BANASTHALI VIDYAPITH

Department of Mathematics and Statistics

COURSE HANDOUT

B. Tech. VI Semester (IT/CS)

Session: Dec.2022 - May 2023

Course: STAT 204, **Probability and Statistical Methods** (Contact Hours: 60)

MSC* In-charge: Dr. Gulab Singh

MSC Faculty Team:

Instructor	Course Time Table (Day and Time)			
Dr. Gulab Singh Bura Branch: IT (Section A)	Wednesday 2.05 pm- 3.00 pm AIC. 201	Thursday 2.05 pm- 3.00 pm AIC. 201	Friday 2.05 pm- 3.00 pm AIC. 201	Saturday 2.05 pm- 3.00 pm AIC. 201
Dr. Gulab Singh Bura Branch: IT (Section B)	Friday 1.05pm- 2.00pm CMS. 203	Saturday 1.05pm- 2.00pm CMS. 203	Sunday 1.05pm- 2.00pm CMS. 203	Monday 1.05pm- 2.00pm CMS. 203
Dr. Naresh Chandra Branch: CS (Section A)	Friday 4.05pm- 5.00pm CMS. 103	Saturday 4.05pm- 5.00pm CMS. 103	Sunday 4.05pm- 5.00pm CMS. 103	Monday 4.05pm- 5.00pm CMS. 103
Dr. Praveen Kr. Tripathi Branch: CS (Section C)	Friday 9.05am- 10.00am CMS. 103	Saturday 9.05am- 10.00am CMS. 103	Sunday 9.05am- 10.00am CMS. 103	Monday 9.05am- 10.00am CMS. 103
Dr. Praveen Kr. Tripathi Branch: CS (Section B)	Friday 12.05pm- 1.00pm AI. 208	Saturday 12.05pm- 1.00pm AI. 208	Sunday 12.05pm- 1.00pm AI. 208	Monday 12.05pm- 1.00pm AI. 208

Course Objectives:

This course deals with the Concepts of Probability and Statistical Methodology which are used in the different areas of Science and Technology. Therefore, the objective of this paper is:

- To enable the students to have a thorough understanding of basic probability theory and some families of distributions, and their applications.
- To aware the students about testing of hypothesis, their problems and interpretations in large as well as in small sample cases.

Course Outcomes:

After successful completion of the course, the students will be able to:

- Understand the concepts of random variables, probability distributions and independence of random variables.

* MSC: Multi Section Course

- Understand the meaning of probability and probabilistic experiment
- Familiarize with the all approaches to probability theory and particularly, the axiomatic approach.
- Understanding the meaning of conditional probability.
- Distinguish between independent and uncorrelated random variables.
- Distinguish between discrete and continuous random variables and be able to represent them using probability mass, probability density, and cumulative distribution function.
- Identify important types of distributions such as exponential, Binomial, Poisson, Normal, and use them as suitable models in basic science and engineering problems.
- Understand the concept of statistical hypothesis and able to solve such type of real life problems.

E-Resources:

1. Probability and Random variables, MIT Open Courses, https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/lecture-notes/
2. Probability and Statistics, NPTEL https://nptel.ac.in/courses/111105041/27
3. Probability and Statistics, **NPTEL, https://nptel.ac.in/courses/111/105/111105090/**

2. Course Description:

Section A

Basic concepts of Probability, Classical, Empirical and Axiomatic approach to Probability. Addition and Multiplication theorems of Probability. Bayes' theorem and its simple applications. Marginal, Joint and Conditional probability. Mathematical Expectation: Expectation of sum & products of random variables, Variance & Covariance.

Section B

Correlation & Regression, Karl Pearson coefficient of Correlation. Partial and Multiple Correlation (up to three variables only).

Probability Distributions: Binomial, Poisson, Normal, Rectangular & Exponential distributions with simple applications. Fitting of Binomial, Poisson, and, Normal distributions.

Section C

Sampling distribution, Standard Error, Simple random sampling and stratified random sampling with their role. Test of significance for mean, variance, Proportion and correlation coefficient. Test of goodness of fit and independence of attributes. Analysis of variance with one observation per cell.

3. Text/Reference Books:

Text books:

TB1. **Richard Arnold Johnson, Irwin Miller, and John E. Freund:** *Probability and Statistics for Engineers*, Prentice Hall, 2011.

Reference Books:

RB1. **A.M. Goon, M.K. Gupta and B.D. Das Gupta:** Fundamentals of Statistics, Vol.I and Vol.II, World Press Pvt. Ltd., Kolkata 1980.

RB2. **M. Alexander, F. Graybill & C. Duane Boes:** Introduction to the theory of Statistics, 3rd edition: Tata McGraw Hill, New Delhi, 2001.

4. Course Plan:

Lecture No.	Topics to be covered	Section	Ref.
1-2	Basic concepts of Probability, Classical and Empirical Definition of Probability	A	TB1 RB1
3	Axiomatic Approach to Probability.	-do-	TB1 RB1
4-5	Addition and Multiplication Theorems of Probability.	-do-	TB1
6-7	Bayes' Theorem and its Simple Applications.	-do-	TB1& RB1&2
8-12	Marginal, Joint and Conditional Probability.	-do-	TB1
13-15	Mathematical Expectation: Expectation of Sum & Products of Random Variables.	-do-	TB1
16-17	Variance & Covariance.	-do-	TB1
18-22	Correlation and Regression, Karl Pearson Coefficient of Correlation.	B	TB1
23-26	Partial and Multiple Correlation (up to three variables only).	-do-	TB1&RB1
27-30	Probability Distributions: Binomial and their fitting	-do-	TB1
31-38	Poisson and Normal Distribution with their fitting	-do-	TB1
39-41	Rectangular & Exponential Distributions with Simple Applications	-do-	TB1
42-44	Sampling Distribution, Standard Error. Simple Random Sampling and Stratified Random Sampling with their Role	C	TB1&RB1
45-47	Test of Significance for Mean.	-do-	TB1&RB1
48-49	Test of Significance for Variance and Proportion.	-do-	TB1&RB1
50	Test of Significance for Correlation Coefficient	-do-	TB1
51-53	Test of goodness of fit and Independence of Attributes.	-do-	TB1&RB1
54-57	Analysis of Variance with One Observation Per Cell.	-do-	TB1&RB1

5 Evaluation Scheme:
In this course (paper), a student will be evaluated out of 100 marks. Out of which 60 marks

would be for final semester examination; and 40 marks would be of continuous assessment (two periodical tests and two assignments).

The following components will constitute the Continuous Assessment

Component	Marks	Submission/ Examination date	Allotment
Home assignment I	10	18 January, 2023	Topics shall be allotted in the class by 10 January 2023
Periodical test I	10	1-4 February, 2023*	-
Home assignment II	10	27 February, 2023	Topics shall be allotted in the class by 18 February, 2023
Periodical test II	10	15-18 March, 2023*	-
Semester Examination	60	16 April- 4 May, 2023*	-

**Subject to change

NOTE: A student is required to be in attendance in all the classes. It is her duty to come in time and take up all the assignments, tests, quizzes and other components of evaluation on the schedule dates, time and venue, failing which she would be awarded zero in that component of evaluation. There is no provision of any re-test/make up.

Consultation Hour:

The students are also free to approach on any day, and at any time during the institute hours for removal of their difficulties or any guidance, with prior information.

Dated: 31/12/2022

(Gulab Singh Bura)
(Naresh Chandra)
(Praveen Kr. Tripathi)

31/12/2022