CORE-UA 107 — QUANTITATIVE REASONING: PROBABILITY, STATISTICS, AND DECISION MAKING

Term: Fall 2019
Prerequisite: None
Instructor: Raoul Normand
Office: WWH 719
TAs: Ashwin Bhola (Sections 4 and 7)
     Elizabeth Zhao (Sections 5 and 6)
Emails: rjn5@nyu.edu (RN), ab8084@nyu.edu (AB), rz1280@nyu.edu (EZ)
Lectures: MW 8:00am – 9:15am, Silver 207
Recitations: Section 4 – T 11:00am – 12:15pm, Silver 507 (Bhola)
             Section 5 – T 12:30pm – 1:45pm, Silver 507 (Zhao)
             Section 6 – T 2:00pm – 3:15pm, Silver 507 (Zhao)
             Section 7 – T 3:30pm – 4:45pm, Silver 407 (Bhola)
Office hours: M 2:00pm – 3:00pm, Th 3:00pm – 4:00pm (RN)
             TBD (AB)
             TBD (EZ)

Course information

Description
This Quantitative Reasoning course presents various real-world applications of mathematical tools and reasoning. In essence, it shows how mathematical thinking can help understand our world better and solve a wide variety of problems, from newspaper distribution to medical testing, gaming strategies, or opinion polls.

Reference book

The course will essentially cover Chapters 1, 2, 3, 5, 6, 7, 8, and 15, but some material will be skipped. Time-permitting, we may also cover additional topics.

TurningPoint
Periodically, we will have pop-up quizzes in class, using the application TurningPoint. You will be given a license and receive an email to register. The easiest way to use
TurningPoint in class is with the phone app that you can find on your respective stores. Your results to these quizzes will not count towards your grade, but your participation in them will. You are also able to access the quizzes after the class to check your results.

**Forum**

An online forum will be opened on Piazza. You should ask all your questions on the forum, not send them by email (except personal ones, of course). It is possible to ask anonymous questions as well. I will periodically offer some input, but it should first and foremost remain your own platform. **Your participation on the forum will count towards your participation grade.** You will receive an email to register.

**Recitations**

Recitations are split into four groups and will take place every Tuesday. **You should attend the recitation that you are assigned to.** Each recitation will cover a variety of exercises. Come prepared, having reviewed the class material, and work actively during the recitations.

**Office hours**

You are more than encouraged to come to office hours to ask any questions that you may have, or even just for a chat. **Take all the advantage that you can of office hours, and do not ever feel like you are bothering me.** Years of experience have shown that students who regularly come to office hours make much more dramatic progress.

If the office hours times are not suitable for you (and only if), you are welcome to drop by to my office anytime, but you run the risk that I may be absent. Tuesdays and Thursdays 2pm – 6pm would probably be a safe bet. Email me if necessary.

**Other concerns**

All questions about the course should be asked on Piazza or during office hours. For other personal matters, feel free to email me.

**Grades**

**Grading policy**

The grade for this course will be computed as indicated below, then turned into a letter grade from A to F.

<table>
<thead>
<tr>
<th>Participation</th>
<th>Quizzes</th>
<th>Homework</th>
<th>Midterm</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>10%</td>
<td>25%</td>
<td>25%</td>
<td>30%</td>
</tr>
</tbody>
</table>

The **participation grade** will take into account your involvement in the class and on Piazza, your willingness to answer questions, your attendance, and your participation in the TurningPoint quizzes.
There will be regular quizzes, about 6 of them, which will cover the content of the earlier weeks. The dates will be announced in class in advance. The worst quiz grade will be dropped.

There will usually be regular homework assignments (about 8 to 10), which you will have one week to finish. They are longer and more difficult assignments, which you should start early so you have time to ask questions if necessary. You can work in groups, but each student should return their own assignment written in their own words. The two worst homework grades will be dropped.

The midterm will take place during the lecture (tentatively on October 16th), in the usual room (Silver 207). It will cover everything seen up to that point.

The final exam will take place at a time to be determined, and will last 2 hours. It will cover everything that we studied during the term, with an emphasis on what was done after the midterm.

The cutoffs for the letter grades are as follows. These might be adjusted, but only to your advantage.

<table>
<thead>
<tr>
<th>[93,100]</th>
<th>[90,93)</th>
<th>[87,90)</th>
<th>[83,87)</th>
<th>[80,83)</th>
<th>[75,80)</th>
<th>[65,75)</th>
<th>[50,65)</th>
<th>[0,50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A-</td>
<td>B+</td>
<td>B</td>
<td>B-</td>
<td>C+</td>
<td>C</td>
<td>D</td>
<td>F</td>
</tr>
</tbody>
</table>

Grade dissemination

All the assignments will be returned, except the final exam for which a specific time will be arranged for you to look at your papers. Grades will be posted on NYU classes. Please check periodically that there is no discrepancy. You have three days to raise any issues regarding the grading, and later complaints will not be accepted.
Tentative schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Book sections</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1 – 4</td>
<td>Ch. 1, 2, 3</td>
<td>Graph theory</td>
</tr>
<tr>
<td>Weeks 5 – 7</td>
<td>Ch. 5, 6</td>
<td>Statistics: distributions, relationships</td>
</tr>
<tr>
<td>October 16 (?)</td>
<td></td>
<td>Midterm</td>
</tr>
<tr>
<td>Week 8</td>
<td>Ch. 7</td>
<td>Statistics: data for decisions</td>
</tr>
<tr>
<td>Weeks 9 – 10</td>
<td>Ch. 8</td>
<td>Probability</td>
</tr>
<tr>
<td>Weeks 11 – 12</td>
<td>Ch. 15</td>
<td>Game theory</td>
</tr>
<tr>
<td>Weeks 13 – 14</td>
<td></td>
<td>Other topics, catch-up, review</td>
</tr>
<tr>
<td>December 16 – 20</td>
<td></td>
<td>Final exam</td>
</tr>
</tbody>
</table>

Note that the Monday, October 14 class is moved to Tuesday, October 15, and that there is no class on Wednesday, November 27.

Advice

The only material that you are expected to know is what is covered in class or assigned as a reading. Exercises on these topics will be done in the homework and the recitations, and extra ones assigned in class. For this reason, your priority should be to review the lectures, the recitations, and the homework. Reviewing means reading the class material and the book, must it mostly means practice: after the lectures, you should naturally study the new concepts and techniques, but also redo the examples. After the quizzes and homework are returned to you, see what you did well and could be improved, and understand your mistakes. Solutions will be given to you: read them carefully, and rewrite the questions that you did not answer properly.

Optional exercises will be assigned in class. You can do as many as you want until you feel comfortable with the material covered, but do so only after reviewing the lectures and redoing the examples.

The majority of this course consists in using mathematical techniques to study real-word problems. It will be expected of you to write clear mathematics, and present well-justified arguments. This is a careful job that requires training. Therefore, whenever you do an exercise (at home or in class), you should always write everything down, without using shortcuts, on a clean sheet of paper, as if it were a homework assignment. Not only will you test and hone your skills, but this will also help you memorize the material.
Course policies

Guidelines for assignments and tests

Please use a blue or black pen for your assignments and tests (no red ink). Do not forget to **write your name** (as on the roster) and your **NetID**, as well as the **number of the page and total number of pages**, such as 1/3, 2/3, 3/3.

No documents, calculators or electronic devices are allowed during tests, but a reference sheet might be allowed.

Class rules and behavior

You are naturally expected to attend every class, and be there on time. It is necessary to follow the material introduced and understand the concepts and techniques. If you do not attend a recitation and miss a quiz, you will receive a 0 for this quiz.

Unless you have special needs (in which case, tell me beforehand), electronic devices such as phones, laptops, or tablets are not allowed during the class. Though it might be tempting to take notes on a tablet or laptop, it is neither appropriate nor efficient for mathematics. In particular, you should **always bring some clean sheets of paper or a notebook** with you, to write down your notes and exercises. Phones are only allowed during TurningPoint quizzes, and should be put away afterwards. In particular, **taking photos of the blackboard or recording the class is not allowed**.

More generally, you are naturally expected to remain quiet and attentive, not to chat, eat, run to the washroom, etc. All in all, respect your classmates and your instructor, as you expect them to respect you.

Absences

If you are absent for a class or a recitation (with no quiz scheduled) for any reason, **no need to message me or your TA**. It is however your responsibility to make sure that you catch up on the material covered during the class that you missed.

If you anticipate to be absent for the midterm or a quiz for a **valid reason, notify me ASAP and before the test**. Except unpredictable circumstances (illness, emergency, unscheduled religious holiday), you should let me know **within three days after the date of the test is announced**. The weight of a missed quiz will carry over to the other quizzes, while the weight of a missed midterm will carry over to the quizzes (15 %) and the final exam (50 %). Absences that are not communicated beforehand will not be excused. Valid reasons include (and are probably limited to) the following.

- A documented medical excuse.
- A University-sponsored event such as an athletic tournament, a play, or a musical performance (excluding practices and rehearsals).
- A religious holiday.
- Extreme hardship such as a family emergency.
A student **missing the final exam or three quizzes** will receive a Failing or Incomplete grade.

**You will have a week to do each homework assignment, so no excuse or delay will be accepted,** except extended medical care. If you anticipate being absent on the hand-in day, you can send your assignment in advance, give it to a classmate, or scan it and send it to me directly by email.

**About your instructor**

I (RN) am a clinical assistant professor at NYU. “Clinical” has nothing to do with medicine and means that my main job is teaching. From 2016 to 2019, I was a visiting assistant professor at NYU Shanghai, and spent three years in Taiwan before. My native language is French, and I have slowly been picking up Mandarin Chinese, so talk to me and help me improve! I might still understand some German and Spanish, but do not count on it.

I have an undergraduate math blog called *Let epsilon be positive*, which you can find at [https://let-epsilon-be-positive.com/](https://let-epsilon-be-positive.com/) It deals with different aspects and techniques of undergraduate math which are, in my experience, not so well-known or not typically taught. It is still new and contains only few articles, but more will be coming when time allows it. Take a look, you might learn a trick or two!

Otherwise, you can probably find me quite easily on Instagram. Your classmates from earlier years sure did, but I will not help you in this endeavor. Please do not try to friend me on Facebook – I still need to keep a vague air of mystery.

**Academic integrity**

Students are expected to read and understand the university’s policy on academic integrity as laid out in the College of Arts & Sciences Bulletin. Plagiarism and cheating will be penalized and reported.

**Disability statement**

New York University is committed to providing equal educational opportunity and participation for students with disabilities. It is the University's policy that no qualified student with a disability be excluded from participating in any University program or activity, denied the benefits of any University program or activity, or otherwise subjected to discrimination with regard to any University program or activity. The Moses Center for Students with Disabilities (CSD) determines qualified disability status and assists students in obtaining appropriate accommodations and services. CSD strives in its policies and practices to empower each student to become as independent as possible. Our services are designed to encourage independence, backed by a strong system of supports. Any student who needs a reasonable accommodation based on a qualified disability is required to register with the CSD for assistance.