

# CS/MA 109 The Art and Science of Quantitative Reasoning

## Fall 2015

### General Information

**Course Description:** Buying music on line, making phone calls, predicting the weather, or controlling disease outbreaks would be impossible without the Mathematical and Computational Sciences— that is, mathematics, statistics, and computer science. This class focuses on methods of reasoning common to these disciplines, and how they enable the modern world. The primary goal of this course is to develop your ability to do precise, rigorous, logical thinking, that is, to “think mathematically”. This is not a “skills” class, but rather, an integrated study of topics from mathematics, statistics, and computer science, presented so as to reveal their inherent depth and beauty and allow you to use the same ideas to enhance your own field of study.

**Prerequisites:** None beyond being ready and willing to work.

**Administrative Information:** Two faculty members, one from Mathematics and Statistics (Prof. Hall) and one from Computer Science (Prof. Snyder), will team teach this course. Students are required to register for either MA 109 A1 and one of MA 109 A2, A3, A4, or A5, or CS 109 A1 and one of CS 109 A2, A3, A4, or A5.

**NOTE:** MA 109 and CS 109 are the same class, it does not matter for which one you are registered.

### Course Materials and Infrastructure:

**Communication:** A web page will be created for the class. You will find the course lecture notes and other material posted here, so check it often. The address will be announced in class.

**Teaching Fellow:** Our Teaching Fellow for the course will be Tommy Unger.

**Contact Information:** All contact information and office hours for Professors Hall and Snyder along with Mr. Unger’s will be available via the course web page.

**No Text:** All course materials will be distributed in class and via the web. This means you save some money—but it also means you **must** attend class since “I’ll just read the text” won’t be possible. While we will have mechanisms in place to determine attendance, the clearest indicator will be grades at the end of the semester. Those who attend (in body and spirit) will automatically do much better than those who do not.

**Computing and Software:** Students are not required to have any formal background in programming or programming languages, or any specific computer, calculator, or other device. Rules for use of computers/calculators in class and exams will be announced.

You may need to use Excel in discussion section and some discussions may be held in Computer Science Instructional Lab, EMA 730 Commonwealth Avenue Room 304 (above Radio Shack). We will announce in lecture special instructions for discussion.

**Academic Conduct** Conduct in this class, like all BU classes, is governed by the BU Academic Conduct Code which can be found at

<http://www.bu.edu/academics/policies/academic-conduct-code/>

Most of the rules are obvious—keep your eyes on your own exam, do not copy off the internet, and so on. Some are more subtle. For example, we encourage you to discuss the course and the homework problems with your classmates, but you should always “write up” your homework entirely by yourself.

If you have any questions about academic conduct, it is your responsibility to **ask**.

## **Course Requirements and Evaluation**

**Homework:** There will be frequent homework assignments. Some may involve a single question or problem, some may be longer and more involved. Homework will be assigned in lecture (another reason you **MUST** attend).

A big part of doing Mathematics is understanding completely what you are saying and communicating your ideas clearly. For your homework problems, the answer will **NEVER** be just a number. You will always be expected to explain your answer and write in complete clear sentences. You must write neatly and typing is always preferred. Sloppy work will never be tolerated.

You are encouraged to discuss the homework problems with classmates either in formal study groups or informally, **BUT YOU MUST WRITE UP YOUR HOMEWORK ON YOUR OWN**. That way, your homework will be different from everyone elses.

**NO LATE HOMEWORK WILL BE ACCEPTED FOR ANY REASON**. You may have your completed homework handed in by a classmate if you are ill or otherwise unable to attend class. The lowest homework grade will be dropped. This policy is designed to take care of emergencies and sudden illness, so only use your dropped homework for good reason.

There will be in-class and in-discussion work as well and it will count as homework.

**Midterm:** One in-class midterm will be given during the semester. The midterm will near the middle of the semester on a date to be announced. **DO NOT MAKE TRAVEL PLANS UNTIL THE DATE OF THE MIDTERM IS ANNOUNCED**. If you are involved in official travel for a class or Boston University group, please contact the lecturers as soon as possible.

**Final Exam:** The final exam will be “inclusive”, over all the material of the semester. The exam will be given only at the officially scheduled time of 3:00-5:00 PM on Friday, Dec. 18. **MAKE YOUR TRAVEL PLANS ACCORDINGLY**.

**Computation of Grades** Each assignment and exam will be worth a number of points. The total points for each of the above will be added, weighted so that 10% of the total is from homework, 40% from Midterm and 50% from final.

**NOTE:** We will announce the letter grades in terms of number of points for the exams. The grade is NOT based on a “90/80/70... scale”.

### **Quick Course Outline:**

**Mathematics:** The first three to four weeks focuses on topics from mathematics. These include the idea of mathematical proof, a review of the idea of functions and common functions used in the course and ending with a discussion of mathematical models.

**Statistics:** The next three to four weeks focuses on probability and statistics, including the idea of probability as quantifying uncertainty, and the elements of inferential statistics and association.

### **Midterm:**

**Computer Science:** The remainder of the semester will be spent on ideas of what digitization means, ideas of complexity of algorithms and modeling information using mathematical constructs.

We will “mix in” Computer Science into the Math, Math into the Statistics and both Statistics and Math into the Computer Science sections—you will see common threads and recurring ideas throughout the semester.