

## Math 128: History of Mathematics in the Islamic World General Course Information, Fall 2024

**Professor:** Noah Aydin **Office:** RBH 319 **E-mail:** aydinn@kenyon.edu

**Class Meetings Times & Location:** MWF: 8:10-9, Hayes 311

**Student/Office Hours:** MWF: 9:10-10; TR: 9:40-11, or by appointment. See my weekly schedule on my website

**Course Web Site:** <http://www2.kenyon.edu/Depts/Math/Aydin/Teach/128/index.html>

**Textbooks:** *Episodes in the Mathematics of Medieval Islam*, 2<sup>nd</sup> ed, J. L. Berggren, ISBN 978-1-4939-3778-3; *Islamic Science and Making of the European Renaissance*, G. Saliba, ISBN 978-0-262-19557-7; *The First Scientist: Ibn al-Haytham*, B. Steffens, 978-1-68206-029-2; *The Prisoner of Al-Hakim*, B. Steffens, 978-168206-016-2.

**Course Description:** This course examines an important and interesting part of the history of mathematics, and more generally, the intellectual history of human kind: history of mathematics in the Islamic world. Some of the most fundamental notions in modern mathematics have their roots in this part of the history such as the modern number system, the fields of algebra and trigonometry, the concept of algorithm, foundations of optics and scientific method. These contributions are generally not known, not only in the West but in the Islamic World either. Moreover, there are commonly held misconceptions about the subject. In addition to studying specific contributions of medieval Islamic scholars in the areas of arithmetic, algebra, geometry and trigonometry in some details, we will also examine the context in which the Islamic science and mathematics flourished, and the role of religion this development. We will discuss the reasons behind the lack of awareness in the subject. We will examine the evidence from recent research that challenges and refutes many of the commonly held misconceptions (the Classical Narrative). The rise of Islamic science and its interactions with other cultures (e.g. Greek, Indian, and European Renaissance) tells us much about the larger issues of humanities. Thus, this course has both a substantial mathematical component (~60-65 %) and a significant history and social science component (~35-40%), bringing together three disciplines: Mathematics, History and Religion. There is a community engaged learning (CEL) component in this course. The culminating event for the course will be live presentations of finals projects at an Islamic Community Center It is part of the Islamic Civilization and Cultures program, and fulfills the QR requirement. No prerequisite is needed beyond high school algebra and geometry (but a solid knowledge in algebra and geometry is needed)

### Learning Goals and Objectives in Math 128

- Explain some of the major contributions of the medieval Islamic Civilization (IC) to mathematics and sciences
- Explain the connections and interactions between IC and other civilizations in terms of exchange of scientific knowledge.
- Understand the reasons behind the rapid developments in scientific progress in the IC
- Understand the reasons behind the lack of awareness on the subject among the general public, even highly educated people.
- Compare and contrast the Classical Narrative (CN) and the Alternative Narrative (AN) of Islamic Science. Explain arguments and evidence for each narrative. Explain specific evidence to support AN.
- Explain specific contributions of Islamic scholars to mathematics and sciences.
- Explain the limitations of the CN and the damage it caused.
- Communicate your knowledge on the subject to a general audience.

### The purpose of the Public Presentations of the Final Projects

In this field, much work is needed on two fronts:

1. Academic research on primary sources
2. Dissemination of established knowledge to the general public.

The main purpose of the public presentations of your final projects is to help disseminate the accurate information on the subject to the general public. Even the Muslim community does not have a good understanding of the subject. They appreciate receiving accurate information in an accessible manner.

### Grading and Evaluation Criteria:

Component	Percentage
Written Homework	22
Two Progress Checks	20
Reading Quizzes and Commentaries	10
Reading Questions	20
Final Project (peer feedback, live presentation, and math lesson)	30

**Written Homework:** This is primarily a math class. As in most math classes, *homework is one of the most important aspects of this course*. Practice is an essential component of the mathematical learning process, thus homework problems will be assigned regularly on mathematical material. Beyond just providing practice, the problems assigned are meant to be *extend* and *deepen* the understanding

you have gained from the reading and the class period. The effort that goes into solving challenging problems always pays off in the long run. I strongly recommend that you start on the homework as soon as possible after the class. That way, if you get stuck on an assignment you can get help from me or from the tutor *before* it is due. *Getting help during office hours (or other times by appointment) will be an important part of the learning process in this course.* You should not view this as an exception but the norm. Your homework should be legible, with problem number and final answer clearly indicated. Explanations in **complete sentences** are expected. Random math expressions floating in space will receive no credit.

#### **Homework Policies:**

1. Each homework set must be submitted at the beginning of the class the day it is due.
2. Homework will be evaluated for neatness, completeness and correctness.
3. If you work with others on assignments, you must follow [Math Department's guidelines on healthy collaboration](#)

**Attendance and Tardiness Policy:** Regular attendance is an essential part of this course and is expected. After one unexcused absence, each unexcused absence will lower your overall course grade by 1%. A total of 9 absences (whether excused or not) will result in expulsion from the course. Tardiness and walking out of the classroom are distracting for everyone. Unless there is a real emergency, please do not leave the classroom before the class is over. Two tardiness or leaving the room during the class will count as an unexcused absence. [See Math Dept's Class Attendance Policy.](#)

**Daily Reading/Responses:** Reading the textbook before each class is a necessity. You should come to class prepared with questions and comments for discussion. To this end, there will be a reading assignment for most days. Reading mathematics is not like reading most other things. You may need to read a section several times before the ideas come together. Please take time to do this. To make sure you have done the reading for a particular class I ask you to submit answers to a few basic questions on the assigned section *before* the next class, by the midnight before. Your grade on a reading assignment will be an integer between 0-5.

**Reading Commentaries and Reading Quizzes:** Several times during the semester you will be asked to write short (1-3 pages) response papers summarizing and commenting on essential ideas in readings. Identify, summarize, and comment on the most important ideas in the readings. You need to type and proof read these papers. In some cases, there will be a short reading quiz on the assigned reading material at the beginning of the class.

**Late and Make-up Policy:** All written homework assignments must be turned in at the beginning of the class period on the assigned due date. **For written math homework**, each student will be allowed one "free" 24-hour extension; no reason needs to be provided. Simply email the professor in advance of the due date (no later than the evening prior to the due date) to say you'd like to use your one-time extension. After that, late homework will not be accepted. For other assignments, no late submission is accepted unless a prior approval is obtained from the professor for a legitimate excuse (see below). For exams, a make-up can only be granted with an official notice from one of the deans (the dean of academics or the dean of students).

**Final Project and Community Engaged Learning Component:** In lieu of a final exam, you will complete a project. The project has two components: (1) a presentation, and (2) math lesson that can be used in a middle school or high school class. You should work in a group of size 3 for the project. You will present your final project at a virtual event to a live audience organized by the Noor Islamic and Cultural Center, NICC, (<http://www.noorohio.org/>) in Columbus. The presentations will take place on Fri, May 3 in the evening. The lesson part will be due at the officially scheduled final exam time for this class, which is 11:30 am on Tuesday, May 7. More information about the project is provided on the course website. The final project is the culminating experience in this course. Everything you learn is meant to help you create a great project at the end. Keep this in mind throughout the semester.

**Academic Honesty:** The rules set forth in the [2023-2024 Course Catalog](#) apply to all aspects of this course. In general, any work submitted for credit must result directly from your own understanding, thoughts, and ideas. Presenting the work of others as your own is strictly prohibited. You must follow the guidelines given in this document in general and mathematics department's guidelines for written homework in particular. Using chatGPT or other generative AI tools are prohibited for any of the assignments or exams in this course. If you have any questions, please ask your professor for clarification.

**Accessibility and Accommodations:** Students who anticipate they may need accommodations in this course because of the impact of a learning, physical, or psychological disability are encouraged to meet with me privately early in the semester to discuss their concerns. In addition, students must contact Student Accessibility and Support Services (SASS) (740-427-5453 or [sass@kenyon.edu](mailto:sass@kenyon.edu)), as soon as possible, to verify their eligibility for reasonable academic accommodations. Though I am happy to help you in any way I can, I cannot make any special accommodations without proper authorization from the SASS staff. Except in extraordinary circumstances (and at the very start of the course), accommodations must be certified and discussed with me at least one week before they are to take effect.

**Participation/Attendance/Engagement:** Pedagogically, regular engagement with the course material is essential for deep learning and it is an expectation in this course. Staying healthy is a prerequisite for this kind of engagement. Unless you have a legitimate excuse, you are expected to attend the class meetings. Legitimate excuses include illness, religious observations, college's official athletic events and similar situations. If you have a situation that prevents you from attending the class, please communicate with me as soon as possible. Timely communication is a key factor here. [Math Dept's attendance policy](#) applies to this course.

Much of the class time will be discussion of the assigned reading material and/or videos and activities that illuminate the ideas we explore. Therefore, attending class regularly and being prepared is essential. If you have extenuating circumstances that prevent you from attending class meetings, let me know as soon as possible. Each unexcused absence will reduce your final course grade by 1%.

### **Non-Discrimination, Civil Rights and Title IX Compliance**

Kenyon College does not discriminate in its educational programs and activities on the basis of race, color, national origin, ancestry, sex, gender, gender identity, gender expression, sexual orientation, disability, age, religion, medical condition, veteran status, marital status, genetic information, or any other characteristic protected by institutional policy or state, local, or federal law. The requirement of non-discrimination in educational programs and activities extends to employment and admission. As a faculty member, I am deeply invested in the well-being of each student I teach. I am here to assist you with your work in this course. If you come to me with non-course-related concerns, I will do my best to help. However, it is important for you to know that *all faculty, are considered Mandated Reporters* of any incidents of harassment, discrimination, and intimate partner violence and stalking. Meaning, I must report any such discussion to the Civil Rights/Title IX coordinator. I cannot keep information involving sexual harassment, sexual misconduct, interpersonal violence, or any other form of harassment or discrimination based on a protected characteristic, confidential. The Health and Counseling Center, the College chaplains, and the staff at New Directions Domestic Abuse Shelter & Rape Crisis Center are confidential resources. For further information, please refer to the following Kenyon College policies: [Discrimination, Sexual Misconduct & Harassment](#); Title IX, VAWA, Title VII.

[Civil Rights Policy](#)    [ADA & Section 504 Student Grievance Procedures](#)

### **Class Norms**

- We are a community of learners and we help and support each other
- We are fully present and fully engaged.
- Everyone should speak. Do not be shy to speak.
- We are respectful of each other.
- We offer friendly and constructive criticism.
- Everyone has something to learn.
- Everyone has expertise to offer.

### **How to Study for this Class**

- Read the assigned sections from the textbook before the class and watch the accompanying video, when there is one available. You may not understand everything in the first reading but that's OK. Do your best. Take notes to ask questions in class.
- Come to the class and actively participate in class discussions and activities. Do not hesitate to ask and answer questions, or contribute to class discussions in other ways. Postings in Moodle forums count as participation.
- Try doing homework problems as soon as they are assigned. Do not wait until the last minute.
- Do homework problems regularly. Do a problem or two every day instead of trying to do everything the last night.
- If you have any questions, come see Prof. Aydin during the regular office hours (no apt needed) or make an appointment.
- You are welcome to chat with Professor Aydin for matters outside the course content as well.
- Form study groups. Research shows studying in groups is really beneficial. BUT make sure that you write your own solutions independently at the end. Follow [Math Dept's guidelines](#) on healthy collaboration.

### **Outline of Weekly Topics** (see the course website for a more detailed schedule, reading materials, and assignments)

**W 1:** Overview and Introduction, The lives and works of selected Muslim scientists: Al-Khwarizmi, Al-Biruni, Omar Khayyam, Al-Kashi, Ibn al-Haytham

**W 2-3:** Islamic Arithmetic (Berggren Chapter 2)

**W 4-5:** Geometrical Constructions in the Islamic World (Berggren Chapter 3)

**W 6:** **Progress Check I** (week of Feb 19), *Prisoner of al-Hakim*

**W 7:** Saliba Chapters 1-3

**W 8-9:** Algebra in Islam (Berggren Chapter 4)

**W 10:** Saliba Chapters 4-7

**W 11:** Review, **Progress Check II** (week of April 8)

**W 12:** Berggren 5.1-5.5

**W 13:** Berggren 5.6, Work on Final Project

**W 14:** Rehearsals, Live presentations of final projects

**Second Part of the Final Project due: Tuesday, May 7, 11:30 am (official final exam date for this course)**