MATH 478/678: History of Mathematics: 3 credits

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Lecture hours	MWF 8:00am–8:50am, NDSU Minard Hall, Rm 208
Office hours	MWF 11:00am–11:50am (or by appointment)
Textbook	David M. Burton, The History of Mathematics: An Introduction, McGraw-Hill Education; 7 edition (2010)
Prerequisites	MATH 270
Course Description	Historical considerations emphasizing the source of mathematical ideas, growth of mathematical knowledge, and contributions of some outstanding mathematicians.
Course Objectives	In this course we will look at the axiomatic method — the cornerstone of modern mathematics — through the historical development of several important mathematical topics. In particular, we will discuss the following topics: The development of geometry concentrating mostly on Euclidian axioms; Numbers, including the Peano axioms for natural numbers, integers and the fundamental theorem of arithmetic, rational numbers as an example of a field, and the long history to the rigorous notion of real numbers; Polynomials as the "nicest" functions, including the discovery of complex numbers, fundamental theorem of algebra, and "infinite" polynomials, aka power series, that were invented by Isaac Newton; and finally Probability theory, including the axioms of Kolmogoroff, classical probability, and the (basic version of) central limit theorem.
Class Attendance	According to NDSU Policy 333 (www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. The students are solely responsible for missed handouts or announcements made during the lectures.
Homework and quizzes	The biggest part of the homework will consists in reading the corresponding sections of the textbook prior to the classes. All the necessary reading will be assigned prior to each week and should take one and half to two hours a week. Along with the reading assignments a number of problems from the textbook will also be assigned. These problems will test your understanding of the mathematical details of the read material. I strongly encourage you to start a reading notebook at the very beginning of the semester and make notes as you read; you should also record your solutions in this notebook. I will test your knowledge of the assigned material by having a weekly quiz. This quiz will usually consist of several true or false questions related to the material. Three lowest grades on the quizzes will be dropped before the final grading.
Group work	During the semester there will be a number of group projects. Each project will cover a separate mathematical fact related to the material discussed in class. Detailed worksheets will be provided. The students of the same group are encouraged to have group

work outside of the class as well. The final submission however should be individual if not stated otherwise.

Final presentation During the semester you will do a deeper research on a specific topic, which may be a particular mathematician, specific mathematical discovery, or a significant mathematical problem. If you are in 478 section, you will be working with usually one or two team members; if you are in 678 section, you will work individually. By February 5th you should decide on the exact topic of your presentation, and submit this information to me. On Week 2 I will provide a list of potential topics, but you are welcome to come up with your own one as well. It is preferable that you pick a relatively modern topic, consult Chapters 11 to 13 of the textbook for inspiration. This expository presentation should be prepared using a standard software such as PowerPoint or Latex (Beamer). If you are in 478 section you are required to use at least 3 other than the textbook sources (for 678 section at least 4). Please note that Internet pages are not an allowed reference to cite. The first draft of your presentation is due on April 15, and the final version is due by April 29th. An approximate time for your presentation is about 10
The submitted presentation should clearly state each team member contribution.

Grading The grading of the course will be based on the

- quizzes — 35%
- group project assignments — 30%
- expository presentation — 35%

The final grade will be A/B/C/D/F with the thresholds 90/80/70/60.

Academic Responsibility and Conduct The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at `www.ndsu.edu/academichonesty`.

Any student found guilty of academic dishonesty will receive a grade of 0 for the homework assignment, or quiz, or test, or exam in question. In addition, every such student will be reported to the Chair of Mathematics, the Dean of their major college, the Dean of the College of Science and Mathematics, the Provost, and the Registrar. The Registrar will add any such student to NDSU's Student Academic Misconduct Database. (Multiple entries in this database may result in additional sanctions from NDSU.)

Special Needs Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office (`www.ndsu.edu/disabilityservices`) as soon as possible.

Schedule *Note:* This is a tentative schedule and subject to a change. Week 1 starts January 8th.

Week 1. A bird-eye view on the history of mathematics.

Week 2. The beginning of Greek geometry.

Week 3. Euclid and the Elements. Euclidian geometry.

Week 4. Euclidian geometry. Non-Euclidian geometry.

Week 5. On the way to rigor. Cantor and set theory. Peano's axioms.

Week 6. Axiomatic development of number sets.

Week 7. Euclid's number theory. Prime numbers.

Week 8. Diophantine Equations. Fermat, Euler, and Gauss.

Week 9. Rational and real numbers.

Week 10. Spring break.

Week 11. Solving polynomial equations. Cubic equations and complex numbers.

Week 12. The fundamental theorem of algebra.

Week 13. Newton and "infinite" polynomials. Birth of calculus.

Week 14. Axioms of probability theory. Basic combinatorics.

Week 15. The law of large numbers and the central limit theorem.

Week 16. Review and additional topics.

Week 17. Dead week. Presentations.

Week 18. Final exam (May 10th, Friday, 10:30am). Presentations.