RUTGERS
Rutgers Business School
Newark and New Brunswick

26:711:685
Special Topics on Management Science**---Advanced Probability**
Spring 2020; Monday 10am~12:50pm, 1WP-502
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Office Hours: Monday and Wednesday 2:30~3:30pm

COURSE DESCRIPTION

This course provides a measure-theoretic treatment of probability-related topics. It covers probability spaces, random variables, independence, expectation, sums of independent random variables, weak convergence, laws of large numbers, characteristic functions, central limit problem, conditional probability, and large deviation.

COURSE MATERIALS (texts to be referenced)

Chung, K.L. 2001. *A Course in Probability Theory*, 3rd Edition. Academic Press (**C**).

Billingsley, P. 1995. *Probability and Measure*, 3rd Edition. John Wiley & Sons (**B**).

Cover, T.M. and J.A. Thomas. 2006. *Elements of Information Theory*, 2nd Edition. Wiley (**CT**).

LEARNING GOALS AND OBJECTIVES

This course will introduce students to some of the important probabilistic concepts. These include measures, probability spaces, random variables, distribution functions, integrations, production measure, independence, sums of independent random variables, laws of large numbers, characteristic functions, central limit problem, conditional probability and expectation, weak convergence, concentration of measures, and large deviations.

PREQUISITES

Students needs to be familiar with undergraduate-level probability and basic real analysis.

ACADEMIC INTEGRITY

I do NOT *tolerate cheating*. Students are responsible for understanding the RU Academic Integrity Policy (https://slwordpress.rutgers.edu/academicintegrity/wp-content/uploads/sites/41/2014/11/AI_Policy_2013.pdf)
I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." Don't let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

ATTENDANCE AND PREPARATION POLICY

Expect me to attend all class sessions. I expect the same of you. If I am to be absent, my department chair or I will send you notice via email and Blackboard as far in advance as possible. If you are to be absent, report your absence in advance at https://sims.rutgers.edu/ssra/. If your absence is due to religious observance, a Rutgers-approved activity, illness, or family emergency/death and you seek makeup work, also send me an email with full details and supporting documentation one week ahead of the occurrence.

For weather emergencies, consult the campus home page. If the campus is open, class will be held. Expect me to arrive on time for each class session. I expect the same of you. Expect me to remain for the entirety of each class session. I expect the same of you. Expect me to prepare properly for each class session. I expect the same of you. Complete all background reading and assignments. You cannot learn if you are not prepared. Expect me to participate fully in each class session. I expect the same of you. Stay focused and involved. You cannot learn if you are not paying attention.

CLASSROOM CONDUCT

Cell phones or any other course-unrelated electronic devices are banned from class.

EXAM POLICIES

There are two in-class quizzes and one final exam. During exams, the following rules apply:
- You are allowed a one-page cram sheet (letter size, front and back) of your own handwriting.
- If you have a disability that influences testing procedures, provide me an official letter from the Office of Disability Services at the start of the semester.
- No cell phones or other electronics are allowed in the testing room.
- Alternate seating; do not sit next to another student or in your usual seat.

GRADING POLICY

Two homework assignments at 15 points each (30 points in total)
Two in-class quizzes at 15 points each (30 points in total)
One final exam at 40 points

The proposed letter grade assignment is as follows:

F	0—29.999
D	30—49.999
C	50—64.999
C$^+$	65—69.999
B	70—84.999
B$^+$	85—89.999
A	90—100

Late assignments will be penalized 20 points (on the 100 point scale) if turned in up to ONE week late. Assignments in excess of ONE week late will not be accepted. There will be no makeup exam, nor extra credit. Your final grade is not subject to negotiation.

COURSE SCHEDULE (Tentative Course Progress)

Date	Coverage
January 27	1: Distribution and Measure (C1 and C2)
February 3	2: Random Variable and Expectation (C3)
February 10	3: Integral involving Lebesgue Measure (C10)
February 17	4: Independence and Product Measure (C3, B3, B18)
February 24	5: Convergence Concepts (C4)
March 2	HW1 due; 1st in-class quiz
March 9	6: Laws of Large Numbers (C5)
March 16	*Spring Break*
March 23	7: Applications of Convergence Results (C5)
March 30	8: Weak Convergence (B25)
April 6	9: Characteristic Function (C6)
April 13	10: Central Limit Theorem (B26, B27)
April 20	HW2 due; 2nd in-class quiz
April 27	11: Radon-Nikodym to Conditional Expectation (B32, B33, B34)
May 4	12: Large-deviation Bounds (CT2, CT3, CT11)
May 11	**FINAL EXAM**

SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with

Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law against Discrimination. https://ods.rutgers.edu

If you are a military *veteran* or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. http://veterans.rutgers.edu/

If you are in need of *mental health* services, please use our readily available services.
Rutgers University-Newark Counseling Center: http://counseling.newark.rutgers.edu/
[Rutgers Counseling and Psychological Services – New Brunswick: http://rhscaps.rutgers.edu/]

If you are in need of *physical health* services, please use our readily available services.
Rutgers Health Services – Newark: http://health.newark.rutgers.edu/]
[Rutgers Health Services – New Brunswick: http://health.rutgers.edu/]

If you are in need of *legal* services, please use our readily available services: http://rusls.rutgers.edu/

If you are in need of additional *academic assistance*, please use our readily available services.
Rutgers University-Newark Learning Center: http://www.ncas.rutgers.edu/rlc
Rutgers University-Newark Writing Center: http://www.ncas.rutgers.edu/writingcenter
[Rutgers University-New Brunswick Learning Center: https://rlc.rutgers.edu/]