

Shyam Lal College, University of Delhi
Tentative Teaching Plan

Academic Year: 2024-25 Teacher

Name: Dr. Rahul Boadh

Course Name: B.Sc.(H)/B.Sc./B.A./B. Com

Paper Name: IT Skills and Data Analysis-I

Semester: Semester III/V (August 1, 2024 to November 28, 2024)

UPC:

Practical Classes

Week	Topic to be covered	Activity	Remarks (References/ Resources
Week 1 - 2	Students learn about the concept of datasets (Variables, Observations); Different type of Variables (Quantitative and Qualitative); Distinction between primary and secondary sources of data	Discussion and illustration	Reference I, Chapter 2
Week 3-4	Basic idea of using questionnaire and how to construct a it; Concept of frequency distribution - cumulative and relative frequencies; Introduction to spreadsheet	Discussion and illustration	Reference 2, Chapter 1 {Section 1.6}
Week 5 -6	Tabular and graphical presentation of data: data tables, frequency curve, histogram, bar graphs. pie charts. Students to explore various representations on spreadsheet using datasets	Discussion and illustration	Reference 2, Chapter 1, Chapter 2
Week 7-8	Introduction of Measures of Central Tendency: Mean, Median. Mode through appropriate examples explaining the use of each one of them in various situations. Understanding the concept of Weighted mean;	Discussion and illustration	Reference 2, Chapter 3

Week 9-10	Measures of dispersion: Range, Variance, Standard deviation; Visualizing the measures of central tendency and dispersion through frequency curve and histogram. Understanding Quartiles, deciles and percentiles numerically.	Discussion and illustration	Reference 2, Chapter 3
Week 11-12	Representation of population characteristics using the basic properties of a Normal Curve, skewness and kurtosis.	Discussion and illustration	Reference 2, Chapter 3, Chapter 5 [Section 5.6]
Week 13-14	Assignments based on Units I and 2 using spreadsheets to consolidate the learning of concepts covered.	Discussion and illustration	Reference 1 & Reference 2

Reference Book:

1. Rowntree, D., Statistics without tears - A primer for non-mathematicians, Allyn and Bacon, 2018.
2. Levin, Rubin, Rastogi and Siddiqui, Statistics for Management, 7th Edn, 2014

Suggested Data Sources

The following data sets are suggested to carry out the activities

1. <https://data.worldbank.org/>
2. <https://www.statista.com/>
3. <https://data.gov.in/>
4. <https://censusindia.gov.in/>
5. <https://www.kaggle.com/>
6. <http://data.un.org/>

Assessment Activity Schedule: The assessment will be conducted during the course, preferably after completion of each unit. Week 1 – 4, Week 5 – 9 and Week 10 – 14 contain three units of the syllabus. Besides tests/assignments, students are encouraged to give blackboard presentation or power point presentation on the topic of their choices covering the content of the syllabus and applications.

Signature of the Teacher

Name of the Teacher: Dr. Rahul Boadh

Designation: Assistant Professor in Mathematics

Paper Name: IT Skills and Data Analysis-II
Semester: Semester III/V (August 1, 2024 to November 28, 2024)

UPC:

Practical Classes

Week	Topic to be covered	Activity	Remarks (References/ Resources
Week 1 - 2	Understanding the definition of a function; graphical representation of a function and vertical line test; visualizing various kinds of functions (Linear, quadratic and cubic functions)	Discussion and illustration	Reference 3
Week 3-4	Reciprocal, exponential and logarithmic functions; Interpreting and visualising the concept of slope of a function through graphical representations.	Discussion and illustration	Reference 3
Week 5 -6	Scatter Diagrams; Correlation analysis - measure and Interpretation of correlation coefficient and coefficient of determination.	Discussion and illustration	Reference 2, Chapter 12
Week 7-9	Hypotheses, model specification and testing; Understanding Bi- variate Regression analysis: Method of Least Squares; Curve of best fit as a model for prediction.	Discussion and illustration	Reference 2, Chapter 12

Week 10-11	Multiple Regression Analysis	Discussion and illustration	Reference 2, Chapter 13
Week 12-14	Project Presentations and Viva		

Reference Book:

1. Rowntree, D., Statistics without tears - A primer for non-mathematicians, Allyn and Bacon, 2018.
2. Levin, Rubin, Rastogi and Siddiqui, Statistics for Management, 7th Edn, 2014
3. Boundless Algebra : <https://courses.lumenlearning.com/boundless-algebra/>

Suggested Data Sources

The following data sets are suggested to carry out the activities

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- b. <https://www.statista.com/>
- c. <https://data.gov.in/>
- d. <https://censusindia.gov.in/>
- e. <https://www.kaggle.com/>
- f. <http://data.un.org/>

Assessment Activity Schedule: The assessment will be conducted during the course, preferably after completion of each unit. Week 1 – 4, Week 5 – 9 and Week 10 – 14 contain three units of the syllabus. Besides tests/assignments, students are encouraged to give blackboard presentation or power point presentation on the topic of their choices covering the content of the syllabus and applications.

Signature of the Teacher

Name of the Teacher: Dr. Rahul Boadh

Designation: Assistant Professor in Mathematics

Course Name: B.Sc.(H)

Paper Name: Mathematical Statistical

Semester: Semester V (August 1, 2024 to November 28, 2024)

UPC:

Theory Classes

Week	Topic to be covered	Activity	Remarks (References/ Resources)
Week 1	Joint Distributed Random Variables: Joint probability mass function for two discrete random variables, Marginal probability mass function, Joint probability density function for two continuous random variables, Marginal probability density function, Independent random variables.	Discussion and illustration	Reference 1, Chapter 5 (Section 5.1 up to page 285).
Week 2	Expected values, covariance, and correlation	Discussion and illustration	Reference 1, Chapter 5 (Section 5.2)
Week 3	Linear combination of random variables and their moment generating functions	Discussion and illustration	Reference 1, Chapter 5 (Section 5.3)
Week 4	Conditional distributions and conditional expectation, Laws of total expectation and variance	Discussion and illustration	Reference 1, Chapter 5 (Section 5.4)
Week 5	Bivariate Normal Distribution.	Discussion and illustration	Reference 1, Chapter 5 (Section 5.5)
Week 6	Distribution of important statistics such as the sample totals, sample means, and sample proportions, Central limit theorem (statement with examples and applications), Law of large numbers.	Discussion and illustration	Reference 1, Chapter 6 (Section 6.1 [up to Example 6.3], and Section 6.2 [except Example 6.7]).
Week 7	Chi-squared, t , and F distributions; Distributions based on normal random samples	Discussion and illustration	Reference 1, Chapter 6 (Section 6.3 [Definitions only], and Section 6.4).
Week 8	Concepts and criteria for point estimation, The methods of moments and MLE	Discussion and illustration	Reference 1, Chapter 7 (Section 7.1 [up to the Definition, page 408], and Section 7.2 [up to page 423, except Example 7.20]).
Week 9-10	Assessing estimators: Accuracy and precision, Unbiased estimation, Consistency and sufficiency, The Neyman factorization theorem, Rao-Blackwell theorem, Fisher Information, The Cramér-Rao inequality (statement only), Efficiency	Discussion and illustration	Reference 1, Chapter 7 (Sections 7.3, and 7.4).
Week 11-12	Interval estimation and basic properties of confidence intervals, One-sample t confidence interval, Confidence intervals for a population proportion and population variance.	Discussion and illustration	Reference 1, Chapter 8 (Section 8.1 [up to Example 8.4], Section 8.2 [up to Example 8.9], Section 8.3 [up to Example 8.13], and Section 8.4 [up to Example

			8.16]).
Week 13-14	Statistical hypotheses and test procedures, One-sample tests about a population mean and a population proportion, P -values for tests; The simple linear regression model and its estimating parameters.	Discussion and illustration	Reference 1, Chapter 9 (Sections 9.1, 9.2 [up to page 519], 9.3, and 9.4). Chapter 12 (Sections 12.1, and 12.2).
Week 15	Chi-squared goodness-of-fit tests, Two-way contingency tables.	Discussion and illustration	Reference 1, Chapter 13 (Section 13.1 [up to Example 13.4], and Section 13.2 [up to Example 13.11])

Reference Book:

1. Devore, Jay L., Berk, Kenneth N. & Carlton Matthew A. (2021). Modern Mathematical Statistics with Applications. (3rd ed.). Springer

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Signature of the Teacher

Name of the Teacher: Dr. Rahul Boadh

Designation: Assistant Professor in Mathematics

Course Name: B.Sc.(H)

Paper Name: Group Theory

Semester: Semester III (August 1, 2024 to November 28, 2024)

UPC:

Theory Classes

Week	Topic to be covered	Activity	Remarks (References/ Resources
Week 1-2	Permutation groups and group of symmetries, Cycle notation for permutations and properties, Even and odd permutations, Alternating groups	Discussion and illustration	Reference 1, Chapter 5 (up to Theorem 5.7, page 104).
Week 3-4	Cosets and its properties, Lagrange's theorem and consequences including Fermat's Little theorem, Number of elements in product of two finite subgroups	Discussion and illustration	Reference 1, Chapter 7 (up to Example 6, page 144).
Week 5-6	Normal subgroups, Factor groups, Cauchy's theorem for finite Abelian groups.	Discussion and illustration	Reference 1, Chapter 9 (Theorems 9.1, 9.2, 9.3 and 9.5, and Examples 1 to 12).
Week 7-8	Group homomorphisms, isomorphisms and properties, Cayley's theorem.	Discussion and illustration	Reference 1, Chapter 10 (Theorems 10.1 and 10.2, Examples 1 to 11). Chapter 6 (Theorems 6.1, 6.2, 6.3, and Examples 1 to 10).
Week 9	First, Second and Third isomorphism theorems for groups.	Discussion and illustration	Reference 1, Chapter 10 (Theorems 10.3, 10.4, Examples 12 to 15, and Exercises 41 and 42, page 208 for second and third isomorphism theorems for groups).
Week 10-11	Automorphism, Inner automorphism, Automorphism groups, Automorphism groups of cyclic groups, Applications of factor groups to automorphism groups.	Discussion and illustration	Reference 1, Chapter 6 (Page 128 to 132). Chapter 9 (Theorem 9.4, and Example 16).
Week 12-13	External direct products of groups and its properties, The group of units modulo n as an external direct product, Applications to data security and electric circuits.	Discussion and illustration	Reference 1, Chapter 8.

Week 14-15	Internal direct products; Fundamental theorem of finite Abelian groups and its isomorphism classes.	Discussion and illustration	Ref. 1, Chapter 9 (Section on internal direct products, pages 183-187). Chapter 11 (Outline of the proof of Fundamental theorem of finite Abelian groups, and its application to determine the isomorphism classes of Abelian groups).
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Reference Book:

1. Gallian, Joseph. A. (2017). Contemporary Abstract Algebra (9th ed.). Cengage Learning India Private Limited, Delhi. Indian Reprint 2021.

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Signature of the Teacher

Name of the Teacher: Dr. Rahul Boadh

Designation: Assistant Professor in Mathematics