Probability Theory for EOR (EBP014B05)
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Welcome to the course Probability Theory for EOR - Edition 2021/2022. In this outline, you can find information on the organization of the course. This course syllabus is based on the one by Dr. T. Boot, who had previously taught this course. Many thanks for his help.

Furthermore, there were limitations over the on-campus activities (e.g., capacity limit over the class size) when designing this course. We had to adapt to the online teaching framework at that moment. There is no room left for re-designing and re-scheduling for block 1B, ***therefore you will notice that most activities are still online except the tutorials and the exams****. Still, we may make some changes accordingly in the future.*

Contents

1 Description

Economic outcomes are inherently uncertain: a factory does not know for sure when a certain machine breaks down, a government does not know for sure whether lowering taxes will increase consumption, you do not know for sure whether studying econometrics will improve your future wealth and well-being.

To have a meaningful conversation about the probability of certain events, we need to specify what we mean by the term probability. This makes probability theory a central building block for studying econometrics and operations research.

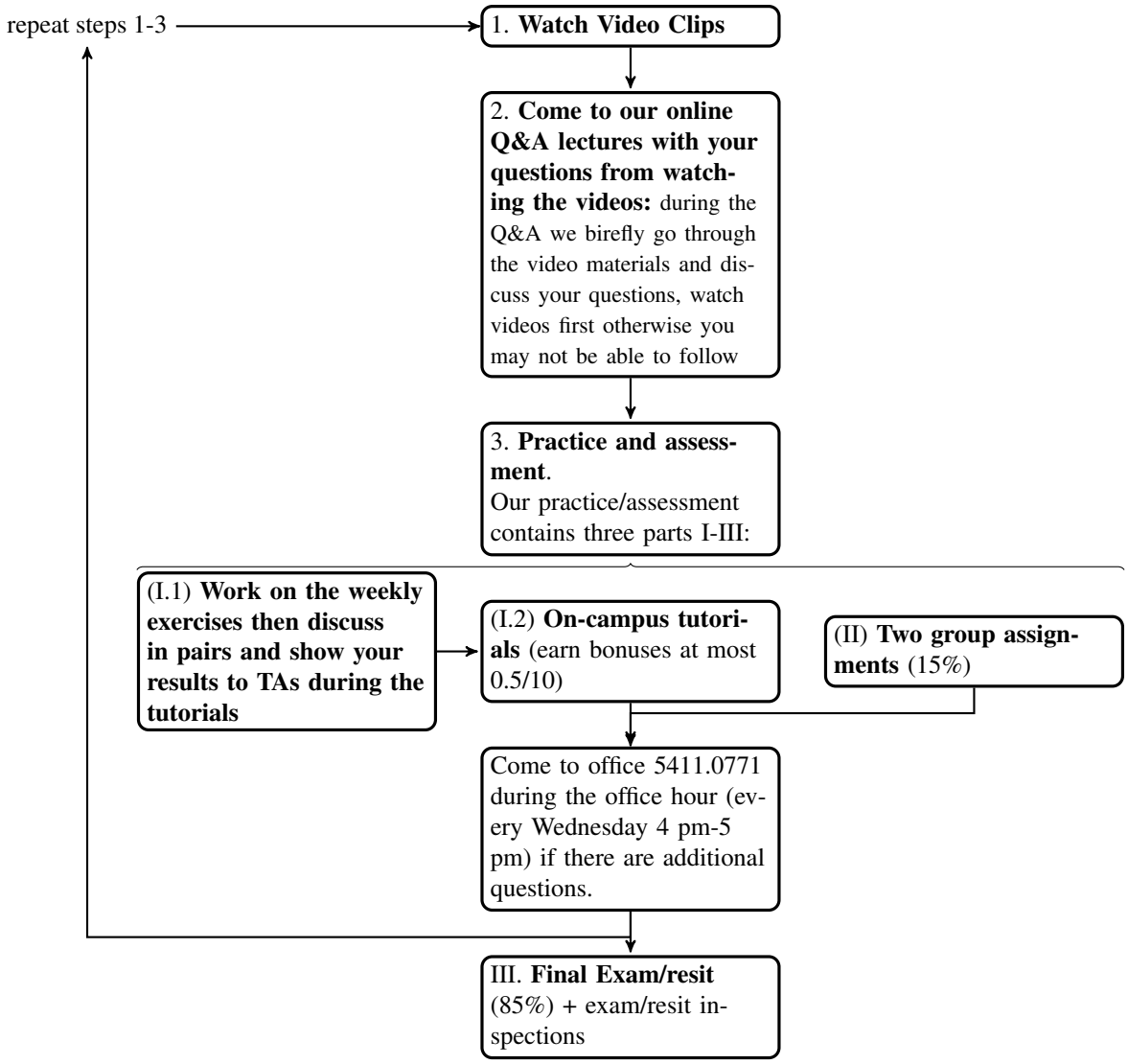
In this course, we develop the (mathematical) language needed to discuss probabilities properly. We will, for example, talk about sample spaces (set of possible outcomes), events (a subset of possible outcomes), probability distributions (a coherent way to assign a probability to an event). We hope you understand that a random variable is simply a specific function with underlying sample space and a probability function.
A crucial the concept is that of a conditional probability: how do possibilities change when new information comes in?

The formal course objectives are the following. Upon completion of the course you will be able to:

1. Quantify uncertainty using a coherent framework for probability.
2. Understand the concept of a conditional probability and use conditional probability as a problem solving tool.
3. Understand the concept of a random variable and derive properties of well-known discrete and continuous random variables.
4. Calculate the expected value of discrete and continuous random variables.
5. Simulate and visualize the outcomes of chance experiments on your computer.

This course would require mathematical concepts covered in Math I, and this course will be followed by Probability Distributions in block 2.1 (using the same book) and Estimation and Testing in block 2.2.

2 Course Organization



2.1 Material

The course is based on Chapter 1 – 6 of Introduction to Probability, Second Edition by J.K. Blitzstein and J. Hwang and published by CRC Press.

A digital version of the book is available for free via this webpage, which is filled with useful resources (for example, there are YouTube videos with lectures by the author). If you can, I recommend getting a physical copy of the book (as this makes studying easier, and you are going to need it for the course Probability Distribution as well).

We also store other teaching materials on a public Github repository:
https://github.com/lingwei-kong/RuG_ProbabilityTheory_for_EOR_LKong
GitHub is a handy tool for collaborating with your teams, and here is one starting guide for your Github – "Hello, World.": https://guides.github.com/activities/hello-world/
It is not compulsory to use GitHub.

2.2 Videos and Q&A lectures

Watch the videos (knowledge clips) before coming to our Q&A lectures. We have one Q&A lecture each week. On Wednesday from 10:00 – 11:00. These lectures consist of roughly 30 minutes of a brief explanation of this week's topics (so it is a quick summary, and you will need to watch videos first to follow) and then ask your questions (see Section 4 for all the places you may leave your questions) from watching the videos along with these brief summaries. These Q&A lectures are not recorded, so ask whatever questions you have.

Other materials for preparing for the lectures: A schedule showing the subjects discussed in each lecture is provided on Nestor, under Course Documents. Use the textbook, slides, especially exercises each week, to facilitate your studies.

Aim The aim of the videos is to provide a comprehensive discussion of new theoretical concepts. And we review briefly during our online sessions where you can ask any questions raised up while watching the videos. For the exam, all material from the book as listed in the Subject Overview is relevant (also, the material not discussed in the lectures).

Slides Slides used during the videos will be made available simultaneously along with the videos.

2.3 Weekly exercises and on campus tutorials

There is one on-campus tutorial session each week. The group composition can be found on Nestor. Join the tutorial for discussions and BONUSES!

I. The first 45 minutes of the tutorial will be used to discuss relevant exercises. You can discuss in pairs with your classmates (i.e., discuss with the one sitting next to you, and I highly recommend that you discuss with different classmates in each tutorial). **Show your discussed results (written solutions and some feedback from your peers) to your teaching assistants (TAs) during the first 45 minutes or the break if you could not finish, this is how you earn your bonuses**. You benefit most from the tutorials if you have gone over the exercises prior to the tutorial.

- The feedback for your results will be made by four categories: 1 (for the presence of the tutorials); 5 (partial solutions); 10 (sufficient results).
- For every 7 points you earn during the tutorials, you would get 0.1 extra bonus added to your final marks, and you can earn at most 0.5 bonuses.

II. The remaining 45 minutes, TAs will present the solutions, and feel free to ask questions.

Group	Day	Time	TA
Group 1	Thursday	11:00-13:00	Joost Doornbos
Group 2	Thursday	11:00-13:00	Sander van Beek
Group 3	Thursday	13:00-15:00	Sander van Beek
Group 4	Thursday	13:00-15:00	Karlijn Zwiggelaar
Group 5	Friday	11:00-13:00	Quinten Huisman
Group 6	Friday	11:00-13:00	Karlijn Zwiggelaar
Group 7	Friday	13:00-15:00	Quinten Huisman
Group 8	Friday	13:00-15:00	Joost Doornbos

Exercises and solutions The exercises are listed in the schedule, which can be found on Nestor, under Course Information. Solutions to questions that are not discussed during the tutorials will be made available at the end of the week.

2.4 Group assignments

There will be two assignments that are due on Friday 19:00 in week 3 and 6. The assignments will consist of some theoretical exercises mixed with some basic coding to verify the results. The assignments are to be made in groups of 2 students from the same tutorial group.

Deadline to enroll in these groups is Friday November 19 at 19:00. You can enroll by clicking Assignments in the main menu of the Nestor Course and then clicking Enroll here.

Students that are re-taking the course also have to participate in the assignments.

Please contact the course coordinator at least three days before the deadline if you want to switch groups between assignments and everyone involved agrees or if you encounter problems in collaborating with your fellow group member.

2.5 On campus exam/resit

Open book exam/resit: you can bring any printed out/hand-written materials and the textbook. It is, however under no circumstances allowed to communicate (either online or offline) with anyone else during the exam. Any suspected case of fraud will be sent to the Board of Examiners.

Extra time In case you are granted additional time by the Board of Examiners, this will be added after the official end time of the exam.

2.6 Locations for on-campus activities

Please check the Rooster for the exact schedules and locations of our on-campus activities: https://rooster.rug.nl/#/en/current/schedule/course-EBP014B05.

2.7 Grading

Denote:

- $A_i \in [0, 15]$: Grade on Assignment i, where i = 1; 2.
- $T_i \in \{1, 5, 10\}$: Grade on Tutorials i, where i = 1; 2; ...;7.
- $E \in [0, 10]$: Exam/resit grade.
- $C \in [0, 10]$: Course Grade.
- P: Progress Grade (the grade stored in your system).

If an assignment is missing, you will receive a 0 on that assignment. Note that if you retake the course, you have to hand in the assignments as well! If $E > 5$ (so you score a 5 or higher on the exam/resit), then

$$C = \begin{cases} E & \text{if } E \leq 5 \\ \min\left\{0.85 * E + 0.15 * \textit{round}\left(10 * \frac{1}{2}\frac{1}{15}(\sum_{i=1}^{2} A_i)\right) + \min\left\{0.1 * \textit{round}\left(\frac{1}{7}(\sum_{i=1}^{7} T_i)\right), 0.5\right\}, 10\right\} & \text{if } E > 5 \end{cases}$$

You pass the course if $C \geq 5.5$ and the Progress grade $P = \textit{round}(C)$.

Finally, if you hand in two assignments, but you do not take part in the exam/resit, you will receive E = 1, and the corresponding grade P = 1 will be entered in Progress.

3 Contact information

The course is taught by Lingwei Kong, who can be reached at l.kong@rug.nl and 5411.0771. Hans Ligtenberg j.w.ligtenberg@rug.nl would assistant our course.

Extra office hours at 5411.0771: every Wednesday 4pm-5pm.

Contact info for our TAs:

Karlijn Zwiggelaar	k.a.h.zwiggelaar@student.rug.nl
Joost Doornbos	joostdoornbos01@gmail.com
Quinten Huisman	q.n.huisman@student.rug.nl
Sander van Beek	s.g.h.van.beek@student.rug.nl

4 Question on the course/material/...

If you have questions on the course organization, the material, exercises, assignments, exam, then you can pose these:

1. During our Q&A lectures: directly unmute yourself, or click the raise-hand button or type the chatbox.
2. During the tutorials: discuss with your TAs.
3. Via the Nestor Discussion Board. Also, use this to help each other! Recommended!
4. Via email (only for questions that are not relevant for other students).

5 General remarks

Find a buddy. Given the course's hybrid nature (online and on-campus), one of the main challenges is motivating yourself to keep up with the material. It helps enormously work with someone and schedule specific hours in a week where you work on the course.

Start working in week 1. Don't underestimate the material. The first week might look like things you had in high school, but previous years have shown that for example, How to count is one of the most difficult subjects(and the course, in general, being one of the most difficult courses of the first year).