

# OBE Description of “Probability and Statistics” for the Undergraduate Programs of BDU

## 1. Description of Course

### Section A: General Information

1.1 Course Title	DS 107: Probability and Statistics
1.3 Type of Course	Common
1.3 Credit Hour	3 (2 Hour Lecture+ 2 Hour Tutorial)
1.4 Pre-requisite Course(s)	None

### Section B: Course Details

#### 1.5 Course Content

**Elements of Statistics:** nature and scope of statistics; population and sample data, representation of statistical data, discrete and continuous variables, **Central limit theorem:** **Measures:** arithmetic mean, geometric mean, harmonic mean, median, mode, range, standard deviation, quartiles, declines, percentiles, mean deviation, quartile deviation, coefficient of dispersion, coefficient of variation, measure of skewness, moments and kurtosis; **Regression and Correlation:** relationship between variables, fitting of regression lines, simple correlation, multiple correlation and regression, correlation coefficient and regression coefficient; **Elements of Probability:** meaning and definition of probability, properties, basic terminology of probability, **Bayes theorem**, random variables, probability function, **Probability Distribution Function:** binomial distribution, poison distribution, normal distribution, standard normal distribution, t-distribution, confidence level, estimation; **Mathematical Expectation:** meaning of mathematical expectations, expected value of a function of a random variables, expected value of a function of two random variables. **Markov Model; Stochastic Analysis; Queuing Analysis:** Queuing system, system performance measures, Queuing model; **Fundamental of hypothesis testing.**

#### 1.6 Course Objectives

This course is designed with the modern theory of statistics and its application in IoT and Robotics System Design and Development. Fundamental statistics, data collection procedures, and measures are introduced successively. Graphing data and curve fitting make this course more precious. Elementary probability and its properties are also included; probability distributions, estimations procedure, and hypothesis testing are familiarized. By the end of this course, students should be able to:

- 1.6.1 Explain the basics of statistics and probability, types of variables, and data type.
- 1.6.2 To understand the concepts basic and advanced statistical concepts and tools in empirical settings and explain data classifications and reporting with various graphical tools.

1.6.3 To efficiently implement the different assess decision-making models with appropriate tools and techniques.

## 1.7 Knowledge required

Need some preliminary knowledge of basic calculus (**differentiation, integration**) and algebra (**set, permutation, and combination**)

## 1.8 Course Outcomes

After learning this course, students will be able to-

- Understand the basics of statistics and probability, types of variables, and data type
- Understand the central tendency of the sample data by measuring the mean, median, mode, dispersion, skewness, kurtosis, and moments.
- Comprehend the basic of regression and correlation and various probability distributions (Binomial distribution, Poisson distribution, Normal distribution, and t-distribution)
- Evaluate scenarios with appropriate tools and techniques for decision making

CO No.	CO Statement	Corresponding PO(s)*	Domains and Taxonomy Level(s)**	Delivery Method(s) and Activity(-ies)	Assessment Tool(s)
1	Apply the concepts of descriptive statistics for any given data set	PO1	C5	Lectures, Tutorial Homework Assignment Discussion	Written exams. presentation; assignment
2	Apply the concepts of inferential statistics for any given data set	PO1	C5	Lectures, Tutorial Homework Assignment Discussion	Written exams. presentation; assignment
3	Analyze a real- world scenario and design decision- making model with appropriate statistical tools	P03, PO4	C6	Lectures, Tutorial Homework Assignment Discussion	Written exams. presentation; assignment

1.9 Mapping of Knowledge Profile, Complex Engineering Problem Solving, and Complex Engineering Activities.

COs	K1	K2	K3	K4	K5	K6	K7	K8	P1	P2	P3	P4	P5	P6	P7	A1	A2	A3	A4	A5
CO-1		√																		
CO-2		√																		
CO-3			√						√	√										
CO-4					√			√	√	√	√									

## 1.9 Lecture Plan

Lec #	Lecture Topics	Teaching-learning Strategy(-ies)	Assessment Strategy(-ies)	Corresponding CO(s)
1	<b>Elements of basic statistics:</b> Nature and scope of statistics; population and sample data, representation of statistical data, discrete and continuous variables,	<ul style="list-style-type: none"> <li>● Lecture</li> <li>● Hand Note</li> <li>● Group work</li> </ul>	Q/A Test (SQ) Assignment Presentation	CO1
2	<b>Measures;</b> central limit theorem; arithmetic mean, geometric mean, harmonic mean, median, mode,	Lecture Hand Note Group work	Q/A Test (SQ) Assignment Presentation	CO1
3	range, standard deviation, quartiles, declines, percentiles, mean deviation, quartile deviation,	Lecture Hand Note Group work	Q/A Test (SQ) Presentation	CO2
4	Coefficient of dispersion, Coefficient of variation, measure of Skewness, moments, and kurtosis;	Lecture Group work Hand Note	Q/A Test (SQ) Presentation	CO2
5	<b>Regression and Correlation:</b> relationship between variables, fitting of regression lines, simple correlation,	Lecture Hand Note Group Work	Q/A Presentation Graphing	CO2
6	multiple correlation and regression, correlation	Lecture Cooperative learning	Quiz Test Test (S B) Demonstration	CO3

	coefficient and regression coefficient;	Hand Note	Assignment	
7	<b>Elements of probabilities</b> meaning and definition of probability, properties, Basic terminology of probability, <b>Bayes theorem</b> , random variables, probability function,	Lecture, Cooperative learning Case Study Hand Note	Quiz Test Demonstration Assignment	CO3
8	<b>Probability distribution Functions;</b> binomial distribution, poison distribution, normal distribution, standard normal distribution, t-distribution, confidence level, estimation;	Lecture Group work Hand Note	Q/A Test (S B) Presentation	CO1,CO3
9	<b>Mathematical Expectation:</b> meaning of mathematical expectations, expected value of a function of a random variables, expected value of a function of two random variables	Lecture, Cooperative learning Hand Note	Quiz Test Mathematical Program (MATLAB) Assignment	CO1,CO3
10	<b>Fundamental Hypothesis testing</b> of	Lecture, Cooperative learning Hand Note	Quiz Test Presentation	CO1,CO3
11	<b>Markov Model</b>	Lecture, Application Cooperative learning	Quiz Test Presentation Assignment	CO3
12	<b>Stochastic Analysis</b>	Lecture Group work Hand Note	Test (S B) Demonstration	CO3

13	<b>Queuing Analysis:</b> Queuing system, system performance measures,	Lecture Group work Hand Note	Presentation Test (S Q) Assignment	CO3
14	<b>Queuing Analysis:</b> Queuing model	Lecture Case Study Cooperative learning Hand Note	Q/A Test (S B) Demonstration	CO4

#### 1.11 Assessment Strategy

- **Class Attendance:** Class attendance will be recorded in every class.
- **Continuous Assessment:** Continuous assessment of any of the activities such as class participation, quizzes (10%), assignment (10%) and presentation (10%) etc. The continuous assessment scheme for the course will be declared on the first day of classes.
- **Mid-term Examination:** A comprehensive mid-term examination will be held in the mid of the term (according to the academic calendar) following the guideline of the Academic Council.
- **Final Examination:** A comprehensive final examination will be held at the end of the term (according to the academic calendar) following the guideline of the Academic Council.

#### 1.12 Distribution of Marks

Class Attendance	10%
Continuous Assessment	30%
Mid-term Examination	24%
Final Examination	36%
Total	100%

#### 1.13 Textbook

1.13.1 An introduction to Probability and Statistics, 3<sup>rd</sup>/4<sup>th</sup> edition, M. Nurul Islam

#### 1.14 Reference Book

1.14.1 Sheldon M. Ross Introduction to Probability and Statistics for Engineers and Scientists.

1.14.2 Ronald E. Walpole, Raymond H. Myers & Sharon L. Myers Probability and Statistics for Engineers and Scientists.

1.14.3 Prem S. Mann, Introductory Statistics (Eight Edition), John Willey & Sons.

1.14.4. S. P. Gupta & M. P. Gupta, Business Statistics, Sultan Chand & Sons.

1.14.5 John E Freund, Mathematical Statistics, Prentice Hall of India.

1.14.6 Johnson R.A, Miller & Freud's Probability & Statistics for Engineers, Pearson Education Asia.

