

# ETHICS IN MATHEMATICS

MATTHEW CORDES

**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 to facilitate the discussion. Finally, as a final performance assessment 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.

**SARS-CoV-2.** For the health and safety of yourself and others the Rectorate and the BAG recommend wearing masks in classrooms. Disability advocates are also asking people to wear masks. Therefore I strongly implore you to wear a mask in this course.

**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 and organizing guiding questions. It will be 50% of the grade.

The essay, due during the end of semester exam period, will count as the final 50% of the grade. The final essay will be two parts. The first part will be a one to two-page explanation of an ethical question related to mathematics. This can be a subject discussed during the course or another topic of your choice. You will have to tell me what your topic is by the penultimate class period. The second part 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?
  - (a) no readings
- (2) Is mathematics ethically neutral? redux
  - (a) CAT(0) Geometry, Robots, and Society – Federico Ardila-Mantilla
  - (b) The Ethics of Mathematics: Is Mathematics Harmful? – Paul Ernest
  - (c) Do Artifacts Have Politics? – Langdon Winner
- (3) What is mathematics?
  - (a) On proof and progress in mathematics – William Thurston

- (b) Arabic and Islamic Philosophy of Mathematics – Mohammad Saleh Zarepour
- (c) Foundations of Eurocentrism in mathematics – George Ghevarughese Joseph
- (4) Surveillance & cryptography
  - (a) The NSA Back Door to NIST – Thomas C. Hales
  - (b) Maths spying: The quandary of working for the spooks – Tom Leinster
  - (c) Mathematics Beyond Secrecy and Surveillance – The Just Mathematics Collective
- (5) Predpol
  - (a) Mathematicians urge colleagues to boycott police work in wake of killings – Davide Castelvechi
  - (b) Runaway Feedback Loops in Predictive Policing – Ensign, Danielle and Friedler, Sorelle A. and Neville, Scott and Scheidegger, Carlos and Venkatasubramanian, Suresh
  - (c) Predictive Policing: Proceed, but with Care – Matthias Leese
- (6) Military funding
  - (a) Military Funding in Mathematics – William Thurston
  - (b) US military funding projects in Swiss universities – swissinfo.ch
  - (c) Pure to applied – Kevin Hartnett
  - (d) Barcodes: The persistent topology of data – Robert Ghrist (optional)
- (7) Finance
  - (a) Recipe for Disaster: The Formula That Killed Wall Street – Felix Salmon
  - (b) The Devil is in the tails: actuarial mathematics and the subprime mortgage crisis – Catherine Donnelly, Paul Embrechts
- (8) Math in the public
  - (a) Mathematics as propaganda – Neil Koblitz
  - (b) The ideology of certainty in mathematics education – Marcelo C. Borba, Ole Skovmose
- (9) Mathematical community
  - (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 – Bernhelm Boß-Bavnbek
- (10) Education & teaching
  - (a) Ethnomathematics and Its Place in the History and Pedagogy of Mathematics – Ubiratan d’Ambrosio
  - (b) Live by the Research Die by the Research – Szilárd Svitek
  - (c) No cops in the lecture hall: cheating and what (not) to do about it – Rashid Amerzaine
  - (d) Is There Enough Poison Gas to Kill the City?: The Teaching of Ethics in Mathematics Classes – Bonnie Shulman
- (11) Code of ethics?
  - (a) AMS Ethical Guidelines
  - (b) A Hippocratic Oath for mathematicians? Mapping the landscape of ethics in mathematics – Dennis Müller, Maurice Chiodo, James Franklin
- (12) Examples of positive ethical engagement
  - (a) The Moral Character of Cryptographic Work – Phillip Rogaway
  - (b) Questions of Responsibility: Modelling in the Age of COVID-19 – Maurice Chiodo and Dennis Müller
  - (c) Geometry v. Gerrymandering – Moon Duchin
- (13) What can we do?
  - (a) no reading