

## STAT 4501 / MATH 5900 I / MAT 5990

**Term:** Fall 2020

**Instructor:** Professor B. Szyszkowicz

**Email:** bszyszk@math.carleton.ca

Online office hours by appointment

**NOTE:** The whole course will be delivered online using cuLearn.

**Grade:** Assignments (50%), Midterm Assignment (20%), Final Assignment (30%)  
- all will be posted on **cuLearn** (with specified deadlines) and should be submitted electronically.

**Lectures:** All lectures will be posted on **cuLearn**. Helpful books:  
*An Introduction to Probability and Statistics*, 2<sup>nd</sup> edition, by Rohatgi & Saleh  
*A Course in Probability Theory*, by K.L.Chung – additional reference recommended for graduate students.

### Course Outline:

- Week 1 :** Classes of Sets. Definition of Probability Measure. Probability space.
- Week 2 :** Properties of Probability Measure. Random Variables and their Distributions.
- Week 3 :** Moments. Markov's Inequality. Moment Generating Function. Random Vectors.
- Week 4 :** Modes of Convergence (almost sure, in probability, in distribution, in  $L_p$ ).
- Week 5 :** Modes of Convergence (continuation).
- Week 6 :** Convergence a.s. Borel-Cantelli Lemmas.
- Week 7 :** Weak Law of Large Numbers.
- Week 8 :** Kolmogorov's Inequality. Kolmogorov's Strong Law of Large Numbers.
- Week 9 :** Kolmogorov's Three Series Theorem. Consistency (weak and strong) of estimators.
- Week 10 :** Characteristic Function. Continuity Theorem. Classical Central Limit Theorem.
- Week 11 :** The Lindeberg-Feller Central Limit Theorem. Asymptotic Normality.
- Week 12 :** The Glivenko-Cantelli Theorem.

**Note:** The above is a very approximate outline only. All detailed information and any changes will be posted regularly on **cuLearn**.

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This course is recommended for graduate and upper level undergraduate students who would like to learn some basic notions of Probability Theory with emphasis on Limit Theorems. Basic concepts like Axioms of Probability, Random Variables and Their Distributions, Moments and Generating Functions, Random Vectors, will be briefly covered (only to the extent needed in this course). Full proofs will be given when possible. The other results (with proofs on the more advanced level, or not important at a given stage) will be discussed with their proofs indicated and references provided.  
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If there is any student in this course who, because of disability, may have need for special accommodations, please discuss it with me. Students must also contact Paul Menton Centre to obtain a Letter of Accommodation for such an arrangement.

