

ETHICS IN MATHEMATICS

FALL 2023

MATTHEW CORDES
TEACHING ASSISTANT: VICTOR JAECK

Abstract. In this course we will discuss ethics related to the practice of mathematics.

Objective. Participants in the course will

- (1) Become familiar with some of the ethical questions inherent to mathematical work
- (2) Explore several applications of mathematics and their impacts on society
- (3) Develop skills to identify ethical questions in mathematics and deepen their understanding of debates on certain issues in the mathematical community
- (4) Consider what a code of ethics for mathematicians could look like
- (5) Practice and improve mathematical communication skills

About the course. Students will be expected to do the readings and have thought critically about their content before each class. During class time, they will be expected to be active, thoughtful participants. Each class period I will ask a few students to help plan the guiding questions that we will use to structure and facilitate the discussion. Additionally, each class period a few students will have to write a summary and reflection on the discussion of that day. Finally, students will be required to write a reflection on the contents of the class.

Etiquette. Discussing mathematics (and ethical questions!) can often be difficult—please work hard to be considerate and respectful when talking to your classmates.

Diversity and Inclusion. We value diversity and inclusion, and are committed to a climate of mutual respect and full participation in and out of the classroom. This class strives to be a learning environment that is equitable, inclusive and welcoming, regardless of race, ethnicity, religion, gender and gender identities, sexual orientation, disability, socioeconomic background, and nationality. If you anticipate or experience any barriers to learning, please discuss your concerns with me.

Grading. Your grade will be determined by a continuous assessment and a final performance assessment.

The continuous assessment will be evaluated through the student's thoughtful participation during discussions all semester and organizing guiding questions. This will be 50% of the grade.

The final 50% of the grade will be two written documents. These should be written with standard font size (e.g., 12pt Times New Roman), standard margins (2.5cm on each side), and 1.5 line spacing.

The first document will be a one to two-page summary of the discussion during one of the class periods and a reflection on the discussions. This will be due the week after the discussion.

The second essay, due during the end of semester exam period, will be a one to two-page self-reflection on what you learned in the class. Questions which should be addressed in the second part of the reflection include:

- Have I gained a better or different understanding of the ethics inherent to the practice of mathematics?
- Have I broadened my thinking or generated new thoughts or ideas not previously formulated?
- Have I helped my peers clarify their thinking and in doing so clarified my own?

Readings. All readings will be available on the course Moodle.

- (1) Is mathematics ethically neutral? (Sep 21)
 - (a) no readings
- (2) Is mathematics ethically neutral? redux (Sep 28)
 - (a) CAT(0) Geometry, Robots, and Society – Federico Ardila-Mantilla
 - (b) The Ethics of Mathematics: Is Mathematics Harmful? – Paul Ernest
 - (c) Mathematical Artifacts Have Politics: The Journey from Examples to Embedded Ethics – Maurice Chiodo, Dennis Müller
- (3) What is mathematics? (Oct 05)

- (a) On proof and progress in mathematics – William Thurston
- (b) The Discursive Construction of Gendered Subjectivity in Mathematics (Chapter 2 of *Inventing the Mathematician: Gender, Race, and Our Cultural Understanding of Mathematics*) – Sara N. Hottinger
- (c) Foundations of Eurocentrism in mathematics – George Ghevarughese Joseph
- (4) Surveillance & cryptography (Oct 12)
 - (a) The NSA Back Door to NIST – Thomas C. Hales (optional)
 - (b) Maths spying: The quandary of working for the spooks – Tom Leinster
 - (c) Mathematics Beyond Secrecy and Surveillance – The Just Mathematics Collective
- (5) Predictive Policing (Oct 19)
 - (a) Mathematicians urge colleagues to boycott police work in wake of killings – Davide Castelvechi
 - (b) Predictive Policing: Proceed, but with Care – Matthias Leese
 - (c) Runaway Feedback Loops in Predictive Policing – Danielle Ensign, Sorelle A. Friedler, Scott Neville, Carlos Scheidegger, Suresh Venkatasubramanian (optional)
- (6) Military funding (Oct 26)
 - (a) Military Funding in Mathematics – William Thurston
 - (b) US military funding projects in Swiss universities – swissinfo.ch
 - (c) Pure to applied – Kevin Hartnett
 - (d) Security robotics for Switzerland – Vanessa Bleich
 - (e) Barcodes: The persistent topology of data – Robert Ghrist (optional)
- (7) Finance (Nov 02)
 - (a) Recipe for Disaster: The Formula That Killed Wall Street – Felix Salmon
 - (b) Mathematics and Finance: An Ethical Malaise – Marc Rogalski
 - (c) The Devil is in the tails: actuarial mathematics and the subprime mortgage crisis (Sections 1, 2, 3, 8 & 9) – Catherine Donnelly, Paul Embrechts
- (8) Math in the public (Nov 09)
 - (a) Mathematics as propaganda – Neil Koblitz
 - (b) The ideology of certainty in mathematics education – Marcelo C. Borba, Ole Skovmose
- (9) Climate change (Nov 16)
 - (a) Communicating the science of climate change – Richard C. Somerville and Susan Joy Hassol
 - (b) The mathematics of sustainability – Simon Levin
 - (c) A Perfect Moral Storm: The Ethical Tragedy of Climate Change (Chapter 1) – Stephen M. Gardiner
- (10) Mathematical community (Nov 23)
 - (a) Myths of Meritocracy, Friendship, and Fun Work: Class and Gender in North American Academic Communities – Mary Leighton
 - (b) Epistemic Injustice in Mathematics – Colin Jakob Rittberg, Fenner Stanley Tanswell, Jean Paul Van Bendegem
 - (c) Perspectives on Teichmüller and the Jaresbericht (pages 1-42) – Bernhelm Booß-Bavnbek
- (11) Education & teaching (Nov 30)
 - (a) Ethnomathematics and Its Place in the History and Pedagogy of Mathematics – Ubiratan d'Ambrosio
 - (b) No cops in the lecture hall: cheating and what (not) to do about it – Rashid Amerzaine, Root Beer
 - (c) Is There Enough Poison Gas to Kill the City?: The Teaching of Ethics in Mathematics Classes – Bonnie Shulman
 - (d) A Framework for Understanding Whiteness in Mathematics Education – Dan Battey, Luis A. Leyva
 - (e) Live by the Research Die by the Research – Szilrd Svitek (optional)
- (12) Code of ethics? (Dec 07)
 - (a) AMS Ethical Guidelines
 - (b) A Hippocratic Oath for Mathematicians – Chandler Davis
 - (c) A Hippocratic Oath for mathematicians? Mapping the landscape of ethics in mathematics – Dennis Müller, Maurice Chiodo, James Franklin
- (13) Examples of positive ethical engagement (Dec 14)
 - (a) The Moral Character of Cryptographic Work – Phillip Rogaway

- (b) Manifesto for the Responsible Development of Mathematical Works – Maurice Chiodo and Dennis Müller
 - (c) Geometry v. Gerrymandering – Moon Duchin
 - (d) Show me the money (or at least where it came from)– Tarik Aougab and Marissa Loving
- (14) What can we do? (Dec 21)
- (a) no reading