Department of Mathematics and Natural Sciences
Fall 2022

STA201	Elements of Statistics & Probability	3 credits

Course Teacher:

Faculty Name: Most. Salma Yeasmin Jannaty (SYN)
Designation: Lecturer
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Class Schedule:

	8:00 - 9:20	9:30 - 10:50	11:00 – 12:20	12:30 - 1:50	2:20 – 3:40
Saturday	_	STA-201(10) UB10103	Consultation	STA-201(14) UB10103	Consultation
Sunday	STA-101 (7) UB10103	STA-201 (19) UB40903	Consultation	Consultation	_
Monday					
Tuesday	STA-101 (7) UB10103	STA-201 (19) UB40903	Consultation	Consultation	_
Wednesday					
Thursday	_	STA-201 (10) UB10103	Consultation	STA-201(14) UB10103	Consultation

Course Introduction:
This course provides an introduction to the theory and practice of probability and statistics in the context of engineering and life science. Probability and statistical methods play an important role in many aspects of engineering and life science including forecasts of extreme operating conditions. The emphasis is on applications, rather than proofs, but some understanding of the concepts and an ability to communicate the meaning of the results is vital. However, a student can never expect to be an effective scientist without attaining due skills in statistics. It aims to enhance a student's quantitative and logical ability to reason.

Course Objective:
The course's main objective is to make familiar with the basic concepts of statistics and its applications for life science and engineering students. Attempts will be made to provide a clear, concise understanding of the fundamental features and methods of statistics along with relevant interpretations and applications for conducting quantitative analyses. This course will help students develop skills in thinking and analysing a wide range of problems in life science and engineering from a probabilistic and statistical point of view.

Course Prerequisite: NA

Course Learning Objectives (CLOs): At the end of this course, students will be able to-
CLO1: Develop fundamental concepts of probability and statistics commonly used in life sciences, engineering and other fields**.**
CLO2: Evaluate various quantities for probability distributions and random variables**.**
CLO3: Perform statistical computations & interpret the outcomes effectively.
CLO4: Develop probabilistic and statistical models for some applications, and apply Statistical methods to a range of problems in life sciences, engineering and other fields**.**
CLO5: Comprehend the theoretical foundations that lead to choosing the appropriate analysis (i.e. hypothesis testing)

Required Text: Probability and Statistics for Engineering and the Sciences- Jay L. Devore, 8th Edition.

Format and Procedures:

- This course is designed for active engagement. Every class will start with a discussion (10 minutes) on the previous lecture followed by explaining unresolved questions and homework.
- There will be an hour-long lecture by the faculty.
- At the end of the lecture, the faculty will spend 5 minutes discussing the probable questions one may have on the issues.
- There will be up to three quizzes in a semester.
- Slack / Google Classroom will be used as a platform for teaching and learning materials & communication section-wise.

General rules to be followed:

- Students are expected to show mutual respect and remain silent while their colleagues are discussing any issues in the class.
- Class attendance is mandatory and marked.
- If any student **fails to show up in four classes in a row s/he will be barred from the class**.
- If any student is sick or has a major family problem s/he must notify his/her class instructor.
- Students are expected to **make appointments via email** before they show up for consultations.
- In case of urgent matters, SMS/Email can be used to approach the faculty.

Marks Distribution of the Course:

Table: Performance Evaluation

Criteria	**Indicators for Learners**
FORMATIVE	
Point 1	Class attendance
Point 2	Quiz
Point 3	Assignments/ Problem sets
Point 4	Term paper/ Project
SUMMATIVE	
Point 5	Midterm
Point 6	Final examination

NOTE: **Class attendance is compulsory for every student.** 5% of total marks in every course will be allocated for attendance. The basis for awarding marks for attendance is as follows:

Table: Assessment Rubric

Criteria	** Weightage in Percentage
Point 1	05%
Point 2	20%
Point 3	15%
Point 4	---
Point 5	25%
Point 6	35%
Total	100%

- **Attendance Marks:**

Attendance Percentage	Marks
90% and above	5
85% to less than 90%	4
80% to less than 85%	3
75% to less than 80%	2
70% to less than 75%	1
Less than 70%	0

NOTE: If the student does not attend a minimum of **70%** of the total classes, a student will not be allowed to take the final exam.

- **Final Examination:**

The duration of the final examination will be ***1.5 to 2 hours*** and it will held between ***December 24, 2022*** – ***January 1, 2023.*** Further instruction about question setting and other relevant issues will be given later.

- **Midterm:**

Midterm will be held during the midterm week ***November 4, 2022 and November 11, 2022***. There will be ***no makeup midterm*** as well, unless any student ***submits application*** through the corresponding chair of the department ***before*** the midterm's scheduled date. ***Syllabus of the midterm*** will be announced later.

- **Quizzes:**

There will be ***3 quizzes***. Each quiz will be of 20 marks. The average of best ***2 quizzes*** will be counted for final grading. Remember there will be no makeup quiz. Syllabus of respective quiz will be given prior to that quiz. Duration of quiz will be decided by respective faculty member.

Tentative dates:

Quiz -1: October, 25 (Section 19); October, 27 (Section 10 and 14)
Quiz -2: November, 29 (Section 19); December, 1 (Section 10 and 14)
Quiz -3: December, 13 (Section 19);December, 15 (Section 10 and 14)

- **Assignments/ Problem Sets:**

Assignments/ Problem sets will be given to enhance the student's ability to adapt with the subject. A total of 5 (five) assignments will be assigned throughout the semester. Average scores of all the assignments will be counted. Total marks allocated for assignment is 15.

Grading policy: Your grade will be calculated using the BRAC University grading formula as follows:

Numerical Scores	Letter Grade	Grade Points
97 to ≤ 100	A+ (Exceptional)	4.0
90 to < 97	A (Excellent)	4.0
85 to < 90	A-	3.7
80 to < 85	B+	3.3
75 to < 80	B (Good)	3.0
70 to < 75	B-	2.7
65 to < 70	C+	2.3
60 to < 65	C (Average)	2.0
57 to < 60	C-	1.7
55 to < 57	D+	1.3
52 to < 55	D (Poor)	1.0
50 to < 52	D-	0.7
< 50	F (Failure)	0.0

Instructions to the students from the course teacher:

- There will be no **makeup quizzes.**
- Makeup exams are highly discouraged. But make up exams can be permitted under compelling situations as per Brac University rules.
- No student will be allowed to sit for the final exam if **he/she misses 30% of the total classes.**
- Each student **must attend** the **first and last class** of the course according to the course plan.
- The student will find supporting documents at the respective channel of relevant faculty members.

The tentative class schedule is shown below. However, the dates and topics may be changed if necessary

Week	Lecture	Topics to be covered	Assignment
1	**1**	Introductory Class: Discussion of course contents, Introduction to statistics and data science, Scopes of Statistics in life science and engineering, Basic Statistical terms & ideas	

Week	Lecture	Topics to be covered	Assignment
	2	Summarization & Graphical presentation of data: Graphical presentation for qualitative and quantitative data, graphical presentation of frequency distribution.	Assignment-1 (Lecturer 1 &2)
2	**3**	Measures of Central Tendency: Arithmetic Mean, Median & Mode (for group and ungrouped data)	
	4	Measures of Central Tendency: Geometric Mean, Harmonic Mean, Weighted Mean, Quantiles: quartiles, deciles and percentiles.	Assignment-2 (Lecturer 3, 4, 5 and 6)
3	**5**	Measures of Dispersion: Range, standard deviation, mean deviation, coefficient of variation (C.V.)	
	6	Measures of Dispersion: Box plot, Stem and leaf plot. Skewness and Kurtosis, outlier and its detection with box plot.	
4	**7**	**Quiz-1** [1st quiz will be taken based on lectures 1 to 6]	
	8	Correlation: Scatter diagram, Pearson correlation coefficient	Assignment-3 (Lecturer 8 & 9)
5	**9**	Regression Analysis: Simple linear regression equation and Introduction to Multiple regression analysis	
	10	Introduction of Probability: Basic concept, Classical approach, Experiment, sample space, event, and mutually exclusive event, Rules of Addition and multiplication	Assignment-4 (Lecturer 10 & 11)
6	**11**	Conditional probability and independence, Bayes' theorem.	
	12	**Quiz-2** [2nd quiz will be taken based on lectures 8 to 11]	
7		**Midterm Examination** [Midterm will be taken based on lectures 1 to 11]	
8	**13**	Random Variables & Mathematical Expectation: Discrete and continuous random variables, Expectation and variance of random variables.	
	14	Joint Distribution: Joint Probability and Conditioning on Random Variables	Assignment-5 (Lecturer 13-18)
9	**15**	Probability Distributions: Binomial & Geometric	
	16	Probability Distribution: Poisson	
10	**17**	Probability Distributions: Normal	
	18	Probability Distribution: Normal & Exponential	
11	**19**	**Quiz-3** [3rd quiz will be taken based on lectures 13 to 18]	
	20	Tests of Hypothesis: Introduction to Statistical Hypothesis Testing	
12	**21**	Tests of Hypothesis: Terminologies of Hypothesis Testing	

Week	Lecture	Topics to be covered	Assignment
	22	Tests of Hypothesis: One-Sample z-Test for a Population Mean	Assignment-5 (Lecturer 20-24)
13	**23**	Tests of Hypothesis: One-Sample t-Test for a Population Mean	
	24	Tests of Hypothesis: Two-Sample z-Test & t-Test for a Population Mean	
		Final Examination [Final exam will be taken based on lectures 13 to 24]	