MA 330, History of Mathematics[1]
University of Kentucky, Spring 2018

1. General Information

Instructor: Dave Jensen
Course Webpage: http://www.ms.uky.edu/∼dhje223/teaching.html
Email: dave.h.jensen@gmail.com
Class Time/Location: CB 337, MWF 9:00-9:50 AM
Office Location/Hours: POT 733, MWF 10-11 AM

Required Course Texts:

Books:

- *Journey Through Genius: The Great Theorems of Mathematics*, 1991, by William Dunham. ISBN-10: 014014739X
- *The Crest of the Peacock: Non-European Roots of Mathematics*, third edition, 2011, by George Gheverghese Joseph. ISBN-10: 0691135266

Articles:

- "The Secret to Raising Smart Kids," by Carol Dweck, 1 January 2015, Scientific American http://www.scientificamerican.com/article/the-secret-to-raising-smart-kids1/
- Handout on Euler's proof of infinitude of primes

2. Course Description and Student Learning Outcomes

Is this a math course, or a history course? It's bo'fem!

This course aims to inform our vision of how mathematics develops, creating for ourselves a cohesive picture of mathematics. Over the course of the semester, we will study connections between mathematics and the non-mathematical world, helping us understand what drives our intellectual values, both individually and collectively.

How have our intellectual values changed over time? What makes a theorem important? What does that even mean? What makes a theorem beautiful? Or useful? What is the role and purpose of proof in mathematics? How do we as mathematical learners and practitioners fit into the contemporary culture of mathematics?

Students in MA 330 will deepen their understanding of

(1) Greek, Egyptian, and Mesopotamian mathematics, with a focus on arithmetic, number theory, Euclidean geometry, and rhetorical algebra;
(2) how the Islamic mathematicians blended these mathematical traditions with traditions from the Indian subcontinent;
(3) how algebra and calculus were initially regarded and practiced, and how this differs from contemporary use;
(4) the development of mathematical approaches to infinite processes; and
(5) the role, purpose, and development of mathematical proof.

Further, students in MA 330 will

(6) enhance their reading, writing, and oral communication skills in mathematical contexts;
(7) increase their persistence and use of self-monitoring when working on mathematics;

[1] I reserve the right to change or amend this syllabus at any time for any reason.

(8) develop an understanding of the global nature of mathematical culture, and the importance of cultural interactions in mathematical history; and
(9) reflect on contemporary mathematical culture, their place in it, and their mathematical values.

3. **Class Structure**

Our activities in this course will directly serve the student learning outcomes listed above. Class time will usually not be spent in a formal lecture style. Instead, we will spend time in class:

- discussing the readings with the entire class,
- working through math in the readings in groups,
- working on problem sets related to the readings in groups,
- presenting problem progress and solutions at the board, and
- offering and receiving constructive criticism regarding our ideas and understanding.

You should expect to spend *at least* six hours per week outside of class for MA 330.

4. **Tentative Schedule**

Next to each date is listed the material that should be read prior to class. We use the abbreviations JTG for Journey Through Genius and Crest for The Crest of the Peacock.

Jan 10: First Day of Class
Jan 12: JTG: Preface
Crest: Preface to the First Edition
Dweck article "Secret to Raising Smart Kids": read all of it
Course Syllabus

Greek Mathematics

Jan 15: No Class: MLK Holiday
Jan 17: JTG: Ch 1, pgs 1–17, start chapter, end at "Great Theorem"
Jan 19: JTG: Ch 1, pgs 17–26, start "Great Theorem," complete chapter.
ASSIGNMENT #1 DUE
Jan 22: JTG: Ch 2, pgs 27–44, start chapter, end at "Book I: Parallelism..."
EXAM
Jan 24: JTG: Ch 2, pgs 44–53, start at "Book I: Parallelism," end at "Epilogue"
Jan 26: JTG: Ch 3, 61–75, start chapter, end at "The Final Books..."
ASSIGNMENT #2 DUE
Jan 29: JTG: Ch 3, 75–83, start at "The Final Books...," complete chapter
EXAM
Jan 31: JTG: Ch 4, pgs 84–99, start chapter, end at "Archimedes' Masterpiece"
ASSIGNMENT #3 DUE
Feb 2: JTG: Ch 4, pgs 99–112, start at "Archimedes' Masterpiece," complete chapter
Loewen chapter "Handicapped by History", pgs 19–36
*** Course Project Proposal Due ***

Egyptian and Mesopotamian Mathematics

Feb 5: Crest: Ch 1
EXAM

Feb 7: Crest: Ch 3, pgs 79–100, start chapter, end at "Applications of Unit Fractions"

Feb 9: Crest: Ch 3, pgs 100–109, start at "Applications of Unit Fractions, end at "Egyptian Geometry"
Crest: Ch 3, pgs 119–122, subsection on "Egyptian Mathematics: A General Assessment"
ASSIGNMENT #4 DUE

Feb 12: Crest: Ch 4, pgs 125–144, start chapter, end at "A Babylonian Masterpiece"
EXAM

Feb 14: Crest: Ch 4, pgs 150–159, start at "Babylonian Algebra," end at "Babylonian Geometry"
Crest: Ch 5

Feb 16: PEER EDIT DAY: First Version of Course Project Due

Islamic Mathematics

Feb 19: JTG: Ch 5, pgs 129–132, start in Epilogue after proof of Pythagorean Theorem, complete chapter
Crest: Ch 11, pgs 450–469, start chapter, end at "Mathematics in the Service of Islamic Law"
ASSIGNMENT #5 DUE

Feb 21: Crest: Ch 11, pgs 471-474, start at "The Theory of Numbers," end at "Extraction of Roots"
EXAM

Feb 23: Crest: Ch 11, pgs 475–487, start at "Extraction of Roots," end at "Geometry in the Islamic World"

Feb 26: Crest: Ch 11, pgs 487–492, start at "Geometry in the Islamic World," end at "Thabit ibn Qurra's Generalization"
Crest: Ch 11, pgs 508–512, start at "The Islamic Contribution: Final Assessment," complete chapter
ASSIGNMENT #6 DUE

The Beginning of Symbolic Algebra

Feb 28: JTG: Ch 6, pgs 133–147, start chapter, end at "Further Topics on Solving Equations"
EXAM

Mar 2: JTG: Ch 6, pgs 147–154, start at "Further Topics on Solving Equations," complete chapter

Mar 5: No Reading
PEER EDIT DAY: First Version of Essay from Assignment #5
ASSIGNMENT #7 DUE

Infinite Series and the Origins of Calculus

Mar 7: JTG: Ch 7, pgs 155–165, start chapter, end at "Newton's Binomial Theorem"
EXAM

Mar 9: JTG: Ch 7, pgs 165–174, start at "Newton's Binomial Theorem," end at "Great Theorem"
ASSIGNMENT #8 DUE

Spring Break: March 12–16 – no class

Mar 19: JTG: Ch 7, pgs 174–183, start at "Great Theorem," complete chapter

Mar 21: JTG: Ch 8, pgs 184–196, start chapter, end at "Great Theorem"
EXAM

Mar 23: JTG: Ch 8, pgs 196–206, start at "Great Theorem," complete chapter

Mar 26: JTG: Ch 9, pgs 207–212, start chapter, end at "Great Theorem"
ASSIGNMENT #9 due
Mar 28: JTG: Ch 9, pgs 212–222, start at "Great Theorem," complete chapter
EXAM
Mar 30: Handout regarding Euler's proof of infinitude of primes
ASSIGNMENT #10 DUE
Apr 2: JTG: Ch 10, pgs 223–229, start chapter, end at "Great Theorem"
Apr 4: JTG: Ch 10, pgs 229–244, start at "Great Theorem," complete chapter
EXAM
ASSIGNMENT # 11 due

Graph Theory

Apr 6: No Reading
Apr 9: History Topic: The Four Colour Theorem

Non-Euclidean Geometry

Apr 11: God Created the Integers, pgs 697–703, 743–749
Apr 13: Heart of Mathematics, pgs 288–299
Apr 16: Final version of course project due

The Nature of Infinity

Apr 18: JTG: Ch 11, pgs 245-258, start chapter, end at "Great Theorem"
EXAM
Apr 20: JTG: Ch 11, pgs 259–266, start at "Great Theorem," complete chapter

Last Week

Apr 23: Makeup day
Apr 25: Makeup day
Apr 27: No Reading
ASSIGNMENT # 12 due

Final Exam

Final: 9:30 AM–10 AM, Wednesday, May 2, 2018
NOTE: The final exam will be only 30 minutes.

5. Assessment and Grading

There will be four elements to assessment and grading in this course: Participation, Homework Assignments, Exams, and a Course Project.

5.1. Participation and Attendance.

- You must be present and engaged in class each day.
- If you have any concerns about your participation grade, come talk with me about them.
- *Absence Policy:*
  - You are allowed 3 unexcused absences. Beyond that, *you will lose 2% of your overall course grade for each unexcused absence.*
  - Students must notify the instructor of their absence prior to the absence or within one week after the absence.
  - Students must submit any written documentation supporting their excused absence within one week after the absence.

  - Absences for major religious holidays require one week advance written notification.

5.2. **Homework Assignments.**

- Assignments will be given regularly. Some portions of the assignments must be typed.
- *WARNING:* No late work will be accepted.
- You should work with other students and share your ideas as part of our course community. However, you should not let your collaboration devolve into letting someone else do all the "hard parts" and then copying their answers.
- *Four Rules for Assignments:*
  - Don't talk to anyone about the problems until you have made a genuine effort to solve them yourself.
  - You must write up the solutions on your own.
  - For each problem, write the names of any other people (students, tutors, etc) with whom you shared ideas.
  - You may *not* search the internet for solutions to problems. We will use our creativity, course texts, and peer collaboration as our tools for investigating the history of mathematics.

5.3. **Exams.**

- Exams will take place roughly once per week, at the start of class.
- Exam dates are listed on the course schedule.
- Most exams will be approximately 10-15 minutes in length.

5.4. **Course Project.**

- You will choose a topic for and complete a major project related to the history of mathematics during the course of the semester. This will be a written project of length 10 pages (without cover sheet or references) with 1 inch margins, 12 point Times New Roman font, double spaced. All projects are expected to be well-written, free from grammatical errors, and have excellent mathematical depth and style.
- You should direct a significant portion of your project toward a general university audience and articulate clearly which sections are aimed toward experts.
- You will turn in a first version of your project for peer review; the first version must be a complete project that you will revise substantially to create your final version.

5.5. **Course Grades.** Your course grade will be determined by your attendance, participation, assignments, exams, and project. The grading scale will be no stricter than the usual A>89.9, B>79.9, C>69.9, D>59.9, E otherwise, weighted as follows:

- Participation: 5%
- Assignments: 30%
- Exams: 30%
- Project:
  - First Version: 10%
  - Final Version: 25%

6. Course Expectations and Classroom/Learning Accomodations

All students are expected to follow the academic integrity standards as explained in the University Senate Rules, particularly Chapter 6, found at:

http://www.uky.edu/Faculty/Senate/rules_regulations/index.htm

Turn off all cell phones, pagers, etc. prior to entering the classroom. ***You are not to use your cell phones, pagers, or other electronic communication devices during class.*** An attitude of respect for and civility towards other students in the class and the instructor is expected at all times.

Any student with a disability who is taking this course and needs classroom or exam accommodations should contact the Disability Resource Center. This should be done as early as possible, to ensure adequate time for making accommodations.

7. Graduation Writing Requirement Information

Learning Outcomes. This is a writing-intensive (W) course approved to fulfill the upper tier of the graduation writing requirement (GWR).

- Write a paper that is essentially free of mechanical errors (grammar, punctuation, spelling, and syntax) and awkwardness, using a style that is appropriate to the purpose and audience.
- Demonstrate an ability to discover, evaluate, and clearly present evidence in support of an argument in the subject area and utilize documentation that conforms to the formats and the citation conventions of the subject area.
- Be aware that composing a successful text frequently takes multiple drafts, with varying degrees of focus on generating, revising, editing, and proofreading.
- Write a capable, interesting essay about a complex issue (discipline-specific) for a general university audience.

Minimum Writing Requirements.

- Students will be required to write a minimum of 15 pages of formal writing.
- At least 10 of these pages must be single-authored assignments.
- No assignments requiring fewer than 4 pages may be included in the 15-page minimum.
- These 15 pages must go through a draft, review, and revision process. Peer review is sufficient to meet the review requirement.

Grading Policies. To pass the course, students must earn a grade of C or higher on ALL FORMAL assignments. Instructors can consider additional formal writing, writing other than the formal writing, or additional projects and assignments in the final grade computation. Thus, students can receive lower than a C as a final grade and still receive GWR credit. Any major assignment that receives a D or below must be revised to reflect competency and resubmitted. Instructors may limit the number of revision attempts and set time restrictions on revisions. At the discretion of the instructor, students who fail to achieve competency may receive an I (incomplete) grade, but in no case may a student whose writing fails to reach the level of C (competent) receive a passing grade in a course that satisfies the University Writing Requirement.

Plagiarism. Part II of Student Rights and Responsibilities (6.3.1; online at http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work written or otherwise submitted by students to their instructors or other academic supervisors is expected to be the result of their own thought research or selfexpression. In cases where students feel unsure

about a question of plagiarism involving their work they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own but which in any way borrows ideas organization wording or anything else from another source without appropriate acknowledgment of the fact the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work whether it be published article chapter of a book a paper from a friend or some file or whatever. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor but when the actual work is done it must be done by the student and the student alone.

When a student's assignment involves research in outside sources or information the student must carefully acknowledge exactly what where and how he/she has employed them. If the words of someone else are used the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Plagiarism also includes making simple changes while leaving the organization content and phraseology intact. However nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain.

UK Mathematics Department Professional Themes. This course will address the four themes of the conceptual framework for the UK professional education program: research, reflection, learning, and leading. Students will engage with fundamental ideas in mathematical research, reflecting on and analyzing core mathematical content that arises throughout mathematics at all levels. Students will develop as life-long mathematical learners who will be able to take active leadership roles in their future roles as professionals and citizens. The ultimate goal in addressing these four themes is to produce teacher leaders who work together to improve student learning among diverse populations and improve education in Kentucky and beyond.

Unbridled Learning Initiatives and the Kentucky Core Academic Standards. This course will provide students an opportunity to advance their knowledge and mastery of the tools associated with Kentucky education reform, focusing on the content and practice standards outlined in the the Kentucky Core Academic Standards. As students carry out projects and complete assignments that involve mathematical content underlying instructional activities for P-12 students in Kentucky schools, they will address one or more components of the Unbridled Learning initiatives.