

# Syllabus - Math 17 Winter 2023

## *The abc Conjecture*

### 1 Course Catalogue Description

Gives prospective Mathematics majors an early opportunity to delve into topics outside the standard calculus sequence. Specific topics will vary from term to term, according to the interests and expertise of the instructor. Designed to be accessible to bright and curious students who have mastered BC Calculus, or its equivalent. This course counts toward the Mathematics major, and is open to all students, but enrollment may be limited, with preference given to first-year students.

### 2 Course Topic

The *abc* conjecture states that if  $a$ ,  $b$ , and  $c$  are relatively prime integers satisfying  $a + b = c$ , then  $a$ ,  $b$ ,  $c$  cannot all have many repeated prime factors. In this course, we will make this conjecture precise, consider polynomial analogues, and discuss the controversy surrounding the announced proof of the conjecture by Shinichi Mochizuki.

### 3 Textbooks

Joseph Silverman, *A Friendly Introduction to Number Theory*, 4th edition, 2017.  
Tom Wright, *Trolling Euclid*, 1st edition, 2016.

### 4 Instructor

**Instructor:** Juanita Duque-Rosero  
**Office:** 243 Kemeny Hall  
**E-mail:** juanita.gr@dartmouth.edu

### 5 Lectures

**Lectures:** Tuesday, Thursday, block 10A (10:10 a.m. - 12:00 p.m.)  
**x-period:** Friday, block 10AX (3:30 - 4:20 p.m.)  
**Office hours:** Monday 4:00 - 5:00 p.m. and Friday 3:30 - 4:30 p.m. (when no x-hour), or please make an appointment by email. Room TBA.

## 6 Learning Outcomes

By the end of this course, you should be able to:

1. Understand some basic structures of algebra and number theory: define terms, explain their significance, and apply them in context;
2. Solve mathematical problems: utilize abstraction and think creatively; and
3. Discover mathematical patterns and then recognize and construct mathematically rigorous arguments.

## 7 Grading

The course grade will be based upon the scores on class participation, homework, and a final project as follows:

- Class participation: 30%
- Written homework: 30%
- Final project: 40%

The lowest homework score will be dropped. This grading policy is subject to change, but grades will not decrease as a result of changes.

## 8 Teaching Methods and Philosophy

I firmly believe in Federico Ardila's axioms and I encourage you to think about them at every step of your learning process:

**Axiom 1** Mathematical potential is equally present in different groups, irrespective of geographic, demographic, and economic boundaries.

**Axiom 2** Everyone can have joyful, meaningful, and empowering mathematical experiences.

**Axiom 3** Mathematics is a powerful, malleable tool that can be shaped and used differently by various communities to serve their needs.

**Axiom 4** Every student deserves to be treated with dignity and respect.

### Expectations

These are my expectations for you: treat me, your classmates, and yourself with respect; come to class on time and prepared to learn; actively work and participate in class; and follow the honor principle. This is what you can expect from me: treat everyone with respect; come to class on time and prepared; do my best to support your class interactions and to help you succeed in this class; and have open channels of communication during class, office hours, or by email.

Classes will usually consist on a combination of lectures and small group class work. We will try to build an active learning environment, so please come and participate!

## 9 The Honor Principle

Academic integrity is at the core of our mission as mathematicians and educators, and we take it very seriously. We also believe in working and learning together.

Collaboration on homework is permitted and encouraged, but obviously it is a violation of the honor code for someone to provide the answers for you.

On written homework, you are encouraged to work together, and you may get help from others, but you must write up the answers yourself. If you are part of a group of students that produces an answer to a problem, you cannot then copy that group answer. You must write up the answer individually, in your own words.

## 10 Attendance

You are expected to attend class in person unless you have made alternative arrangements due to illness, medical reasons, or the need to isolate due to COVID-19. For the health and safety of our class community, please: do not attend class when you are sick, nor when you have been instructed by Student Health Services to stay home. Please arrange with your professor how to catch up on any course material that you miss.

## 11 Mental Health and Wellness

The academic environment is challenging, our terms are intensive, and classes are not the only demanding part of your life. There are a number of resources available to you on campus to support your wellness, including: the Counseling Center which allows you to book triage appointments online (<http://www.dartmouth.edu/~chd/>), the Student Wellness Center which offers wellness check-ins (<http://www.dartmouth.edu/~healthed/>), and your undergraduate dean (<http://www.dartmouth.edu/~upperde/>). The student-led Dartmouth Student Mental Health Union and their peer support program may be helpful if you would like to speak to a trained fellow student support listener. If you need immediate assistance, please contact the counselor on-call at (603) 646-9442 at any time. Please make me aware of anything that will hinder your success in this course.

## 12 Accommodations

Students requesting disability-related accommodations and services for this course are required to register with Student Accessibility Services (SAS; Getting Started with SAS webpage; [student.accessibility.services@dartmouth.edu](mailto:student.accessibility.services@dartmouth.edu); 1-603-646-9900) and to request that an accommodation email be sent to me in advance of the need for an accommodation. Then, students should schedule a follow-up meeting with me to determine relevant details such as what role SAS or its Testing Center may play in accommodation implementation. This process works best for everyone when completed as early in the quarter as possible. If students have questions about whether they are eligible for accommodations or have concerns about the implementation of their accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

## 13 Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

## 14 Title IX

At Dartmouth, we value integrity, responsibility, and respect for the rights and interests of others, all central to our Principles of Community. We are dedicated to establishing and maintaining a safe and inclusive campus where all have equal access to the educational and employment opportunities Dartmouth offers. We strive to promote an environment of sexual respect, safety, and well-being. In its policies and standards, Dartmouth demonstrates unequivocally that sexual assault, gender-based harassment, domestic violence, dating violence, and stalking are not tolerated in our community.

The Sexual Respect Website (<https://sexual-respect.dartmouth.edu>) at Dartmouth provides a wealth of information on your rights with regard to sexual respect and resources that are available to all in our community.

Please note that, as a faculty member, I am obligated to share disclosures regarding conduct under Title IX with Dartmouth's Title IX Coordinator. Confidential resources are also available, and include licensed medical or counseling professionals (e.g., a licensed psychologist), staff members of organizations recognized as rape crisis centers under state law (such as WISE), and ordained clergy (see [https://dartgo.org/titleix\\_resources](https://dartgo.org/titleix_resources)).

Should you have any questions, please feel free to contact Dartmouth's Title IX Coordinator. Their contact information can be found on the sexual respect website at: <https://sexual-respect.dartmouth.edu>.