Course Title: "STEM and Society: Historical and Current Perspectives of scientists, mathematicians, and engineers"

Instructors: Tathagata Sengupta and Ayush Gupta

Course Code: SCE323.2
Course Classification: Elective Course
Course Credits: 4 credits

Start Date: August 7, 2023
End Date: Dec 1, 2023
Total In-Class Hours: 14 weeks x 4 hours/wk = 56 hours

Course Meeting Times: Monday (11 AM to 1 PM) and Wednesday (11 AM to 1 PM)

Mode: In person

Course Introduction:
In this course, we will read how past and current scientists, mathematicians, and engineers have thought about the connections between the technical work they do and society. We will read a short selection of book chapters and papers for class discussions. Through engaging with these texts deeply, we will build an understanding of how the technical work within the disciplines connects to broader issues in society, on questions that have persisted over time: on representation of diverse bodies and viewpoints within the discipline, on development, on building institutions, and on scientific temper. Through these readings, course participants will also learn about how unexamined epistemological assumptions shape the ideas, terms, and concepts in STEM.

Course Outcomes:
It is expected that at the end of the course, students will:
- Develop a critical understanding of scientific (and mathematical) epistemology and scientific temper, how claims and ideas in science are shaped.
- Develop a sophisticated understanding of how the technical and social aspects of scientific (and mathematical) work impact one another, historically and currently.
- Situate texts (and authors) within particular temporal and cultural contexts.
- Develop a resource toolkit for critical reflection on scientific values and practices.

Tentative Course Schedule:
- Physics, physics epistemology, society of physicists, physics in society (Prescod-Weinstein; Rotblat) - 3 weeks
- Mathematics, taming of new realities, and challenges (Hacking, Godel) - 3 weeks

- Science, scientific temper, and role of science in India (The Scientist in Society Collection of Essays) - 2 weeks
- Mathematical temper and practice – myths and realities (Harris) - 2 weeks
- AI, AI epistemology & ethics, and AI & society (Bender; Raji; Prabhakaran) - 2 weeks
- Politics of writing mathematics (Harron) - 2 weeks

Assignments:
- Reading: Weekly reading assignments
- Writing: Weekly writing assignment based on readings (~500 word).
- Term Paper: Course participants will do a review of current writing on STEM and society (can select a sub-discipline of choice) from journals such as Nature, Science, Physics Today, Scientific American, publications from the Union of Concerned Scientists (UCS), Science for the People (SftP), or other suitable sources and write a ~1500 word review report. Paper drafts would be due by Nov 15th. Final Papers to be submitted by Dec 1st.

Course Readings:
1. Prescod-Weinstein, C. (2021). *The disordered cosmos: A journey into dark matter, spacetime, and dreams deferred*. Hachette UK.
2. Joseph Rotblat: (i) Bulletin of Atomic Scientists (Aug 16, 1985); (ii) Nobel Address
3. The Scientist in Society, 2010. Thema, Kolkata. Essays and Addresses by P. C Ray, C. V. Raman, P. C. Mahalonobis, M. N. Saha, S. N, Bose, and H. J. Bhabha.
4. Hacking, Ian. The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference. United Kingdom, Cambridge University Press, 2006.
5. Hacking, Ian. The Taming of Chance. United Kingdom, Cambridge University Press, 1990.
6. Gödel, Kurt. Kurt Gödel: Unpublished Philosophical Essays. Germany, Birkhäuser Basel, 1995.
7. Harris, Michael. Mathematics Without Apologies: Portrait of a Problematic Vocation. United Kingdom, Princeton University Press, 2017.
8. Piper Harron's thesis (mainly introduction and 'layscapes'): The Equidistribution of Lattice Shapes of Rings of Integers of Cubic, Quartic, and Quintic Number Fields: an Artist's Rendering; placed in the genre of other 'mindblowing dissertations': https://ideophone.org/mindblowing-dissertations/
9. Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021, March). On the Dangers of Stochastic Parrots: Can Language Models Be Too Big? . In *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency* (pp. 610-623).
10. Raji, I. D., Gebru, T., Mitchell, M., Buolamwini, J., Lee, J., & Denton, E. (2020, February). Saving face: Investigating the ethical concerns of facial recognition auditing. In *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society* (pp. 145-151).
11. Prabhakaran, V., Mitchell, M., Gebru, T., & Gabriel, I. (2022). A Human Rights-Based Approach to Responsible AI. *arXiv preprint arXiv:2210.02667*.