NEW YORK CITY COLLEGE OF TECHNOLOGY
The City University of New York

DEPARTMENT:	Mathematics
COURSE:	MAT 2572
TITLE:	Probability and Mathematical Statistics I
DESCRIPTION:	In this course students will study discrete and continuous probability distributions including the Binomial, Poisson, Hypergeometric, Exponential, Chi-squared, and Normal distributions. Topics include conditional distributions, confidence intervals, chi-square goodness of fit distribution, tests for independence and randomness, and an application to queuing theory.
TEXT:	An Introduction to Mathematical Statistics and Its Applications, 5th Edition Larson, Richard J. and Marx, Morris L. Prentice Hall
CREDITS:	4 (4 class hours)
PREREQUISITES:	MAT 1575
	Prepared by Professors Jonathan Natov and Arnavaz Taraporevala (Fall 2011)

A. Testing Guidelines:
The following exams should be scheduled:
1. A one-hour exam at the end of the First Quarter.
2. A one session exam at the end of the Second Quarter.
3. A one-hour exam at the end of the Third Quarter.
4. A one session Final Examination.

B. A statistical software will be used. Relevant handouts will be given to students.

Intended Learning Outcomes

Course LO	Gen Ed LO	Flexible Core: Scientific World LO
Be able to create meaningful visualization of data, and understand the interpretation of such representations	IL(IC): Be able to present data in appropriate ways to best illustrate a point. W(Context): Be able to identify a context of a situation in order to choose an appropriate representation of data.	Gather, interpret, and assess information from a variety of sources and points of view.
Interpret statistics like mean and variance. Understand and use the terminology (in writing or in oral form) in Probability and Statistics such as: probability, conditional probability, sample mean, random variable, probability distribution, hypothesis test, level of significance, contingency table,	IL(CE): Be able to connect relevant experience and academic knowledge. R(Context): Be able to interpret statistics in the context of a problem. W(L): Be able to express solutions using appropriate terminology.	Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring the scientific world, including, but not limited to: computer science, history of science, life and physical sciences, linguistics, logic, mathematics, psychology, statistics, and technology-related studies.
Understand the experimental underpinnings of probability	IL(R): Be able to reflect as a learner building on prior experience to develop or understand experiments carried out in this context. R(A): Be able to describe an experiment that would test a given probability.	Demonstrate how tools of science, mathematics, technology, or formal analysis can be used to analyze problems and develop solutions.
Create hypotheses test for word problems and estimate the level of significance of such a test	I(T):Be able to connect ideas of probability and statistics to test hypotheses and estimate level of significance of such a test. R(I): Be able to interpret the results of a hypothesis test in terms of the original problem. W(AS): Be able to analyze a real situation and form, carry out and interpret the results of a hypothesis test.	Evaluate evidence and arguments cri tically or analytically. Produce well-reasoned written or oral arguments using evidence to support conclusions.
Have specific knowledge of the modeling applications of distributions including: binomial, hypergeometric, normal, exponential, geometric, student-t, chi-squared.	IL(CD): Be able to apply statistical problems in real life problems. R(Context): Be able to find the appropriate model for a real-life situation. W(F,C): Be able to produce a written report of a hypothesis test with appropriate labeling and logical flow of supportive evidence to support conclusions.	Produce well-reasoned written or oral arguments using evidence to support conclusions.
Can produce computer experiments to estimate certain quantities	IL(T): Be able to adapt ideas of real experiments to the context of computer experiments. W(SE): Be able to perform computer experiments to support ideas and arguments. W(CP): Be able to explain the context and purpose of an experiment in words or orally.	Articulate and evaluate the empirical evidence supporting a scientific or formal theory.
Be able to read statistical studies involving problems in the real world	R(Comprehension):Be able to comprehend aspect of a statistical study as well as understand it's limitations and it's interpretation.	Understand the scientific principles underlying matters of policy or public concern in which science plays a role.

New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

MAT 2572 Probability and Mathematical Statistics I **Text**: *An Introduction to Mathematical Statistics and Its Applications*, 5th Edition, by Larson and Marx

Session	Probability and Mathematical Statistics	Homework
1	**2.1** Introduction **2.2** Sample Space and Algebra of Sets	**P. 20**: 2.2.1, 2.2.4, 2.2.5, 2.2.7, 2.2.10 **P. 24**: 2.2.21, 2.2.22, 2.2.29 **P. 26**: 2.2.37
2	**2.3** The Probability Function	**P. 31**: 2.3.2, 2.3.5, 2.3.9, 2.3.10, 2.3.15, 2.3.16
3	**2.4** Conditional Probability	**P. 39**: 2.4.1, 2.4.5, 2.4.7, 2.4.12, 2.4.13, 2.4.14, 2.4.15 **P. 47**: 2.4.26, 2.4.29
4	**2.4** Conditional Probability (Bayes Theorem) **2.5** Independence	**P. 52**: 2.4.41, 2.4.45, 2.4.47 **P. 58**: 2.5.1, 2.5.3, 2.5.7, 2.5.9
5	**2.6** Combinatorics	**P. 73**: 2.6.2, 2.6.3, 2.6.5, 2.6.15 **P. 79**: 2.6.17, 2.6.23 **P. 85**: 2.6.35, 2.6.41
6	**2.7** Combinatorial Probability	**P. 98**: 2.7.1, 2.7.3, 2.7.7, 2.7.21
7	**Exam 1**	
8	**3.1** Introduction **3.2** Binomial and Hypergeometric Probabilities	**P. 108**: 3.2.1, 3.2.5, 3.2.7, 3.2.9, 3.2.11, 3.2.15 **P. 117**: 3.2.21, 3.2.23, 3.2.28
9	**3.3** Discrete Random Variables	**P. 128**: 3.3.1, 3.3.2, 3.3.3, 3.3.5, 3.3.7, 3.3.11, 3.3.13
10	**3.4** Continuous Random Variables	**P. 138**: 3.4.1, 3.4.3, 3.4.5, 3.4.7, 3.4.11
11	**3.5** Expected Values	**P. 148**: 3.5.5, 3.5.7, 3.5.13, 3.5.17, 3.5.21, **P. 155**: 3.5.29, 3.5.31, 3.5.35
12	**3.6** The Variance	**P. 159**: 3.6.1, 3.6.5, 3.6.7, 3.6.11 **P. 162**: 3.6.19, 3.6.21
13	**3.12** Moment-Generating Functions	**P. 210**: 3.12.2, 3.12.5 **P. 214**: 3.12.9, 3.12.12 **P. 216**: 3.12.19, 3.12.23
14	**Exam 2**	
15	**4.1** Introduction **4.2** Poisson Distribution	**P. 226**: 4.2.1, 4.2.5, 4.2.7 **P. 233**: 4.2.10, 4.2.11, 4.2.13, 4.2.17, 4.2.19 **P. 238**: 4.2.27, 4.2.29

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Session	Probability and Mathematical Statistics	Homework
16	**4.3** The Normal Distribution	**P. 245**: 4.3.1, 4.3.2, 4.3.5, 4.3.7, 4.3.9, 4.3.11
17	**4.3** The Normal Distribution (CLT)	**P. 250**: 4.3.15, 4.3.17 **P. 258**: 4.3.21, 4.3.23, 4.3.25, 4.3.27, 4.3.31, 4.3.33
18	**4.4** The Geometric Distribution **4.5** The Negative Binomial Distribution	**P. 262**: 4.4.1, 4.4.2, 4.4.3 **P. 269**: 4.5.1, 4.5.2, 4.5.3
19	**4.6** The Gamma Distributions	**P. 274**: 4.6.1, 4.6.2, 4.6.3
20	**Exam 3**	
21	**5.3** Interval Estimation	**P. 309**: 5.3.1, 5.3.2, 5.3.3, 5.5.4, 5.3.13, 5.3.15, 5.3.19
22	**6.1** Introduction **6.2** The Decision Rule **6.4** Type I and Type II Errors (optional)	**P. 359**: 6.2.1, 6.2.4, 6.2.7, 6.2.10, 6.2.11 **P. 377**: 6.4.3, 6.4.5
23	**7.4** Drawing Inferences About μ	**P. 399**: 7.4.1, 7.4.5, 7.4.7, 7.4.16 **P. 405**: 7.4.17, 7.4.19, 7.4.21, 7.4.22
24	**7.5** Drawing Inferences About σ^2	**P. 416**: 7.5.1, 7.5.3, 7.5.9, 7.5.10, 7.5.16, 7.5.17
25	**Exam 4**	**P. 360**: 7.2-1, 7.2-3, 7.2-5, 7.2-7, 7.2-13
26	**10.3** Goodness-of-Fit Tests: All Parameters Known **10.4** Goodness-of-Fit Tests: Parameters Unknown	**P. 508**: 10.3.2, 10.3.4, 10.3.7, 10.3.9 **P. 517**: 10.4.1, 10.4.3, 10.4.5, 10.4.7, 10.4.11
27	**10.5** Contingency Tables	**P. 527**: 10.5.1, 10.5.3, 10.5.5, 10.5.6, 10.5.8, 10.5.9
28	Project Presentations	
29	Project Presentations	
30	**Final Examination**	