Syllabus: M 3010 History of Mathematics

Instructor: Andrej Cherkaev*

Preamble

Course Number and Title: M 3010 History of Mathematics
Semester and Year: Fall 2020
Dates and time: Mo We Fr 11:50 am-12:40 pm.
Location: Zoom
Instructor: Andrej Cherkaev
Email: cherk@math.utah.edu
Office hour: Monday 2-3 pm or by appointment
Phone: 801-4039500
Accessibility & Support: Please contact me via email and by Zoom during office hour, after every class meeting, or by appointment.

Attendance I know that online learning could be unfamiliar, challenging, and stressful. However, teleconferences are and will remain norms in today’s professional world; we need to be ready.
- Online attendance is strongly encouraged. A part of the grade is based on in-class discussions.
- Please keep the cameras on during the class to communicate, see, and be seen by your classmates and instructor.
- When you send me an email about the class issues, include ”3010” in the subject line.


*email: cherk@math.utah.edu. Homepage http://www.math.utah.edu/ cherk/
Text: A History of Mathematics by Victor Katz. 3rd ed., Pearson, 2014. The textbook is a respected 1000-page encyclopedia of math. history and is reasonably priced ($30 in Amazon). It is readable for anyone with a calculus background (we exclude sections that require more). We will review selected chapters.

Additional course materials: Various internet sources will be specified in Canvas class page. Lecture Notes will be posted online.

Technical requirements Students are expected to be computer literate, and Canvas and Zoom navigation skills are expected. Knowledge and navigation of Canvas and Zoom are critical to access all features and resources of this course. Because of live Zoom sessions, a reliable internet connection, and adequate bandwidth are needed. For technical assistance, review the Canvas Getting Started Guide for Students or contact TLT, Knowledge Commons, etc.

Description

Content overview From the beginning of recorded history, mathematics has been a hallmark of every society. Its complexity reflects a civilization’s ability to handle logic, quantities, shapes, processes, arrangements, etc. Today, mathematics is all around us in computers, engineering, architecture, medicine, transportation, art, money, and even sports. More than 100 000 papers are published annually. The diversity of areas of contemporary mathematics is shown in the glossary: (en.wikipedia.org/wiki/Glossary_of_areas_of_mathematics). Naturally, one wants to understand how we get to this place.

The course offers a journey through the four millennia of mathematical research. We track the history of algebra, geometry, discrete mathematics, calculus, statistics. We look at ancient societies’ contributions and recent developments observing the graduate rise of sophistication and abstraction of concepts; learn about great mathematicians and their ideas. We review some central problems of the times and practice in their solutions.

Course expected learning outcomes At the end of the course, the students should understand the tendencies and reasons of the development of mathematics, the methods of ancient mathematicians, the ideas behind
modern mathematical branches. The students should understand the landmark problems that lead to breakthroughs in mathematical practices; learn about the works of great mathematicians in the past and present. Finally, students should polish their skills in writing essays.

The course M3010 satisfies the General Education requirements; it addresses the following Essential Learning Outcomes: Critical Thinking, Written Communication, Foundations and Skills for Lifelong Learning.

**Course Design**  The course consists of lectures, discussions, homework, essay writing, peer reviews, and consultations with the instructor. Instructor’s online lectures will be delivered via Zoom and video conferencing on Canvas during class times. All assessments for this course will also be held during class time and office hours via Canvas and Zoom. Homework problems and essays will be submitted via Canvas.

I expect that the students will read the assigned material before class and be ready for the discussion. A part of the grade assesses the in-class activity (questions and discussion). The lecture slides will be available on Canvas before the lecture.

**Assignments, Assessment, and Grading**  The homework will be assigned every week or two. The midterm and final essays serve as midterm and final exams.

The grade is based on:
- Homework problems - 30%.
- Participation in class discussions and presentation - 10%.
- Peer reviewer - 10%
- Midterm Essay on Math before 19th century - 20%
- Final Essay on development of a mathematical concept - 30%.

**The syllabus may be changed**  This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule depending on the needs of our class. Any changes will be announced in class and posted on Canvas.
<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Subject</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 24 - 28</td>
<td>Introduction. Structure and roots of modern math. Prehistoric math, Mesopotamia- numeral</td>
<td>Notes</td>
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<tr>
<td>2</td>
<td>Aug 31 - Sept 4</td>
<td>Mathematics in Bronze Age: 2nd millennium BCE. Mesopotamia, Egypt</td>
<td>Ch. 1</td>
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<td>3</td>
<td>Sept 9 - 11</td>
<td>Early Greek math/ Plato, Aristoteles, Pythagoras</td>
<td>Ch 2-3</td>
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<td>4</td>
<td>Sept 14 - 18</td>
<td>Euclid. Hellenistic math</td>
<td>Ch 4-5</td>
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<td>5</td>
<td>Sept 21 - 25</td>
<td>Medieval Mathematics: Muslim world (algebra and trigonometry), China, India, Europe</td>
<td>Review Ch 7-11</td>
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<td>Origins of Modern math. 16-18th centuries</td>
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<td>7</td>
<td>Oct 5 - 8</td>
<td>Fermat, Pascal, Descartes: Number theory, Probability, Analytic geometry</td>
<td>Ch. 14</td>
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<td>8</td>
<td>Oct 12 - 15</td>
<td>Newton and Leibniz: Function, Calculus and Differential Equations, first computer</td>
<td>Ch. 16</td>
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<td>9</td>
<td>Oct 19 - 22</td>
<td>Bernoulli, Euler: Calculus of Variations, Series, Beginning of Topology</td>
<td>Ch. 17</td>
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<td>10</td>
<td>Oct 26 - 29</td>
<td>Lagrange, Laplace. Partial differential equations, Mechanics</td>
<td>Ch. 18</td>
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<td>Modern math. 19th century-present</td>
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<td>11</td>
<td>Nov 2 - 6</td>
<td>Differential and non-Euclidean Geometry, , fractals, tilings, graphs</td>
<td>TBA</td>
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<tr>
<td>12</td>
<td>Nov 9 - 13</td>
<td>Analysis. Hilbert space. Set theory, foundations, computer logic, deep learning</td>
<td>TBA</td>
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<tr>
<td>13</td>
<td>Nov 16 - 20</td>
<td>Diff equation, Numerics, Optimization, Chaos and Homogenization</td>
<td>TBA</td>
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<td>14</td>
<td>Nov 23, 25</td>
<td>Challenges and perspectives</td>
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<td>15</td>
<td>Dec 1, 3</td>
<td>Reserve</td>
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Essays: Important dates
October 14. Submit the project of the midterm essay for approval.
October 21. Submit the draft of the essay for peer review.
October 30. Submit the midterm essay

November 4. Submit the project of the final essay for approval.
November 13. October 2. Submit the draft of the essay for peer review.
December 7. Submit the final essay.

The guidances to essays writing and reviewing are published separately.

Course Policies

Checking grades Please check the accuracy of all homework, online assignments, and exam grades. Keep record of all your graded assignments. If you see any error in Canvas’s grades, reach out to the instructor quickly.

Late Assignments/Regrading Policies I will be flexible where possible/appropriate. Please remember, however, that grading late assignments is a pain. You may ask for regrading provided you have a good reason.

Incompletes According to university policy, to be considered for an incomplete, a student must have 20% or less of the course work remaining and be passing the course with a C or better. You must request an incomplete grade, and I will consider giving that grade under exceptional circumstances.

Content Accommodations Consistent with principles of academic freedom, the faculty, individually and collectively, has the responsibility for determining the content of the curriculum. Students are expected to take courses that will challenge them intellectually and personally. Students must understand and articulate the ideas and theories that are important to the discourse within and among academic disciplines. A personal disagreement with these ideas and theories or their implications is not sufficient grounds for requesting the accommodation (see https://regulations.utah.edu/academics/6-100.php).

Plagiarism Plagiarism is unacceptable and results in F - grade. I use plagiarism detection service.
University of Utah policies

Discrimination and Harassment: If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or Office of the Dean of Students, 270 Union Building, 801-581-7066. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS). Please see Student Bill of Rights, section E http://regulations.utah.edu/academics/6-400.php.

Names/Pronouns. Canvas allows students to change the name that is displayed AND allows them to add their pronouns to their Canvas name. Class rosters are provided to the instructor with the student’s legal name as well as “Preferred first name” (if previously entered by you in the Student Profile section of your CIS account, which managed can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center. https://lgbt.utah.edu/campus/faculty_resources.php

English Language Learners. If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (http://writingcenter.utah.edu/); the Writing Program (http://writing-program.utah.edu/); the English Language Institute (http://continue.utah.edu/eli/). Please let me know if there is any additional support you would like to discuss for this class.

Undocumented Student Support. Immigration is a complex phenomenon with broad impact to those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a
wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801.213.3697 or visit dream.utah.edu.

**Veterans Center.** If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5 pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for any reason. Wellness Statement. 

Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources, contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

**Student Success Advocates:** The mission of Student Success Advocates is to support students in making the most of their University of Utah experience (ssa.utah.edu). They can assist with mentoring, resources, etc. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact a Student Success Advocate for support (https://asuu.utah.edu/displaced-students).

**The Americans with Disabilities Act:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

**Addressing Sexual Misconduct:** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, including sexual orientation or gender identity/expression,
you are encouraged to report it to the University’s Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or to the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS).

**Campus Safety:** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu

**University Counseling Center** The University Counseling Center (UCC) provides developmental, preventive, and therapeutic services and programs that promote the intellectual, emotional, cultural, and social development of the University of Utah students. They advocate a philosophy of acceptance, compassion, and support for those they serve and each other. They aspire to respect cultural, individual and role differences as they continually work toward creating a safe and affirming climate for individuals of all ages, cultures, ethnicities, genders, gender identities, languages, mental and physical abilities, national origins, races, religions, sexual orientations, sizes, and socioeconomic statuses.

**Office of the Dean of Students** The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students and assists with the interpretation of University policy and regulations. Please consider reaching out to the Office of Dean of Students for any questions, issues and concerns. 200 South Central Campus Dr., Suite 270. Monday-Friday 8 am-5 pm.