JOHN JAY COLLEGE OF CRIMINAL JUSTICE

The City University of New York
524 West 59th Street, New York, NY 10019

SYLLABUS FOR
PROBABILITY AND MATHEMATICAL STATISTICS I
MAT 301, Sections 03 & 04, Spring 2025: January 25 – May 22, 2025

Professor: Dr. Leslie Chandrakantha **Semester: Spring 2025**

Class Time: **Sec 03: Period 4, MW 12:15 pm – 1:30 pm in Room NB 6.61**

Sec 04: Period 6, MW 4:30 pm – 5:45 pm in Room NB L2.72.05

Office: Room 6.63.17 NB, **Telephone: 212 237 8835**

Office Hours: MW 11:00 am– 12:00 pm or by appointment

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Course Description:
This course emphasizes the probability theory necessary for the study of statistical inference. Topics include pictorial and tabular results of descriptive statistics, an introduction to probability theory, independence and conditional probabilities including Bayes' Theorem. Several discrete (binomial, hypergeometric, negative binomial, Poisson) and continuous (Normal, exponential, gamma, uniform) probability distributions will be studied including the concepts of a distribution function, probability mass and density functions, expected value, variance, and standard deviation. Joint probability distributions and sampling distribution follow. We shall see how the law of large numbers and the Central Limit Theorem are used in statistics. The course will then apply the concepts of probability learned to the point estimates, confidence intervals, tests of hypothesis, and regression. Probability can be taught as a branch of mathematics but is much better appreciated if taught with many applications and it is expected that all topics will involve real world applications. The instructor shall provide handouts, and PowerPoint slides. These handouts, slides and other supporting material will be posted on the course's Blackboard page. Student will use computer software such as Maple and R. In fact, learning how to use R is a major course objective.

Course Objectives:

- Choose and appropriate probability or statistical model for a particular problem.
- Know what conditions are typically required for the use of particular probability and statistical models and be able to assess whether those conditions are reasonably met.
- Interpret calculated solutions of particular probability models.
- Make appropriate inferences using the chosen statistical models.
- Use the R software system to handle datasets, display a dataset graphically, and to do probability computations, statistical analyses, and computer simulations.

Course pre-requisites:
ENG 201 and MAT 241/151

Requirements and Course Policies

Attendance:
Students are expected to attend every class and to arrive on time. Lateness, excessive absences, or a lack of participation will adversely affect a student's final grade. **Any student with more than four (4) absences will receive a failing grade in the course**. You are expected to notify the professor by email on the day of your absence. Two absences are allowed without penalty. Each additional absence results in a deduction of 1% from the total number of points achievable for the course.

Classroom Etiquette:

- Students will turn off all electronic devices before entering class. Texting or reading texts during class is prohibited and will be penalized.
- Students will act professionally during class.
- Discourteous or disorderly behavior in class will not be tolerated.
- You are asked not to leave the room during class; including after quizzes, except for emergencies.
- You are expected to participate in class and to be respectful of the opinions of other students.
- The College maintains a policy prohibiting eating and drinking in classrooms with computers. Please adhere to this policy.

Required Textbook and Other Material

- Need to have an account in ***WebAssign*** *online* learning system.

Text**: "Probability and Statistics for Engineering and the Sciences", 9th edition** by Jay L. Devore published by Cengage Publishing Company. Two ways to get the package:

- You can obtain the package (access to e-book and Webassign) through the John Jay Akademos bookstore.
- You can obtain the e-book and Enhanced WebAssign directly from WebAssign.

Use your browser to go to WebAssign (**www.WebAssign.net**). You will need the class key which is shown below. On the top right of the screen there is tab with the words "ENTER CLASS KEY". Click that. Enter the class key above and click "Submit". You should see verification that this is the correct section. Click 'Yes, this is my class". If you have ever taken a WebAssign class, then you have an account. Otherwise create one here. Just follow the directions. At some point you have to pay WebAssign about **$100.00** and get an immediate access code or use the access code from package bought from John Jay Akademos bookstore. WebAssign does offer short grace period but it starts when the course becomes available which is January 29 for this course. Thus, you will have to pay WebAssign by very early in the semester to be able to do the homework and access the online e-book. The class key is

Section 03 (12:15 pm Class): jjay.cuny 5357 7804
Section 04 (4:30 pm Class): jjay.cuny 4391 2615

WebAssign student enrollment Instructions:

1. Go to **GetEnrolled.com**
2. Enter this Course Key:

3. Follow the on-screen instructions to complete your *WebAssign* registration
4. Visit the **Cengage Student Registration Page** for a step-by-step guide and

EVALUATION in MAT 301

Homework (Online HW + R) 30%
Exam I 20%
Exam II 20%
Final Exam 30%

Final Exam Date: Sec 03 (12:15 pm class) – 05/21 at 10:30 am – 12:30 pm.
Sec 04 (4:30 pm class) – 05/21 at 3:30 pm – 5:30 pm.

When a student has to miss a test due to some educational activities such as a field trip, or due to some other acceptable reason, the student must talk to the instructor before the day of the test and arrange for a time before the schedule test–time to take the test. **No make-up tests** will be given unless the student has a verifiable excuse, and a justification for not attempting to take the test ahead time. If a student fails to make any attempt to take a test ahead of time or at the schedule time, no points will be given.

Course outline is given in next page.

Course Outline

Session	Topics	Chapter
1	What is probability? Statistics? How do they differ? Descriptive Statistics? Inferential Statistics? How are they used? Why are they important? Populations and Samples, Collecting data	1
2	Visual displays of data – Stem and Leaf, Histogram, Dotplot, Boxplot. Numerical measures of location and variability. Mean, median, percentiles, trimmed means, sample proportions, variance, and standard deviation.	1
3	Probability – experiment, sample space, events, union, intersection, complement, null. Axioms of probability. Proving results from axioms. Properties of probability. The equally likely case and counting. Multiplication principle, permutations, combinations	2
4	Conditional probability and Bayes' Theorem. Independence	2
5	Examples related to independence and conditional probability.	2
6	Discrete random variables and their probability distributions. Probability mass function, cumulative distribution function. Expected value, variance, standard deviation. Chebychev's inequality and statistics.	3
7	Binomial probability distribution. Hypergeometric distribution	3
8	Negative binomial and Poisson distributions.	3
9	Continuous probability distributions. Probability density function, cumulative distribution function. Expected value, variance, and standard deviation.	4
10	The Normal Distribution. Standard vs nonstandard normal distributions.	4

	Approximation to binomial.	
11	Exponential and Gamma Distributions. Other distributions used for approximations. Probability plots.	4
12	**Exam One.**	
13	Joint distributions. Independent random variables. Conditional distributions	5
14	Expected value of a function of a random variable. Covariance. Correlation.	5
15	Statistics and sampling distributions. Simulation.	5
16	Distribution of the sample mean and the Central limit theorem.	5
17	Point estimators. Unbiased. Minimum variance. Standard error	6
18	Moment generating functions	Handout
19	Point estimation: Method of moments. Maximum likelihood method.	6
20	Point estimation: Maximum likelihood method.	
21	Confidence intervals – single sample. Confidence level, precision, sample size.	7
22	Large sample confidence intervals and the normal distribution.	7
23	Small sample confidence intervals and the t distribution. Chi Square confidence intervals for variance.	7
24	**Exam Two**	
25	Tests of hypotheses – single sample. Null vs alternative hypothesis. Type I, type II error, Power.	8
26	Tests concerning means, proportions.	8
27	Inferences based on two samples	9
28	Review	12
29	**Final Examination**	

Incomplete Grade Policy

An Incomplete Grade (INC) is within the discretion of the faculty member as to whether or not to give the grade of Incomplete. A grade of incomplete may be given to a student who does not complete the coursework. Incomplete work is due by the student no later than the third week of the following semester. The foregoing statement does not relieve the student from his/her responsibility in completing coursework as directed.
(For more information consult the *Undergraduate Bulletin 2012-2013*, *p.232*)

Americans with Disabilities Act (ADA) Policies

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Accessibility Services (OAS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from the OAS which is located in the New Building, Room L.66.00 (212-237-8031). It is the student's responsibility to initiate contact with the Office and to follow the established procedures for having the accommodation notice sent to the instructor." (*Undergraduate Bulletin 2012-2013*, *p.260)*
(A Faculty Guide to Teaching College Students with Disabilities 4th ed., p.3)

Statement of the College Policy on Plagiarism:

Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations require citations to the original source.

Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

It is the student's responsibility to recognize the difference between statements that are

common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrasing, summarizing, and direct quotations are acceptable forms of restatement, as long as the source is cited.

Students are advised to consult with their instructors when they are unsure about how and when to provide documentation. The Library has free guides designed to help students with problems of documentation. (John Jay College of Criminal Justice Undergraduate Bulletin, http://www.jjay.cuny.edu/academics/654.php, *(seeUndergraduate Bulletin 2013-2013: Chapter 6 Academic Standards)*