: Impacts on Industry: Impact of AI systems On Different Industry Sectors
Reading:
   ISBN: 979-8372570238, Published: January 4, 2023
   Chapters 15, 16
   Published: 2 November 2022 (Pages 39-52)
Videos:
1) https://www.youtube.com/watch?v=_U2YobRC8OY
   The Impact of AI on Jobs | Rutika Muchhala |
2) https://www.youtube.com/watch?v=eXdVDhOGqoE
   AI Is Dangerous But Not For Reasons You Think | Sasha Luccioni |

Session 7: Decision Making: Ethical Decision Making in Engineering
Reading:
Chapters 17,18,19

Videos
1) https://www.youtube.com/watch?v=3FYt6qsoybM
   Engineering Ethics And Difficult Decision Making | Justine Metz |
2) https://www.youtube.com/watch?v=q-nhktqMoT4
   Ethical Decision Making | Shohini Kundu |

Session 8: Mid-Term Examination

Session 9: Accountability & Responsibility in Engineering Design Practices
Reading:
   Chapter 7: AI Ethics and AI Criminal Accountability
   ISBN: 979-8372570238, Published: January 4, 2023
   Chapters 9,10,11

Videos:
1) https://www.youtube.com/watch?v=bNpx7gpSqbY
   The Biggest Reason Why Start-Ups Succeed | Bill Gross |
2) https://www.youtube.com/watch?v=bCteZqlwf-k
   Check Yourself-Accountability | Charlie Johnson |
3) https://www.youtube.com/watch?v=AyxhKt94Ebg
   Hold Yourself Accountable | Janyssa Berrios |

Session 10: Societal Issues: Environmental and Healthcare Ethics in AI Practices
Readings:
   Chapter 19: AI ethics and Societal Panopticons
2) Research Paper: Societal Issues Concerning the Application of Artificial Intelligence in Medicine
   Published: 2 November 2022 (Pages 63-78)

Videos:
1) https://www.youtube.com/watch?v=WOAgllKD9o
   Why We Need Engineers Now More Than Ever | Elanor Huntington |
Session 11: Collaboration: Human Beings in AI systems Collaboration With The Design Of Ethical Engineering Solutions

Reading

Videos:
1) https://www.youtube.com/watch?v=Fd_nkBHgX8s
   Working Together To Make Things Happen | JP Cardoso |
2) https://www.youtube.com/watch?v=Q7chxarBJ98
   Innovation Is All About People | Alexandre Janssen |

Session 12: Regulation: Regulatory Frameworks in Engineering Standards

Reading:
1) https://www.technologyreview.com/2024/01/05/1086203/whats-next-ai-regulation-2024/

Videos:
1) https://www.youtube.com/watch?v=koaGLPhftzs
   Through The Eyes Of An Engineer | Grady Hillhouse |
2) https://www.youtube.com/watch?v=1BopR9PPxSQ
   Regulating AI For The Safety Of Humanity | Ayush Patel |

Session 13: Personal Ethics: Your Individual Responsibilities As An Engineer

Reading:
1) Engineering Student’s Ethical Awareness and Behavior: A New Motivational Model
   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539265/
2) Ethics: Examining Your Engineering Responsibilities
   https://www.researchgate.net/publication/274064404_Ethics_Examining_Your_Engineering_Responsibility
3) AI, Responsibility, Attribution, and a Relational Justification of Explainability

Videos:
1) https://www.youtube.com/watch?v=b5UUBPA1-FU
   Individual and institutional responsibility for reducing implicit bias | NiCole T. Buchanan |
Section 14 & 15: Group Projects/Case Studies/In Class Presentations

The students will be divided into groups with four members in each group. Each group will be asked to choose an AI Algorithm in a particular application and address its ethical considerations. Each group of students will present their project in class. The project will be documented with a PowerPoint presentation. During the class presentations, the students are expected to take notes, pose questions, write, and submit a summary or reflection of others’ presentations, especially if they agree or disagree with others’ assessment of the ethical considerations of AI Systems. Their reflections will be summarized in Essay #4.

Final Exam: December Date

Our Inclusive Learning Community

Our USC Principles of Community state “USC is a multicultural community of people from diverse racial, ethnic, gender, and class backgrounds, national origins, faith backgrounds, political beliefs, abilities, and sexual orientations. Our activities, programs, classes, workshops, lectures, and everyday interactions are enriched by our acceptance of one another, and we strive to learn from each other in an atmosphere of positive engagement and mutual respect.” https://diversity.usc.edu/usc-principles-of-community/

As Trojans, we understand the value of the perspectives of individuals from all backgrounds that reflect the rich diversity of our USC community and beyond. The study of Leadership requires us to recognize how diversity, equity and inclusion is not only the ethical approach, but also creates a competitive advantage for organizations. Together, we will strive to make this classroom a psychologically safe and inclusive environment for all of us to develop and practice inclusive behaviors. As such, we will:

● Respect the dignity and essential work of all individuals,
● Promote a culture of respect within the university community,
● Respect the privacy, property, and freedom of others,
● Reject bigotry, discrimination, violence or intimidation of any kind,
● Practice personal and academic integrity and expect it of others, and
● Promote the diversity of opinions, ideas and backgrounds which is the lifeblood of the university.

If you see ways we can improve, please let us know.

Policy for the Use of AI Generators

In this course, we encourage you to use artificial intelligence (AI)-powered programs to help you with assignments that indicate the permitted use of AI. You should also be aware that AI text generation tools may present incorrect information, biased responses, and incomplete analyses; thus, they are not yet prepared to produce text that meets the standards of this course. To adhere to our university values, you must cite any AI-generated material (e.g., text, images, etc.) included or referenced in your work and provide the prompts used to generate the content.
Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university’s mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity’s website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Course Content Distribution and Synchronous Session Recordings Policies
USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. (Living our Unifying Values: The USC Student Handbook, page 13).

Students and Disability Accommodations:
USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.
Support Systems:

**Counseling and Mental Health** - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

**988 Suicide and Crisis Lifeline** - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

**Relationship and Sexual Violence Prevention Services (RSVP)** - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

**Office for Equity, Equal Opportunity, and Title IX (EEO-TIX)** - (213) 740-5086
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

**Reporting Incidents of Bias or Harassment** - (213) 740-5086 or (213) 821-8298
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

**The Office of Student Accessibility Services (OSAS)** - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

**USC Campus Support and Intervention** - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

**Diversity, Equity and Inclusion** - (213) 740-2101
Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

**USC Emergency** - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

**USC Department of Public Safety** - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

**Office of the Ombuds** - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

**Occupational Therapy Faculty Practice** - (323) 442-2850 or otpf@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.