



NORTH SOUTH UNIVERSITY

Center of Excellence in Higher Education

The first private university in Bangladesh

Department of Mathematics and Physics

Course Title	Probability and Statistics
Course Code	MAT-361
Section No	
Semester	Summer2023
Course Coordinator	Mahboob Shaheen (mahboob.shaheen@northsouth.edu)
Instructor & Department Information	
Instructor's Name	
Office Room	
Office Hours	By appointments and
Office Phone	
Email Address	
Links	North South University Website: http://www.northsouth.edu Department Website: http://www.northsouth.edu/academic/seps/mp.html

Course & Section Information	
Prerequisites	MAT250
Class Time & Location	
Course Credit Hours	3:0
Text Book	Probability and Statistics for Engineers and Scientists (4th edition, 2012), Anthony Hayter
Reference Book	Probability and Statistical Inference(9th Edition), Robert V. Hogg, Elliot A. Tanis, Dale L. Zimmerman

Marks Distribution:

Attendance	10%
Assignments	10%
Quizzes	20%
Mid-Term	25%
Final Exam	35%

Grading Policy:

Numerical Scores	Letter Grade	Grade Points
93 & above	A	4.0
90 - 92	A-	3.7
87 - 89	B+	3.3
83 - 86	B	3.0
80 - 82	B-	2.7
77 - 79	C+	2.3
73 - 76	C	2.0
70 - 72	C-	1.7
67 - 69	D+	1.3
60 - 66	D	1.0

Course Short Description

This course is an introduction to probability theory and statistical inference for undergraduates in engineering and the sciences. This course attempts to provide basic concepts of set theory, central tendency, dispersion, and different approaches to conceptualizing probability. It discusses useful laws of probability, the Bayes' rule, random variables, and their distributions. It also covers discussions on certain operators like mathematical expectation, the variance of random variables, and probability distributions, such as Binomial, Geometric, Negative Binomial, Poisson, Uniform, Normal, and Exponential, and their applications. It focuses on sampling distribution, hypothesis tests for a single mean, and preliminary ideas on regression analysis.

Course Objectives

1. To apply basic concepts of sets, sample space, and randomness of data.
2. To acquaint students with probability and its laws.
3. To develop skills in probability and sampling distributions.
4. To analyze generating functions and their applications in real-life data.
5. To become familiar with different hypothesis tests and decision-making troubleshooting.

Classroom Rules of Conduct

1. Electronic devices e.g. **cell phone, laptop, notepad, iPad, iPod, mp3, etc**, are strictly prohibited in the class.
2. It is imperative that the students maintain absolute discipline in class. Students are also expected to arrive on time for the class, as frequent late attendance will not be accepted.
3. **Academic Integrity Policy:** Department of Mathematics and Physics does not tolerate academic dishonesty by its students. At minimum, students must not be involved in cheating, copyright infringement, submitting the same work in multiple courses, significant collaboration with other individuals outside of sanctioned group activities, and fabrications.

Students are advised that violations of the Student Integrity Code will be treated seriously, with special attention given to repeated offences.

Please Refer to NSU Student Handbook, Sections: "Disciplinary Actions" and "Procedures and Guidelines".

CO/PO Mapping:

CLOs	Description	Bloom's taxonomy domain/level (C: Cognitive, P: Psychomotor, A: Affective)	Delivery methods and activities	Assessment tools
CLO1	Apply basic probability concepts such as conditional probabilities, independence, Bayes Rule, and combinations and permutations to calculate probabilities of events of practical interest.	C3, P2	Lectures, notes	Quiz, Exam
CLO2	Analyze and conceptualize random variables, single and multivariate distributions, conditional distribution and independence of random variables.	C3, C4, P2	Lectures, notes	Quiz, Exam
CLO3	Identify and apply Binomial, Negative Binomial, Geometric, Hyper-geometric, Poisson, Exponential and Normal probability models to find mean, variance and associated probabilities.	C3, C4	Lab class/ Discussion	Lab work/ Assignment
CLO5	Derive sampling distribution of statistics and estimate point estimators for various parameters using the method of moments and the method of maximum likelihood.	C3, C4, C5, P3	Lectures, notes	Quiz, Exam
CLO6	Evaluate the performance of various estimators using properties such as unbiasedness, efficiency and minimum variance.	C5, P3	Lab class/ Discussion	Lab work/ Assignment
CLO7	Build confidence intervals for means and interpret the results. Find and perform statistical test on means.	C3	Group discussion	Presentation/ Assignment
CLO8	Perform hypothesis test to make decision.	C4, P2	Demonstration	Quiz, Exam

Tentative Lecture Plan and Syllabus for MAT-361

Chapter 1: Probability Theory (4 lectures)	Home Works
1.1 Probabilities	1.1.1 to 1.1.6, 1.1.8 to 1.1.11
1.2 Events	1.2.1, 1.2.2, 1.2.4, 1.2.5, 1.2.7, 1.2.8, 1.2.10, 1.2.12
1.3 Combinations of events	1.3.1, 1.3.2 (a,b,c,d), 1.3.5, 1.3.6, 1.3.7, 1.3.9
1.4 Conditional probability	1.4.3, 1.4.6, 1.4.9
Chapter 2: Random Variables (4 lectures)	
2.1 Discrete random variables	2.1.1
2.2 Continuous random variables	2.2.2, 2.2.6
2.3 The expectation of a random variable	2.3.1, 2.3.12
2.4 The variance of a random variable	2.4.5
2.5 Jointly distributed random variables	2.5.3
Chapter 3: Discrete Distributions (3 lectures)	
3.1 The Binomial distribution	3.1.4, 3.1.9
3.2 The Geometric and Negative Binomial distribution	3.2.5, 3.2.9
3.3 The Hypergeometric distribution	3.3.3
3.4 The Poisson distribution	3.4.4, 3.4.8
Chapter 4 & 5: Continuous Distribution (3 lecture)	
4.2 The exponential distribution	4.2.2
5 The Normal distribution	5.1.1, 5.1.3, 5.1.9
Midterm	
Chapter 6: Descriptive Statistics (3 lectures)	
6.1 Experimentation	
6.2 Data presentation	6.2.1, 6.2.3
6.3 Sample statistics	6.3.1
Chapter 7: Statistical Estimation & Sampling Distributions (2 lectures)	
7.1 Point estimates (Maximum likelihood method)	
Chapter 8: Inferences on a Population Mean and Population variance (4 lectures)	
8.1 Confidence intervals	8.1.1, 8.1.3, 8.1.5
8.2 Hypothesis testing	8.2.1, 8.2.3, 8.2.5, 8.2.7, 8.2.9, 8.2.11, 8.2.13
Chapter 9: Comparing two population mean and two population variance (3 lectures)	
9.2 Analysis of paired samples	
9.3 Analysis of independent samples	
Chapter 12: Simple linear regression (2 lectures)	
Review (1 Lecture)	

Final Exam (Declared by the Controller of Examinations)

Note: The instructor reserves the right to make changes to the syllabus if necessary.

Exams & Make Up Policy

Three quizzes will be taken (best **Two** out of **Three** will be considered). **NO makeup for quizzes under any circumstances.** If a student misses any of the Midterm exams due to the circumstances beyond their control (official valid documents are required) and informed beforehand (if possible), reasonable arrangement may be considered. There will be **no extra question** in the Midterm and Final exams, so that students should have to answer all the questions given in the exam script.
Cell phones are **prohibited** in exam sessions.

Attendance Policy

Students are required and expected to attend all classes regularly and on time and participate in class discussions. North South University mandates to fail students who are absent 25% or more from their classes, even if such absences are excusable. It is the responsibility of the student to become aware of other course-related announcements missed during an absence.

Please Refer to NSU Student Handbook, Section: "Study Principles and Policies"

Communication Policy:

All communications should take place using the instructor's **email**. Announcements in class will override any statement made here or in any other handouts. It is the student's responsibility to be aware of any announcements made in classes.

Marks distribution for attendance:

Number of class	0-15	16-30
Marks	0	According to RDS attendance percentage

Appropriate Use Policy

All members of the North South University community must use electronic communications in a responsible manner. The University may restrict the use of its computers and network systems for electronic communications subject to violations of university policies/codes or local laws or national laws. Also, the university reserves the right to limit access to its networks through university-owned or other computers, and to remove or limit access to material posted on university-owned computers.

Students Complaints Policy

Students at North South University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

Students with Special Needs

North South University will provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities/special needs that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their instructors to ensure that their needs are met. The University through its Special Need section will exert all efforts to accommodate special needs.

Special Needs Section

Telephones: +88-02-5566 8200 ext-1220

Location: **Room # 413/A, Admin Building (4th floor).**

Please Refer to NSU Student Handbook, Section: "Special Needs Services"