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

DEPARTMENT:	Mathematics
COURSE:	MAT 1372
TITLE:	Statistics with Probability
DESCRIPTION:	Topics covered include sample spaces and probabilities, discrete probability distributions (Binomial, Hypergeometric, Poisson), expectation and variance, continuous probability distributions (Normal, Student, Chi-Square), confidence intervals, hypothesis testing, correlation and regression. Spreadsheets are used throughout the semester.
TEXTS:	1. Required: Introductory Statistics Sheldon Ross 3rd edition, Academic Press 2. Suggested for those sections using Excel (check with your instructor): Statistics with Microsoft Excel Beverly J. Dretzke 5th edition, Pearson
CREDITS:	3 (2 class hours, 2 lab hours)
PRE- or COREQUISITES:	MAT 1375
	Prepared by Professors Thomas Johnstone, Boyan Kostadinov and Jonathan Natov (Fall 2010)
	Revised by Prof. Satyanand Singh (Fall 2011) and by Prof. Ezra Halleck (Spring 2021)

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

Multiple short projects or one long project should be part of the course.

B. Statistical software will be used throughout the semester. Students should plan to spend time with tutorials, especially those unfamiliar with the software chosen by the instructor.

Learning Outcomes: Upon completion of the course, students will be able to

Course Learning Outcome	General Education Learning Outcome	Flexible Core Scientific World Learning Outcome
Collect, organize, group and display data in a table and in graphs, analyze for shape and skewness and interpret within context.	IL(IC): present data in appropriate ways to best illustrate a point. W(Context): 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.
Compute and interpret measures of central location, variability and position, such as mean, median, mode, standard deviation and percentiles. In communication, make effective use of both probability and statistics terminology.	IL(CE): connect relevant experience and academic knowledge. R(Context): interpret statistics in the context of a problem. W(L): 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 how inference relies on a probabilistic analysis of sampling. Apply the Central Limit Theorem to find the mean and standard deviation of a sampling distribution as well as its shape.	IL(R): reflect as a learner building on prior experience to develop or understand experiments carried out in this context. R(A): describe an experiment that would test a given probability. W(CP): explain the context and purpose of an experiment in words or orally.	Demonstrate how tools of science, mathematics, technology, or formal analysis can be used to analyze problems and develop solutions.
Solve a problem by setting up a hypothesis test and using either the rejection region or p-value approach.	I(T): connect ideas of probability and statistics to test hypotheses and estimate level of significance of such a test. R(I): interpret the results of a hypothesis test in terms of the original problem. W(AS): analyze a real situation and form, carry out and interpret the results of a hypothesis test. W(F,C): produce a written report of a hypothesis test with appropriate labeling and logical flow of supportive evidence to support conclusions.	Evaluate evidence and arguments cri tically or analytically. Produce well-reasoned written or oral arguments using evidence to support conclusions.
Provide real-world examples modeled by binomial, hypergeometric, Poisson, normal, student-t and chi-squared distributions.	IL(CD): apply statistical problems in real life problems. R(Context): find the appropriate model for a real-life situation.	Produce well-reasoned written or oral arguments using evidence to support conclusions.
Simulate a probability distribution as well as the process of going from a population to a sample.	IL(T): adapt ideas of real experiments to the context of computer experiments. W(SE): perform computer experiments to support ideas and arguments.	Articulate and evaluate the empirical evidence supporting a scientific or formal theory.

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 1372 Statistics with Probability **Texts: 1)** Introductory Statistics by Sheldon Ross, 3rd edition
2) Statistics with Microsoft Excel by Beverly J. Dretzke, 5th edition

Session	Statistics with Probability	Text #1	Homework	Text #2
1	Introduction to Statistics and Excel	1.1-1.4	**P. 11:** 5-8, 11, 12	**P. 1-5, 9-11 and 13-23**
2	Frequency and Relative Frequency Tables; Graphical Descriptive Techniques	2.1-2.4	**P. 25**: 1, 2, 3; **P. 39**: 1, 3; **P. 47**: 1, 3	SORT, FREQUENCY **P. 28-29, P. 45-48,** **P. 59-76**
3	Measures of Central Location; Measures of Variability; Measures of Position Box plots	3.2-3.5	**P. 79**: 1, 9; **P. 86**: 1, 2, 11; **P. 98**: 1, 5; **P. 105**: 1, 2, 6	AVERAGE, MEDIAN, VAR.P/S,STDEV.P/S PERCENTILE, QUARTILE, Boxplot **P. 36-48, P. 77-87**
4	Covariance and Coefficient of Correlation	2.5, 3.7	**P. 54**: 1, 5; **P.128**: 1, 3	COV, CORREL **P. 189-193**
5	Least Squares Method and Regression	12.1-12.3	**P. 542**: 1, 5; **P. 548**: 1, 2, 3	SLOPE, INTERCEPT **P. 205-210**
6	Assigning Probabilities to Events; Prob. Rules	4.1-4.3	**P. 150**: 1, 3, 4, 7, 10-12; **P. 156**: 1, 2, 7, 9-10	
7	Experiments Having Equally Likely Outcomes; Venn Diagrams; Trees	4.4	**P. 164**: 1, 2, 3, 6, 9, 10, 12, 14	
8	Conditional Probability and Independence; Contingency Tables	4.5	**P. 177**: 1-4, 7, 11, 15, 18, 28, 29, 33, 35, 38	
9	Counting	4.7	**P. 195:** 1-9 odd, 10, 12, 13, 15	FACT, PERMUT, COMBIN
10	**First Examination**			
11	Random Variables, Probability Distributions	5.2	**P. 215**: 1, 3, 4, 9, 10, 15, 17, 18	
12	Expected Value Variance	5.3 5.4	**P. 225**: 1, 3, 4, 5, 9, 11, 19, 23, 27, 30 **P. 236**: 2, 3, 5, 10, 11, 17, 18, 19	
13	Binomial Distribution Hypergeometric Distribution (optional)	5.5 (5.6)	**P. 244**: 2, 3, 5, 10, 11, 21, 23 (**P. 249**: 1, 3, 5)	BINOM.DIST(s,n,p,false) **P. 104-108** (HYPERGEOM.DIST)
14	Poisson Distribution	5.7	**P. 253**: 1, 3, 5	POISSON.DIST **P. 111-115**

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Session	Statistics with Probability	Text #1	Homework	Text #2
15	Continuous Random Variables; Normal Data Sets and the Empirical Rule	6.2, 3.6	**P. 264**: 1, 2, 3, 6, 7 **P. 114**: 1-2, 6, 8, 10	
16	Normal Random Variables	6.3, 6.4	**P. 269**: 1, 2, 3, 5, 7, 19; **P. 276**: 3, 4, 5	NORM.S.DIST, NORM.S.INV(p) **P. 115-122**
17	Finding Normal Probabilities	6.5, 6.7	**P. 281**: 1, 3, 5, 9, 13; **P. 289**: 1, 3, 9, 13	
18	Distribution of the Sample Mean; Central Limit Theorem	7.1-7.4.2	**P. 303**: 1, 3, 5; **P. 311**: 1, 3, 5, 7, 11, 13	Sampling (Data Analysis Tools) RANDBETWEEN **P. 260-264**
19	Sampling Proportions from a Finite Population	7.5-7.5.1	**P. 319:** 1, 3, 9, 14, 17	
20	**Second Examination**			
21	Estimating Population Means and Proportions	8.1-3	**P. 334**: 5, 7, 9 **P. 338**: 3, 7	
22	Interval Estimators for Population Means and Proportions; T distribution	8.5-8.7	**P. 357:** 1, 3 **P. 366:** 1, 4 **P. 377:** 1, 3	T.DIST, T.DIST.2T, T.DIST.RT **P. 140-153**
23	Hypothesis Testing with Known Standard Deviation	9.2-9.3.1	**P. 392:** 1, 3; **P. 400**: 1, 3, 5, 7, 9, 11; **P. 408**: 1, 3, 5	**P. 131-153**
24	Inference about a Population Mean with Unknown Standard Deviation	9.4	**P. 417**: 1, 3, 5, 13, 17	T.INV(p,df), T.INV.2T(p,df) **P. 140-153**
25	**Class Project Presentations**			
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27	Distr. of the Sample Variance of a Normal Pop.; Chi-Squared Goodness of Fit Test	7.6, 13.2	**P. 325**: 1 **P. 615**: 1, 3, 7, 11	CHISQ.DIST, CHISQ.DIST.RT CHISQ.INV(p,df), CHISQ.INV.RT **P. 129-130, P. 249-255**
28	Chi-Squared Test for Independence	13.3	**P. 626**: 1, 3, 5, 9, 11	
29	Review			
30	**Final Examination**			
optional	Hypothesis Tests Concerning Two Populations	10.1-10.6	Chapter 10 could become basis for projects	Equality of means, proportions, paired