Lakehead University

Department of Mathematical Sciences

MATH-3332-FDE -- Introduction to Mathematical Probability – Fall 2021

COURSE OUTLINE

Instructor: Dr. Deli Li, RB-2003, Ext. 8231, dli@lakeheadu.ca

Notes: 1. **If you e-mail me, please put "MATH-3332" in the Subject line so I can tell that your email is not spam.**
   2. **This course outline is subject to change. Any changes will be announced by emails.**

Textbooks: **Book 1**   **Introduction to Probability and Statistics, 4th Edition,**
                                         by J. S. Milton and Jesse C. Arnold

                   Book 2   **Student Solution Manual for Book 1**

Credit Weight: 0.5

Prerequisite: MATH 1172

Description:
As a mathematical introduction to the theory and applications of probability, topics include sample spaces and events, permutations and combinations, binomial coefficients, the probability of an event, some rules of probability, conditional probability, independent events, Bayes' Theorem, probability distributions, discrete random variables, continuous random variables, probability density functions, joint distributions, marginal distributions, conditional distributions, the expected value of a random variable, moments, Chebyshev's Theorem, moment-generating functions, conditional expectations, some special probability distributions such as the discrete uniform distribution, the Bernoulli distribution, the binomial distribution, the negative binomial and geometric distributions, the hypergeometric distribution, the Poisson distribution, the multinomial distribution, the uniform distribution, the gamma, exponential, and chi-square distributions, the beta distribution, the normal distribution, the normal approximation to the binomial distribution, the bivariate normal distribution, etc., functions of random variables, and limit theorems such as the law of large numbers and the central limit theorem. Basically, this course will cover Chapters 1-6. The instructor reserves the right to add or delete sections to the list.

Learner Outcomes:
Successful students of this course will be able to:

- Calculate probabilities and conditional probabilities by working with sets that represent the events and by using some fundamental counting principles and the rules of probability.
- Understand the concept of independent events and to apply our understanding of independent events to real-life scenarios.
- Use the law of total probability and Bayes' theorem to calculate probabilities of some complex events.
- Use random variables and their distributions to model the outcomes of random experiments.
- Calculate the mean and variance for random variable with given distribution.
- Apply the general properties of the expectation and variance operators and Chebyshev's Theorem.
- Calculate cumulative distributions, marginal distributions, conditional distributions, and moment generating functions.

- Identify some basic properties of some special probability distributions such as the discrete uniform distribution, the Bernoulli distribution, the binomial distribution, the negative binomial and geometric distributions, the hypergeometric distribution, the Poisson distribution, the multinomial distribution, the uniform distribution, the gamma, exponential, and chi-square distributions, the beta distribution, the normal distribution.
- Find probabilities by using the normal approximation to the binomial distribution.
- Find the probability distributions of some simple functions of random variables.
- Explain and use the law of large numbers and the central limit theorem.

Lectures:
Mondays & Wednesdays 01:00 PM – 02:30 PM (07 September 2021 - 06 December 2021) via Zoom. See "Zoom Instructions" at the end of this course outline for access instructions.
Attending lectures is not compulsory. According to historical records, however, there is a positive correlation between the regular lecture attendance and the final course mark. Pre-reading related sections in the textbook is expected.

Labs:
Tuesdays 07:00 PM – 08:00 PM (07 September 2021 - 06 December 2021) via Zoom. See "Zoom Instructions" at the end of this course outline for access instructions.
During the lab hours, you will meet your instructor and ask questions about the course materials and even get help to finish your assignments.

Office Hours:
Tuesday & Thursday 01:00 PM – 2:30 PM via Zoom
Problems that you are having with the course should be either a) given to your instructor during the office hours, or b) sent to Dr. Deli Li's email address at dli@lakeheadu.ca.

Course Requirements

Six Assignments (25%):
Each set of assignment problems and their due dates will be posted on D2L
It will be in your own interest to try to work on the problems yourselves. Solutions to some selected problems will be discussed in the labs. For this reason, it is highly recommended that you attend your labs. Assignments should be uploaded and submitted on **D2L** for course **MATH-3332-FDE**. Each assignment **pdf file** should have a cover page with information including course number, assignment number, student's name, and student's ID number. **Late assignments will not be marked under any circumstances. Sloppy writing may face a mark penalty up to 25%**.

Midterm Exam (25%):
The midterm exam will be written during the regularly scheduled class time **(01:00 PM – 02:30 PM in D2L)** on **Wednesday 20 October 2021. No make-up test is provided for students who miss writing the midterm exam at the scheduled time.** If there is a legitimate (documented) excuse, the final mark will be calculated on the basis of the final exam. Otherwise, a grade of **0%** for the missed exam will be averaged with other grades.

Final Exam (50%):
The final exam will be written in the scheduled three hours. It will cover all of the course material. Further details will be provided closer to the exam date.

Notes: Exams will be D2L open books and a non-programmable calculator is allowed.

Marking Disputes: If you feel you have been treated unfairly in the marking of the midterm exam or an assignment, **email your complaint to Dr. Deli Li at** dli@lakeheadu.ca

Drop Date: The final date to withdraw from this course without academic penalty is Friday 05 November 2021.

Academic Dishonesty: All cases of academic dishonesty will be dealt with according to the University's Code of Student Behaviour and Disciplinary Procedures, copies of which are available from the Registrar.

Notes:
Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities and/or medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please contact Student Accessibility Services http://studentaccessibility.lakeheadu.ca (SC-0003, 343-8047 or sas@lakeheadu.ca)

Zoom instructions

In order to access Zoom lectures, follow the steps below:

(1) Go to the D2L page of this course.
(2) Click on "Other Tools" (top right of the page).
(3) A scroll-down menu will appear, scroll all the way down and click on "Zoom".
(4) You will be directed to the "Upcoming Meetings" page in Zoom. All upcoming lectures are listed here. Click to join. Please mute your microphone.