

## Math 128: History of Mathematics in the Islamic World General Course Information, Fall 2020

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

**Class Meetings:** MWF: 9:10-10 via Zoom. The same link for all meetings <https://zoom.us/j/986340648>

**Drop-In/Chat Hours:** MW: 10:10-12; F: 10:10-11, 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; *Ibn al-Haytham The First Scientist*, B. Steffens, 978-1-5935-024-0; *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. 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 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 it. 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         |
| Participation, Attendance and Engagement           | 8          |
| Reading Questions                                  | 8          |
| Final Project (presentation, paper, and animation) | 34         |

**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 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 to Moodle as a single pdf file.
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](#)

**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 frequent reading assignments. 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, the midnight before. Your grade on a reading assignment will be an integer between 0-4.

**Reading Commentaries and Reading Quizzes:** A number of 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.

**Final Project and Community Engaged Learning Component:** In lieu of a final exam, you will complete a project. The project has three components: a paper, a presentation, and an animation/illustration of a math topic that we discuss in the course. 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 Saturday, December 12 at 8 pm. The final paper will be due at the officially scheduled final exam time for this class, .... More information about the project is provided on the course web page. Keep this requirement in mind throughout the semester.

**Academic Honesty:** The rules set forth in the 2020-2021 Course Catalog apply to all aspects of this course.

<http://www.kenyon.edu/directories/offices-services/registrar/course-catalog-2/administrative-matters/academic-integrity-and-questions-of-plagiarism/>  
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. If you have any questions, please ask your professor for clarification.

**Disabilities:** If you have a disability which requires accommodations in this class, please feel free to discuss your concern with me, but you should also consult Ms. Erin Salva, the coordinator of student access and support services ([salvae@kenyon.edu](mailto:salvae@kenyon.edu), x5453). It is Ms. Salva who has the authority and expertise to decide on the accommodations that are proper for your disability. Though I am happy to help you in any way I can, I cannot grant any accommodations without a notification from Ms. Salva.

**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 remote synchronous class meetings. Legitimate excuses include: falling ill to the degree of not being able to attend class meetings remotely, illness in the family or other family emergencies, poor internet connection, and similar other 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. This component of your grade will be based on: regular attendance, the level of your participation, engagement and interest, and the quality of your feedback on the works of your classmates. Contributing to the discussions on Moodle forums will be an important part of class participation and engagement. 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%.

#### **Statement on Title IX**

Kenyon College seeks to provide an environment that is free of bias, discrimination, and harassment. If you have experienced any form of harassment/misconduct/assault, interpersonal violence, or stalking we encourage you to report it. If you report the incident to a faculty member, they must notify Kenyon's Civil Rights & Title IX Coordinator and share the information you provided. More information can be found on the following College web pages:

Sexual Harassment & Misconduct Policy: [www.kenyon.edu/directories/offices-services/title-ix/policy/](http://www.kenyon.edu/directories/offices-services/title-ix/policy/)

Discrimination & Discriminatory Harassment Policy: <https://www.kenyon.edu/directories/offices-services/ocr/discrimination/>  
ADA/504 Student Grievance Procedures:

[www.kenyon.edu/directories/offices-services/ocr/discrimination/504-ada-grievance/student-grievance-procedure-resolving-complaints-under-ada-section-504/](http://www.kenyon.edu/directories/offices-services/ocr/discrimination/504-ada-grievance/student-grievance-procedure-resolving-complaints-under-ada-section-504/)

## COVID-19 Class Policies

For the health and safety of all on campus, students studying in-person are required to know and follow Kenyon's COVID-19 policies and the local public health rules. Kenyon's policies include daily health screening reports, physical distancing, proper wearing of masks or facial coverings, COVID-19 testing and regular hand washing. If a student fails to follow any of the college COVID-19 policies, they will not be permitted in the classroom nor allowed to engage in class activities, including office hours. Violations will be reported to college officials. If a student is unable to attend class due to illness, quarantine or other circumstances related to COVID-19, please contact the appropriate college officials. They will notify your instructors of any necessary accommodations. It is also advisable to let the instructor know of your absence or need for accommodations as soon as possible; however, you are not obligated to disclose any specific health or private information. The faculty instructor will work with the student to implement the accommodations requested by college officials.

**PANDEMIC CONTINGENCY PLAN:** Since this course is fully remote, the impact of pandemic will be relatively lighter. Every class meeting will be recorded and made available shortly after the session. Students who are impacted by the pandemic during the semester should contact the professor as soon as possible. The professor will make appropriate arrangements on a case-by-case basis.

## Copyright of Course Materials

Course materials created by the faculty instructor such as slide presentations, handouts, assignments, quizzes, tests, and classroom recordings are protected by copyright law. You may share these materials with other students enrolled in the course. You may not reproduce, distribute, or display course materials for anyone outside of the class without the faculty member's explicit, written consent. The faculty instructor may record or live-stream class sessions for on-campus course instruction and/or remote instruction. Students are not permitted to record class sessions without the permission of the instructor.

## How to Study for this Class

- Read 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.
- Make use of the tutoring sessions that will be offered for each Math hmw set. Look for announcements for details.
- If you have any questions, have a chat with Prof. Aydin during the regular drop-in 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 Oct 5), *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**

**W 12:** Berggren 5.1-5.5

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

**W 14:** Rehearsals

**Final Paper due: Wed, Dec 16, 11:30 am (official final exam date)**