DSC 101: The Origins of Mathematics
Fall 2017
Instructor: Dr. Benjamin Purkis

TuTh 1:40-3:20pm, Oxford Science Building 101

Instructor Information:

Email: benjamin.purkis@emory.edu
Office: Modular Unit, Quad Side
Office Hours: Tuesday/Thursday 3:30-5 or by appointment; drop-ins are encouraged!
Drop-in policy: If my office door is open, you are always welcome to come in and ask whatever questions you may have. If my office door is closed, you are welcome to knock; I may answer, but I may also ask that you come back at another time. The best way to see me is to come during office hours or email me to set up an appointment.

Course Information and Policies:

Description: This course will survey the development of mathematics from prehistory to the present day, focusing on the problems that societies and mathematicians encountered and the methods and techniques they used to approach them. Students will be expected to work together to find solutions to problems that puzzled mankind, and present those solutions to their peers. It is important to note that this course is a mathematics course; while the history is an important aspect, students will be working on mathematical problems and computations weekly.

Course Objectives: At the end of this course, you will be able to...

- Have a working knowledge of the development of mathematics throughout history.

- Understand the context behind modern mathematical subjects.

- Approach new mathematical problems by asking the types of questions that mathematicians do.

- Work independently and with others to solve complex problems through organized critical thinking.

- Use information resources both in the library and elsewhere to research mathematical topics.

Textbook: *An Introduction to the History of Mathematics*, 6th Edition, by Howard Eves. This book is out-of-print, but will be made available through the campus bookstore. Until it is available, I will post all readings on the Canvas website. We will follow the textbook semi-closely throughout the semester, but will often skip around and take frequent deviations.

Content: The main content of the course is discovering what lies at the core of mathematics through study of its history. Therefore we will cover several different eras in mathematical history, including (as time permits):

1. **Prehistory, Egypt and Babylonia** - The earliest civilizations (and pre-civilizations!) developed many important mathematical concepts. Topics covered will include numeral systems, right triangles, inductive mathematics for practical application, and some simple arithmetic and geometry.

2. **Ancient Greece** - The Greece of ancient times is perhaps the genesis of modern mathematical thought. Topics covered will include the beginnings of geometry and number theory, the Pythagorean school, Euclid's axiomatic geometry, and Archimedes' multiple contributions, including the stirrings of calculus nearly 2000 years before Newton and Leibniz.

3. **Ancient China** - While the civilizations in the west made great mathematical strides, the ancient Chinese made equally impressive advances in mathematics, in some cases making achievements that would not be matched in the west for over a thousand years. Topics here will include approximations of π, the Chinese "rod" numeral system, magic squares, the Chinese Remainder Theorem and Pascal's triangle and the binomial theorem.

4. **Hindu and Arabian** - The Hindu and Arabian cultures not only made their own contributions to mathematics, but also played a vital role in preserving the mathematical knowledge of ancient Greece through the Dark Ages. Topics covered will include the Hindu-Arabic numeral system, zero and negative numbers, and the development of algebra.

5. **The Mathematical Renaissance** - As the Dark Ages ended, mathematical thought made a comeback, along with the rest of the world. Here we will cover the early development of modern mathematics, including the adoption of the Hindu-Arabic numeral system, the works of Fibonacci, and contributions to trigonometry, algebra, number theory, and the foundation of calculus.

6. **Modern Mathematics** - For the final section of the course we will examine the state of mathematics today, and what kind of problems puzzle the mathematicians today. Topics will include unsolved mathematical problems such as the Millenium Problems, topics in set theory and the philosophy of mathematics, and the development of modern branches of mathematics such as topology, analysis, various types of geometry, and more.

Structure: Class periods will follow this general structure:

- **Reading Quiz:** The first 10-15 minutes of class will consist of a reading quiz to test your understanding of the reading assigned. After taking the quiz individually, each group will then take the same quiz together.

- **Introduction:** The next portion of class will be a short lecture introducing the topic or problem for the day. This lecture will generally not be longer than 20 minutes, and will give the context for the following group work.

- **Group Work:** Students will split into groups of four and brainstorm possible approaches or solutions to the problem solved. After a period of time, the groups will

reconvene and share their approaches to the problem and what progress they made, and the class will discuss the problem as a whole. This will be the majority of class time.

- **Wrap Up:** At the end of class will be a short lecture describing how the problem was approached historically, whether it was solved, and what affect it had on the development of mathematics. This lecture will also set the stage for the next class period.

Course Expectations:

Grading: Quizzes and exams will be graded based on *correctness*, *completeness*, and *legibility*. Your grade for this course will be calculated as follows:

Problem Sets:	150 points
Reading Quizzes: 75 points each for individual/team quiz	150 points
Projects: Two at 175 points each	350 points
Midterm Exam:	150 points
Final Exam:	200 points
Total:	1000 points

Grades will be assigned by the following scale:

A	≥ 925	A-	895-924	B+	865-894
B	825-864	B-	795-824	C+	765-794
C	725-764	C-	695-724	D+	665-694
D	595-664			F	≤ 594

Classes: While attendance will not be taken directly, it is essential that you come to class on time every day, *having read the material assigned.* Your ability to get the most out of our class periods is greatly hampered if you are not prepared, especially since we only have 28 classes. You are responsible for all the material covered in class, even if you are absent.

Teams: On the second day of class, you will be assigned to a team of four of your class-mates. You will work with this team every day in class, and are encouraged to work with them outside of class as well! Teams will receive the same score on the team portion of reading quizzes (see below), so make sure you are prepared!

Reading Quizzes: Reading quizzes will take place every class period, and are meant to check that you have read the material assigned thoroughly. Each person will have 5 minutes to complete the quiz individually, and then the teams will have 5 minutes to complete the quiz as a team. All team members will receive the same score on the team portion of the quiz. All quizzes are closed book and notes, and *calculators are banned.*

Exams: You will have one midterm exam and a cumulative final exam this semester. Your exam dates are:

- Midterm Exam: **Thursday, October 5th in class**

- Final Exam: **Monday, December 11th from 9am-12pm**

The midterm exam will cover all material from the first half of the course; the final exam will be cumulative. All exams are closed book and notes, and *calculators are banned.*

Projects: There will be two major projects in this class. One will focus on research of a mathematician in history and their works, while the second will focus on the development of an unsolved problem in mathematics. More information will be given about the projects when they are assigned.

Other Information and Policies:

Makeups: In general, makeups are not allowed for exams or assignments. However, if you have a valid reason for a makeup exam, inform me as soon as possible. Valid reasons include medical emergency, a death in the family, or religious observations. Extensions will only be granted for emergency situations.

A Word on Technology: Please leave all iPods, MP3 players, netbooks, etc. stowed and off for the duration of the class. Cell phones should be silenced. Return all seats and tray tables to the upright and locked position.

Honor Code: The Honor Code of Oxford College applies to all work submitted for credit in this course. In order to receive credit for your work, you must place your name on it. By placing your name on submitted work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.

Academic Accommodations: The Office of Accessibility Services (OAS) works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, students must contact OAS and complete the registration process. Faculty may not provide disability accommodations until an accommodation letter has been processed; accommodations are not retroactive. Students registered with OAS who receive a letter outlining specific academic accommodations are strongly encouraged to coordinate a meeting time with their professor to discuss a protocol to implement the accommodation as needed throughout the semester. This meeting should occur as early in the semester as possible. Contact the OAS for more information at (770) 784-4690 or `adsroxford@emory.edu`. Additional information is available at the OAS website at `http://equityandinclusion.emory.edu/access/students/index.html`.

Religious Holidays: Instructors are encouraged, not required, to accommodate students' academic needs related to religious holidays. Please make every effort to negotiate your religious holiday needs within the first two weeks of the semester; waiting longer may compromise your instructor's ability to extend satisfactory arrangements. If you need guidance negotiating your needs related to a religious holiday, the College Chaplain, Rev. Lyn Pace, `ppace@emory.edu`, Candler Hall 202, is willing and available to help.

****Please be aware that Rev. Pace is not tasked with excusing students from classes or writing excuses for students to take to their professors.*

Emory's official list of religious holidays may be found at:
`http://www.religiouslife.emory.edu/faith_traditions/holidays.html`.

This syllabus is a guide for effective learning in this class; it is not a legal contract. The instructor reserves the right to modify the syllabus as needed.