SYLLABI AND SCHEME OF EXAMINATIONS
FOR
MULTIDISCIPLINARY COURSES
FOR UNDER GRADUATE
PROGRAMS (SINGLE MAJOR)
IN STATISTICS

(Based on Curriculum and Credit Framework for UG Programs under NEP)

WITH EFFECT FROM
THE
SESSION 2024-25

MAHARSHI DAYANAND UNIVERSITY
ROHTAK (HARYANA)

SYLLABI AND SCHEME OF EXAMINATIONS FOR MULTIDISCIPLINARY COURSES FOR

UNDER GRADUATE SINGLE MAJOR PROGRAMS/ SINGLE MAJOR PROGRAM AFTER 2nd SEMESTER OF MULTIDISCIPLINARY PROGRAM in STATISTICS

Name of the Department	Nomenclature of Multidisciplinary Course (MDC) @ 3 credits	Course Code	Credits Distribution			Total Credits	Workload			Total Workload	Marks				Total Marks
			L	T	P		L	T	P		Theory		Practical		
											Internal	External	Internal	External	
Statistics	Basic Statistics	**24STAX01MD01**	2	0	1	3	2	0	2	4	15	35	5	20	75
Statistics	Statistics in Everyday Life	**24STAX02MD01**	2	0	1	3	2	0	2	4	15	35	5	20	75
Statistics	Statistical Computing Using SPSS	**25STAX03MD01**	0	0	3	3	0	0	6	6	0	0	25	50	75

L: Lecture; T: Tutorial; P: Practical

Note:

A student has to opt for three Multidisciplinary Courses in first three semesters from the pool of the courses offered in the disciplines other than those of Major disciplines and Minor disciplines and the one not studied at 10+2 or equivalent level.

Syllabi for Single Major Programs for Multidisciplinary in Statistics

Semester: I

Session: 2024-25

Name of Program	B.Sc. (Statistics)	Program Code	USSTA4
Name of the Course	Basic Statistics	Course Code	24STAX01MD01
Hours per Week	02 Hours	Credits	02
Maximum Marks	50 {External (term-end exam) – 35} (Internal – 15)	Time of Examinations	03 Hours

Note:
The examiner will set nine questions in all into five sections A, B, C, D, and E of the question paper from all the four units - I, II, III and IV of the syllabus. The candidate must attempt five questions in all selecting at least one question from each section. The question given in section A is compulsory comprises 08 short answer type questions two from each unit (each of marks 01) and out of which the student will be required to attempt any 07 questions. In the remaining sections B, C, D and E there will be two questions of 07 marks each from all the four units.

Course Learning Outcomes (CLO):
CLO 1: Students acquainted with Knowledge of Statistics and It's Importance.
CLO 2: Students acquainted with Knowledge of Various Types of Data, Measures of Central Tendency and Dispersion
CLO 3: Students acquainted with Knowledge about the Graphical Presentation of Data.
CLO 4: Students acquainted with Knowledge about the Graphical Presentation of Data.
CLO 5: Students acquainted with Knowledge of the Concepts of Regression Analysis.

Unit 1: Statistics: Definition, Scope & Limitations, Concepts of Statistical Population and Sample. Data: Quantitative and Qualitative, Methods of Collection, Scales of Measurement: Nominal, Ordinal, Interval and Ratio.

Unit 2: Tabular and Graphical Representation of Data: Classification, Tabulation, Diagrammatic Representation using Bar Graph, Line Graph, Dot Plot, Pie Chart, Pareto Chart, Histogram, Frequency Polygon, Ogives, Stem and Leaf Plot, Box and Whisker Plot, and Scatter Plot.

Unit 3: Measures of Central Tendency: Mathematical and Positional, Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis.

Unit 4: Analysis and Consistency of Categorical Data, Independence and Association of Attributes, Bivariate Data: Definition, Scatter Diagram, Simple, Partial and Multiple Correlation (3 Variables Only), Rank Correlation; Simple Linear Regression

References:
1. Gupta, S.C. and Kapoor, V. K. (2020): Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Mukhopadhyay, P. (2020): Mathematical Statistics, Books and Allied Private Limited, Kolkata.
3. Kapoor, J.N. and Saxena, H.C. (2020): Mathematical Statistics, Sultan Chand & Sons, New Delhi.
4. Ross, S.M. (2017): Introductory Statistics, Academic Press, Elsevier.
5. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2016): Fundamental of Statistics, Vol. I, The World Press Private Limited, Kolkata.

Name of Program	B.Sc. (Statistics)	Program Code	USSTA4
Name of the Course	Practical(Basic Statistics)	Course Code	24STAX01MD01
Hours per Week	02 Hours	Credits	01
Maximum Marks	25 {External (term-end exam) – 20} (Internal – 5)	Time of Examinations	1½ Hours

Note:
There will be five questions in all, and the students must attempt any three questions. The question paper will set on the spot jointly by the internal and external examiners.
Distribution of Marks will be as follows:
Marks for Question Paper: 12
Marks for Practical Record Book: 05
Marks for Viva-Voce: 03
Total: 20

Course Learning Outcomes (CLO):
CLO 1: Students acquainted with Knowledge of Statistics and It's Importance.
CLO 2: Students acquainted with Knowledge of Various Types of Data, Measures of Central Tendency and Dispersion
CLO 3: Students acquainted with Knowledge about the Graphical Presentation of Data.
CLO 4: Students acquainted with Knowledge about the Graphical Presentation of Data.
CLO 5: Students acquainted with Knowledge of the Concepts of Regression Analysis.

List of Practicals:
1. Graphical Representation of Statistical Data.
2. Computation of Measures of Central Tendency and Dispersion. Use of an Appropriate Measure and Interpretation of Results.
3. Moments, Measures of Skewness and Kurtosis, Box Plot.
4. Consistency of Data up to Two Attributes. Concepts of Independence and Association of Two Attributes.
5. Yule's Coefficient of Association.
6. Bivariate Data: Scatter Diagram, Plotting and Interpretation.
7. Calculation of Product Moment Correlation Coefficient, Correlation Ratio, Rank Correlation.
8. Calculation of Regression Coefficients.
9. Perform Simple Linear Regression on a Dataset.
10. Calculation of Partial and Multiple Correlation Coefficients for Three Variables.

References:
1. Gupta, S.C. and Kapoor, V. K. (2020): Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Mukhopadhyay, P. (2020): Mathematical Statistics, Books and Allied Private Limited, Kolkata.
3. Kapoor, J.N. and Saxena, H.C. (2020): Mathematical Statistics, Sultan Chand & Sons, New Delhi
4. Ross, S.M. (2017): Introductory Statistics, Academic Press, Elsevier.
5. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2016): Fundamental of Statistics, Vol. I, The World Press Private Limited, Kolkata.
6. R. Vidya: Descriptive Statistics, NPTEL Swayam Portal
   (URL: https://onlinecourses.swayam2.ac.in/cec21_ma01/preview)

Name of Program	B.Sc. (Statistics)	Program Code	USSTA4
Name of the Course	Statistics in Everyday Life	Course Code	24STAX02MD01
Hours per Week	02 Hours	Credits	02
Maximum Marks	50 {External (term-end exam) – 35} (Internal – 15)	Time of Examinations	03 Hours

Note:
The examiner will set nine questions in all into five sections A, B, C, D, and E of the question paper from all the four units - I, II, III and IV of the syllabus. The candidate must attempt five questions in all selecting at least one question from each section. The question given in section A is compulsory comprises 08 short answer type questions two from each unit (each of marks 01) and out of which the student will be required to attempt any 07 questions. In the remaining sections B, C, D and E there will be two questions of 07 marks each from all the four units.

Course Learning Outcomes (CLO):
CLO 1: Students will achieve Knowledge of Various Types of Data.
CLO 2: Students will achieve Computational Skill for Identifying Random Variables and It's Applications
CLO 3: Students will achieve Knowledge about the Measures of Central Tendency and Dispersion.
CLO 4: Students will achieve The Skill to Use Probability Distributions in Everyday Life.
CLO 5: Students will achieve The Knowledge About the Techniques to Test the Hypothesis Based on Real Life Phenomena.

Unit 1: Data, Types of Data, Scales of Measurement, Random Variables: Discrete and Continuous Random Variables, Mathematical Expectations and Variance, Skewness and Kurtosis, Illustrations on Real Life Applications.

Unit 2: Discrete Probability Distributions: Bernoulli, Binomial, Poisson, Geometric, Negative Binomial, Hyper-Geometric Distributions with Their Applications in Everyday Life.

Unit 3: Continuous Probability Distributions: Uniform, Normal, Exponential, Rayleigh, Weibull, Laplace Distributions with Their Applications in Everyday Life.

Unit 4: Testing of Hypothesis: Concept of Hypothesis, Degrees of Freedom, Level of Significance, Critical Region, Types of Errors, One Sample Tests for Mean; Variance and Population Proportion, Paired t-test, Two Independent Sample Tests for Means; Variances and Proportions; Correlation Test and Chi-square Test.

References:
1. Agarwal, B.L. (2022): Basic Statistics, Seventh Edition, New Age Publication.
2. Miller, I. and Miller, M. (2014): Mathematical Statistics with Applications, Pearson Education Limited.
3. Mukhopadhyay, P. (2020): Mathematical Statistics, Books and Allied Private Limited, Kolkata.
4. Gupta, K.R. (2014): Statistics Volume – II, Atlantic Publisher, New Delhi.
5. Devore, J.L. (2012): Probability and Statistics for Engineering and the Sciences, Eight Edition, Brooks/Cole, Cengage Learning.

Name of Program	B.Sc. (Statistics)	Program Code	USSTA4
Name of the Course	Practical(Statistics in Everyday Life)	Course Code	24STAX02MD01
Hours per Week	02 Hours	Credits	01
Maximum Marks	25 {External (term-end exam) – 20} (Internal – 5)	Time of Examinations	1½ Hours

Note:
There will be five questions in all, and the students must attempt any three questions. The question paper will set on the spot jointly by the internal and external examiners.
Distribution of Marks will be as follows:
Marks for Question Paper: 12
Marks for Practical Record Book: 05
Marks for Viva-Voce: 03
Total: 20

Course Learning Outcomes (CLO):
CLO 1: Students will achieve Knowledge of Various Types of Data.
CLO 2: Students will achieve Computational Skill for Identifying Random Variables and It's Applications
CLO 3: Students will achieve Knowledge about the Measures of Central Tendency and Dispersion.
CLO 4: Students will achieve The Skill to Use Probability Distributions in Everyday Life.
CLO 5: Students will achieve The Knowledge About the Techniques to Test the Hypothesis Based on Real Life Phenomena.

List of Practicals:
1. Simulate Data for a Bernoulli Process (e.g., a series of coin flips) and Fit the Bernoulli Distribution to the Observed Data.
2. Collect or Simulate Data for a Scenario with a Fixed number of Trials and Two Possible Outcomes (e.g., number of successes in a series of tests) and Fit a Binomial Distribution to the Data.
3. Gather Data on the Number of Events Occurring in Fixed Intervals of Time or Space (e.g., number of emails received per hour) and Fit a Poisson Distribution to the Data.
4. Simulate Data for the Number of Trials Until the First Success (e.g., number of coin flips until getting heads) and Fit a Geometric Distribution to the Data.
5. Collect Data on the Number of Trials required to Achieve a Fixed Number of Successes (e.g., number of attempts needed to get a certain number of heads in coin flips) and Fit a Negative Binomial Distribution to the Data.
6. Simulate Data for a Scenario involving Sampling without Replacement (e.g., drawing cards from a deck) and Fit a Hypergeometric Distribution to the Data.
7. Generate Data for a Uniform Distribution over a Specified Range (e.g., random numbers between 0 and 1) and Fit the Uniform Distribution to the Data.
8. Collect Real-life Data (e.g., heights of individuals) and Fit a Normal Distribution to the Data. Assess the Fit using QQ Plots and Goodness-of-fit Tests.
9. Simulate or Gather Data on Time between Events (e.g., time between arrivals of customers) and Fit an Exponential Distribution to the Data.
10. Simulate Data for a Rayleigh Distribution (e.g., modeling wind speeds) and Fit the Rayleigh Distribution to the Data.
11. Collect Data related to Lifetimes of Products or Failure Times and Fit a Weibull Distribution to the Data.
12. Gather Data that might follow a Laplace Distribution (e.g., differences between observed and expected values) and Fit the Laplace Distribution to the Data.
13. Conduct a Large Sample z-test for a Single Mean
14. Conduct a Large Sample z-test for the Difference of Two Means.
15. Perform a Large Sample Test for a Single Proportion.
16. Conduct a Large Sample Test for the Difference of Two Proportions.
17. Conduct a t-test for a Single Mean.
18. Perform a t-test for the Difference of Means.
19. Conduct a Paired t-test.
20. Perform a χ^2-test for Goodness of Fit.
21. Conduct a χ^2-test for Independence of Attributes in a Contingency Table.
22. Perform an F-test for Equality of Variances between Two Samples.

References:

1. Gupta, S.C. and Kapoor, V. K. (2020): Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Mukhopadhyay, P. (2020): Mathematical Statistics, Books and Allied Private Limited, Kolkata.
3. Kapoor, J.N. and Saxena, H.C. (2020): Mathematical Statistics, Sultan Chand & Sons, New Delhi
4. Ross, S.M. (2017): Introductory Statistics, Academic Press, Elsevier.
5. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2016): Fundamental of Statistics, Vol. I, The World Press Private Limited, Kolkata.
6. R. Vidya: Descriptive Statistics, NPTEL Swayam Portal
   (URL: https://onlinecourses.swayam2.ac.in/cec21_ma01/preview)

Name of Program	B.Sc. (Statistics)	Program Code	USSTA4
Name of the Course	Statistical Computing Using SPSS	Course Code	25STAX03MD01
Hours per Week	03 Hours	Credits	03
Maximum Marks	75 {External (term-end exam) – 50} (Internal – 25)	Time of Examinations	03 Hours

Note:

There will be seven questions in all, and the students must attempt any five questions. The question paper will be set on the spot jointly by the internal and external examiners.

Distribution of Marks will be as follows:

Marks for Question Paper: 35
Marks for Practical Record Book: 10
Marks for Viva-Voce: 05
Total: 50

Course Learning Outcomes (CLO):

CLO 1: Students Acquired the Knowledge to Understand Presentation and Interpretation of the Data in SPSS
CLO 2: Students Acquired the Understanding of the Measures of Central Tendency and Dispersion, Correlation in SPSS
CLO 3: Students Acquired the Knowledge to Understand Fitting of Probability Distributions in SPSS
CLO 4: Students Acquired the Ability to apply Parametric and Non-Parametric Tests
CLO 5: Students Acquired the Skill to Perform Simple Linear Regression in SPSS

List of Practicals:

1. Presentation of the Data through Different Graphs
2. Compute the Measures of Central Tendency and Dispersion for a Dataset
3. Determine the Correlation Coefficient.
4. Determine the Spearman's Rank Correlation.
5. Check the Independence and Association of Attributes.
6. Check the Consistency of Categorical Data.
7. Perform Small Sample Tests
8. Perform Large Sample Tests
9. Find Confidence Interval to Estimate the Parameters.
10. Perform One-Way and Two-Way ANOVA
11. Find the Best Fitted Line using the Method of Curve Fitting.
12. Fit the Simple Linear Regression and Assess the Significance of Obtained Model.

References:

1. Mukhopadhyay, P. (2020): Mathematical Statistics, Books and Allied Private Limited, Kolkata.
2. Kapoor, J.N. and Saxena, H.C. (2020): Mathematical Statistics, Sultan Chand & Sons, New Delhi.
3. Cunningham, B.J. (2012): Using SPSS: An Interactive Hands-on approach.
4. Field, A. (2013): Discovering Statistics Using SPSS, Fourth Edition, SAGE.
5. Hogg, R.V., Tanis, E.A., & Zimmerman, D.L. (2019): Probability and Statistical Inference. Pearson