SYLLABUS FOR MA505, HISTORY OF MATHEMATICS

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Course Description

This is a course that presents the development of mathematics through its history as part of human culture, a course that presents a unified view of much of the undergraduate mathematics major curriculum according to the historical accretion of procedures and results. It is aimed at students who already have a considerable background in mathematics, including two years of calculus and a year of modern mathematics (linear algebra, discrete mathematics, abstract algebra), and who are capable of following and presenting the logic of arguments and proofs. Mathematical developments and arguments are presented with a historical emphasis but also anachronistically in modern notation and interpretations.

Although the course proceeds through lectures, students are meant to participate in the development by participating in class, filling in by reading and studying the text, and researching mathematical problems presented as periodic exercises. An important goal is to convey the idea that a mathematical proof or solution is a narrative based on logic and hypotheses, this embedded in the historical development.

BU Hub Learning Outcome

Historical Consciousness, a unit of Philosophical, Aesthetic, and Historical Interpretation. This course evidently develops the historical consciousness of the development of mathematics, as part of the development of human culture and civilization itself. After noting that the genesis of writing had mainly to do with accounting according to quantity (Old Babylonia), we proceed through the intellectual development and analysis of concepts (Greek Geometry), the subsequent development of symbolic reasoning (Islamic Algebra), and thence, and mainly, through the historical evolution of sophisticated techniques of reasoning and deduction for the understanding dynamic change (Calculus and Mathematical Analysis).

Outcomes for Majors and Minors

This course fulfills upper-level requirements for the following majors: Mathematics, Mathematics and Philosophy.

Pre-requisites

(a) MA 225 Multivariate Calculus. (b) MA 242 Linear Algebra or MA 293 Discrete Mathematics or consent of instructor.

Required Text

Mathematics and its History by John Stillwell, Springer, Third Edition 2010. Available at the BU Bookstore. On course reserve at the Science and Engineering Library.

Grading and Procedures

The course grading is broken down into 8 units as follows: Exercises, 4; Final, 2; Midterm, 1; Attendance, 1. The percentage-wise worst unit is dropped, and the rest are given equal weight in calculating the grade. For example, suppose that your Exercise grade (points achieved over points possible for all assigned exercises) was .91; your Final was .81; your Midterm was .85, and your attendance was .90. Then one unit of the Final will be dropped, and your cumulation will therefore be: .91 x 4 + .81 x 1 + .85 x 1 + .90 x 1.

Attendance is calculated according to your signing an attendance sheet circulated at each class meeting.

The *Midterm* will be administered in the week after the semester break.

The *Final* will be administered at the mandated time according to the BU calendar.

Exercises will be periodically assigned, collected on the date due, and returned graded; they can be recycled once for full credit up to the collection date of the succeeding assignment.

Topics and Exercises

The following topics, and corresponding exercises to be assigned, are drawn from the text. The coverage and pace with which we will proceed in class depends in part on class participation and the preparedness of the students. In particular, some exercises may be dropped or altered, and some supplementary exercises may be assigned. Each week the exercises due will be specified according to section.

Chapter 1. The Theorem of Pythagoras. 1.2: 3,4. 1.3: 1–4. 1.4: 1,2. 1.6: 1,2.
Chapter 2. Greek Geometry. 2.1: 1,2. 2.3: 1–4. 2.4: 2–4.
Chapter 3. Greek Number Theory. 3.2: 1–5. 3.3: 1–5. 3.4: 3,4.
Chapter 4. Infinity in Greek Mathematics. 4.3: 4–6. 4.4:1–3.
Chapter 5. Number Theory in Asia. 5.2: 1,2. 5.3: 1,2. 5.4: 2–4.
Chapter 6. Polynomial Equations. 6.2: 1–3. 6.3: 1–5. 6.4. 1–5. 6.5: 1–3. 6.7: 1–3.
Chapter 7. Analytic Geometry. 7.2: 1–4. 7.3: 1–3. 7.4: 1,2. 7.5: 1,2.
Chapter 9. Calculus. 9.2: 1,2,4,5. 9.3: 3,4. 9.5: 1–4. 9.6: 1–3.
Chapter 10. Infinite Series. 10.1: 1–5. 10.2: 1–3. 10.4: 1–2. 10.6: 1–3. 10.7: 1,4,5,6.
Chapter 11: Number Theory Revival. 11.1: 1,3. 11.2: 1–4.
Chapter 12: Elliptic Functions. 12.2: 2. 12.3: 2,3. 12.4: 1–5. 12.5: 1,2.
Chapter 13: Mechanics. 13.1: 1–3. 13.6: 1–3
Chapter 14: Complex Numbers in Algebra. 14.3: 2–5. 14.5: 2–4. 14.6: 1,2. 14.7: 1–3.

Other Class and University Policies

Absences from class will be noted according to attendance sheets as mentioned above; the effect of the number of absences will be as in the grading described above. Other times for midterm and final may possibly be arranged, e.g. for religious observances, beforehand.

Accommodations for Students with Documented Disabilitiies will be made by arrangement; this typically may involve extra time on exams.

The Incomplete Grade I is given only in very exceptional cases to students who have maintained a good record through much of the course and suddenly find themselves in very difficult circumstances. A definite arrangement will then be made for clearing the

incomplete grade. Others who find early on that they are not keeping up are urged to drop or withdraw from the course.

Academic Conduct is according to: https://www.bu.edu/academic/policies/academic-conduct code. Cheating or plagiarism on exams is not tolerated, and will be handled according to the code.