Course Description
Mathematics, like other subjects, is an intellectual product of culture, society, and creative people. This course will discuss the characteristics of the Western mathematics, Islamic, Indian, and the Chinese ones. The development of algebra in the Medieval and the Renaissance, and the formation of the differential and integral calculus will also be discussed. The general trends of mathematics in the eighteenth and nineteenth centuries, and the first half of the twentieth century will be outlined. It will also explore how culture-centered different mathematics merged into a universal modern one.

What makes this course a Writing Intensive Course?
This is a Writing Intensive course that fulfills the WI requirement for graduation. Writing intensive courses pay special attention to developing critical reading, writing, and analytic skills to prepare students for the CPE and college-level coursework in general. Both informal and formal writing will be designed to maximize your understanding of the subject matter. Formal writing assignments, at least 10-12 pages total, account for the largest portion of your grade and will include opportunities for revision.

Prerequisites/Co-requisites
Students must have taken (or been exempt from) MAT 206, MAT301, MAT302.

Student Learning Outcomes and Assessment:

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<tr>
<th>Course Student Learning Outcomes</th>
<th>Measurements</th>
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<td>1. Student will be able to complete (a) formal writing assignment(s) of at least 10-12 pages in length that has/have gone through the revision process (e.g. research paper, content-related report, essay).</td>
<td>1. Examples of student papers</td>
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<td>2. Student will be able to generate pieces of informal writing in response to a variety of prompts, concepts, situations or reading assignments.</td>
<td>2. Examples of student writing</td>
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<td>3. Student will be able to compare characteristics of Babylonian, Egyptian, Greek, Chinese, Indian, and Muslim mathematics.</td>
<td>3. Examples of students writing or oral presentation</td>
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<td>4. Students will be able to determine the development of algebra in the Middle Ages and the Renaissance.</td>
<td>4. Examples of students writing or oral presentation</td>
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5. Students will be able to identify the major steps in the formation of the calculus.

6. Students will be exposed to the general trends of mathematics in the 19th and the first half of the 20th centuries.

5. Examples of students writing or oral presentation

6. Oral presentation

General Education Outcomes and Assessment:

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<tr>
<th>General Education Learning Outcomes</th>
<th>Measurements</th>
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<td><strong>Communication Skills</strong> - Students will be able to write, read, listen and speak critically and effectively.</td>
<td>Oral presentation, informal and formal writing.</td>
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<tr>
<td><strong>Quantitative Reasoning</strong> - Students will be able to use quantitative skills and the concepts and methods of mathematics to interpret historical issues.</td>
<td>Oral presentation, informal and formal writing.</td>
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<tr>
<td><strong>Information &amp; Technology Literacy</strong> - Students will be able to collect, evaluate and interpret information and effectively use information technologies.</td>
<td>Oral presentation, informal and formal writing.</td>
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Required Text & Readings


Evaluation & Requirements of Students

This course is labeled as Written Intensive. As a result, students are required to do THREE 5-minute oral presentations and to write FOUR 2-page informal essays (double space) and ONE 5-page formal essay (also double space). For those who do honor research projects or S-STEM or S-STEP scholarship research projects, they may just write FOUR 2-page informal essays and ONE 12-page research paper for the two purposes.

Arriving late or leaving early will be treated as lateness on the attendance roster. During class time 1) all cell phones MUST be powered off or set into vibration mode; 2) headphones, walkman, CD players, PSP, and iPod, are NOT allowed in the classroom; 3) all children or non-enrolled persons are not permitted to attend class.

The final grade will be defined in the following manner:

**Attendance and Class Participations** 15%

**Oral Presentations** 15%

**Informal Essays** 40%

**Formal Essay** 30%

Index of the Grade Definitions:

93 – 100 % A
90 – 92 % A-
87 – 89 % B+
83 – 86 % B
80 – 82 % B-
77 – 79 % C+
73 – 76 % C
70 – 72 % C-
College Attendance Policy
At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

Academic Adjustments for Students with Disabilities
Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

BMCC Policy on Plagiarism and Academic Integrity Statement
Plagiarism is the presentation of someone else’s ideas, words or artistic, scientific, or technical work as one’s own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with the instructor. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC’s website, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).

Outline of Topics

1: Before the Advent of Civilization
   Nature of Mathematics
   1: Origins of Number and Culture

II: Antiquity: From Protomathematics to Theoretical Mathematics
   2.2 Mathematical Achievements in Ancient Mesopotamia
   2.4 The Mathematical Record in Ancient Egypt

3: Beginnings of Theoretical Mathematics in Pre-Socratic Greece
   3.1 Ancient Greece from 1200 to 600 BCE
   3.2 The Ionian Nascence and Deductive Reasoning
   3.3 Seeds of Theoretical Mathematics in Archaic and Classical Greece Sources
   3.4 Mid-Fifth to the fourth Century BCE
   3.5 Athens, the School of Hellas

4. Theoretical Mathematics Established in Fourth-Century Greece
   4.1 The Glory That Was Greece: Fourth-Century Athens
   4.2 The Theory of Irrationals
   4.3 Plato’s Circle
   4.4 Menaechmus: Conic Sections and the Method of Analysis and Synthesis

5: Ancient Mathematical Zenith in the Hellenistic 3rd Century BCE
5.1 The Hellenistic Age 120
5.2 The Alexandrian Bridge 124
5.3 Euclid: A Conjectural Life 130
5.4 The Elements 132
5.5 Remainder of the Euclidean Corpus 147

6: Archimedes to Diocles 150
6.1 Archimedes: Life and Work in Outline 150
6.2 Archimedes’s Writings 156
6.3 Eratosthenes, Apollonius, and Diocles 170

7: Mathematics in Roman and Later Antiquity, Centering in Alexandria 184
7.1 Early Roman Civilization and Mathematics 185
7.2 Crucial First-Century Changes Affecting Mathematics 192
7.3 Alexandria to 200: Trigonometry, Mensuration, and Arithmetic 194
7.4 Revival and Demise of Ancient Alexandrian Mathematics 208

8: Mathematics in Traditional China from the Late Shang Dynasty to the Mid-17th Century 224
8.1 Ancient Chinese Civilization to 220 224
8.2 Numeration and Major Literary Sources 226
8.3 Civilization in Imperial China, 220-1644 237
8.4 Mathematics in China, 220-1653 239

9: Indian Mathematics: From Harappan to Keralan Times 259
9.1 The Nature and Sources of Ancient and Medieval Indian Mathematics 259
9.2 The Harappan, Vedic, and Jaina Periods 262
9.3 India’s Classical Period 237
9.4 medieval Indian Mathematics 275
9.4 Medieval Indian Mathematics 275

III The Islamic World, Latin West, and Maya America from the Middle to ca. 1500 285

10: Mathematics in the Service of Religion 286
10.1 Early Medieval Europe 286
10.2 A Note on Maya Mathematics and Calendrics 299

11: The Ear of Arabic Primacy and a Persian Flourish 307
11.1 Muhammad, the Qur’an, and Early Medieval Islam 308
11.2 Bayt al-Hikmah: Reception of Foreign Knowledge and Translations 313
11.3 Mathematics at the House of Wisdom and Its Medieval Influence 318
11.4 Mathematics in Medieval Islam after 1055 340

12: Recovery and Expansion in Old Europe, 1000-1500 357
12.1 Political Stabilization and Economic Development 357
12.2 Role of Interactive Learning and Piety 362
12.3 Two Original Medieval Latin Mathematicians 367
12.4 The Rise of Universities and Scholasticism 372
12.5 Style and Applications of Late medieval Mathematical Thought 378
12.6 The Merton School and the School of Paris 381
12.7 The 14th Century Crisis and Recovery 385
12.8 Late 14th and 15th Century Mathematics 390
Writing Assignments:

1) *The class is divided into three groups, one argues for the Babylonians, the other for the Egyptians, and another for the Greeks. Please pick one of them, and write 2 pages arguing the most important mathematical contributions your “people” made for the development of mathematics as well as their lasting impact on our current life.*
2) Music and mathematics are often said to be universal languages. People can communicate with each other through them. Like using different musical instruments to make music, ancient peoples had used different methods to do mathematical calculations. Please write a paper in 2 pages explaining to your younger brother or sister the different approaches to certain topics, for instance, numeration systems, multiplications, square roots extractions, solutions for system of linear equations, and proofs of the Pythagorean theorem, by the Ancient Greeks, Chinese, or the Indians.

3) Algebra is an important mathematical subject. Everyone who graduates from high school had studied elementary algebra in one way or another. Suppose you are requested to write a blog addressing the development of algebra down to the 16th century, please argue why certain mathematicians or mathematical books are important.

4) Suppose a math-major BMCC freshman sends you a letter asking you what the calculus is? where it comes from? and why he or she has to take it in order to graduate? Please reply the letter answering the raised questions.

5) Pick one of the previous four assignments, and enlarge it to a 5-page formal thesis.