

# Syllabus for MATH 3081, Probability and Statistics

Northeastern University, Summer 2 2014

**Instructor:** Neranga Fernando, Ph.D.

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*Office hours:* MTWR 12 – 1 pm, or by appointment

*Meeting times and location:* MTWR, 9.50 – 11.30 am at Shillman Hall 210.

**Textbook:** An Introduction to Mathematical Statistics and its Applications, R. Larsen and M. Marx, fifth edition. (published by Prentice Hall).

**Web materials:** All class announcements, material, and grades will be posted on Blackboard.

**Homework and quizzes:** No homework will be collected. An in-class quiz will be given on every Thursday starting from the first week. The quiz in the last week will be given on Wednesday. No quiz will be given in the mid-term exam week. It is strongly advised that you do all of assigned homework since the quizzes will closely resemble the homework problems. No quiz scores will be dropped. Make up quizzes will ONLY be given if you have missed the quiz for a valid reason and you can prove it.

## **Mid-term exam and Final exam:**

There will be a mid-term exam, and a cumulative final exam in this course. Mid-term exam is a 100-minute in-class exam; it will be on Thursday, July 31. A make up mid-term exam will ONLY be given if you have missed the mid-term exam for a valid reason and you can prove it.

Date and the location of the final exam are to be determined. **Check for exam schedule conflicts as soon as possible.** Only two finals at the same time or three in one day is a University recognized legitimate reason to be excused from taking the final at the scheduled time. Students with such a conflict should complete a final exam conflict form, available on the registrar's website.

**Grading:** The course grade will be determined as follows:

Final exam: 40%

Mid-term: 25%

Quizzes: 35%

The grade I (Incomplete) will be given only if you have a good attendance record, have missed the Final for a good reason, and otherwise are doing passing work. An incomplete is given at the discretion of the instructor.

Letter grades are determined numerically:

$A > 92$ ,  $92 \geq A^- > 89$ ,  $89 \geq B^+ > 86$ ,  $86 \geq B > 82$ ,  $82 \geq B^- > 79$ ,  $79 \geq C^+ > 76$ ,  $76 \geq C > 72$ ,  $72 \geq C^- > 69$ ,  $69 \geq D^+ > 66$ ,  $66 \geq D > 62$ ,  $62 \geq D^- > 59$ ,  $F = < 59$

**Note:** This is an introduction course to the theory of probability and statistics. Its goal is to develop the mathematical tools and concepts necessary for modeling uncertainty and data analysis in real-world problem. This is a Calculus-based course, and assumes a working knowledge of single-variable calculus as well as some acquaintance with multi-variable calculus (including multiple integration).

**Additional resources:**

Name, email address, and office hours of Course TA: Xu Sun, [sun.xu@husky.neu.edu](mailto:sun.xu@husky.neu.edu)  
MTWR 3 pm – 4 pm at 563 LA

**Issues with the course/instructor:** If you have issues with this course and/or instructor which you are not comfortable discussing with your instructor, you should contact the course coordinator, Prof. Lindhe, [j.lindhe@neu.edu](mailto:j.lindhe@neu.edu). If you are not comfortable discussing issues with the course coordinator, you should contact the Teaching Director of the Department of Mathematics, Prof. Massey, [d.massey@neu.edu](mailto:d.massey@neu.edu).

**Academic Honesty:** Collaboration on tests and exams is not allowed. From Student Code of Conduct (see <http://www.northeastern.edu/osccr/academicintegrity>): "A necessary prerequisite to the attainment of the goals of the University is maintaining complete honesty in all academic work. Students are expected to present as their own only that which is clearly their own work in tests and in any material submitted for credit. Students may not assist others in presenting work that is not their own. ... Offenders are subject to disciplinary action." For more on Academic Integrity see: <http://www.northeastern.edu/registrar/courses/cat1213-univ-proc.pdf>

**Some important dates:**

*July 14, is the last day to drop a summer 2 class without a W grade*

*July 14, is the last day to elect pass/fail for summer 2 class*

*July 23, is the last day to file a Final Exam Conflict Form for summer 2 classes*

*August 04, is the last day to drop a summer 2 class with a W grade*

**Important:**

1) Any student with a disability is encouraged to meet with the instructor during the first week of classes to discuss accommodations. The student must bring a current Memorandum of Accommodations from the Disability Resource Center.

2) If you are an athlete and have conflicts with an important class activity (quiz, mid-term, or final), you should let your instructor know before the end of second week of classes. You should also bring an official letter from the Office of Athletics.

3) All electronic devices (mobile phones, laptops etc.) should be turned off during class time, quizzes, and exams.

4) It is University policy that no grade, including an incomplete, can be changed after one year. Exceptions must be authorized by the Academic Standing Committee.

5) It is your responsibility to be aware of any changes the instructor may make to the syllabus as they are announced in class. Students are responsible for all information given when they are absent.

**TRACE:** Please complete the TRACE evaluations at the end of the course.

## **Schedule of Topics and Suggested Homework Exercises**

### **Week 1: June 30 – July 4**

§ 2.1 Introduction

§ 2.2 Sample Spaces and the Algebra of Sets # 2, 3, 13, 16, 22, 26

§ 2.3 The Probability Function # 1, 2, 4, 6, 9, 12

§ 2.4 Conditional Probability # 1, 2, 7, 12, 16, 21, 24, 25, 26, 31, 34, 39, 40, 42, 46, 52

§ 2.5 Independence # 11, 12, 16, 18, 19, 20, 23, 25

§ 3.2 Binomial Probabilities # 4, 7, 8, 9, 23

### **Week 2: July 7 – 11**

§ 3.3 Discrete Random Variables # 1, 4, 5, 7, 13, 14

§ 3.4 Continuous Random Variables # 1, 3, 5, 8 – 10

§ 3.5 Expected Values # 1, 8, 12, 18, 20(a), 27

§ 3.6 The Variance # 2, 5 – 8, 11

### **Week 3: July 14 – 18**

§ 3.7 Joint Densities # 1, 8, 10, 17, 19, 23, 40, 45

§ 3.9 Further Properties of the Mean and Variance # 13, 16, 17, 20

§ 4.2 The Poisson Distribution # 10, 17, 20, 21

§ 4.3 The Normal Distribution # 2, 5, 8, 14, 16, 17, 21, 22, 27, 30, 33, 35

**Week 4: July 21 – 25**

§ 4.3 The Normal Distribution (Continued) # 2, 5, 8, 14, 16, 17, 21, 22, 27, 30, 33, 35

§ 5.2 Estimating Parameters # 1, 3 – 7, 10, 11

§ 5.3 Interval Estimation # 1, 2, 4, 5, 11, 14, 26

§ 5.4 Properties of Estimators # 5, 9, 11

**Week 5: July 28 – August 1**

§ 6.2 The Decision Rule – Hypothesis Tests # 1, 3, 4, 6, 7, 9, 10, 11

§ 6.3 Testing Binomial Data # 1 – 4, 6

§ 6.4 Type I and Type II Errors # 1, 4, 5, 7, 8, 9, 10

Review

Mid-term Exam

**Week 6: August 4 – 8**

§ 7.2 The t-distribution

§ 7.3 Deriving the t-distribution # 13

§ 7.4 Drawing Inferences about  $\mu$  # 1, 2, 7 – 9, 12

§ 7.5 Drawing Inferences about  $\sigma^2$

§ 9.2 Testing  $H_0: \mu_x = \mu_y$  # 1 – 10

**Week 7: August 11 – 15**

§ 9.3 The F-test # 2 – 5, 7

§ 9.4 Binomial Data: Testing  $H_0: p_x = p_y$  # 1 - 5

Review for the final exam

**August 18 - 19: final exam**