

Semester	SIX
Course	Major
Paper Code	C3ST230641P
Paper Title	Data Analysis - II
No. of Credits	4
Theory / Practical /Composite	Practical
Classes per week	Unit 1: 2 periods/week Unit 2: 2 periods/week Unit 3: 2 periods/week
Module	1

### Course Outcomes

<b>1. Remember</b> fundamental concepts and terminology of survey sampling, design of experiments, multivariate distributions, asymptotic theory, time series analysis, and non-parametric methods.
<b>2. Understand</b> the theoretical foundations of SRS, stratified sampling, experimental designs, multivariate probability distributions, CLT-based inference, and non-parametric tests.
<b>3. Apply</b> appropriate statistical techniques to analyze sampling data, experimental data, multivariate data, time series, and large-sample and non-parametric problems.
<b>4. Analysis</b> of data using ANOVA for experimental designs, efficiency comparisons in sampling, trend and seasonal components in time series, and dependence structures using ACF and PACF.
<b>5 Evaluate</b> the suitability and effectiveness of sampling methods, experimental designs, asymptotic approximations, and non-parametric tests for real-world statistical problems.
<b>6. Create</b> statistical models, simulations, and interpretations for multivariate distributions, factorial experiments, time series transformations, and inferential procedures.

### Syllabus

Content	No. of lectures	CO mapping	Cognitive levels
<b><u>UNIT 1: Multivariate Probability Distributions &amp; Introduction to Asymptotic Theory</u></b>  1. Applications of Multinomial & Multivariate Normal Distribution. 2. Drawing sample from multivariate normal distribution and simulating the sampling distributions of mean vector and variance- covariance matrix. 3. Test of significance and confidence intervals for single proportion and difference of two proportions, single Poisson mean and difference of two Poisson means, using CLT. 4. Determination of the minimum sample size required to achieve normality by sample proportion and sample mean.	26	CO1 CO2 CO3 CO5 CO6	K1 K2 K3 K5 K6
<b><u>UNIT 2: Time Series Analysis &amp; Non-Parametric</u></b>			

<p><b><u>Methods</u></b></p> <ol style="list-style-type: none"> <li>1. Determination of trend by curve fitting &amp; moving averages.</li> <li>2. Determination of seasonal indices by method of averages.</li> <li>3. Conversion of an evolutive series to a stationary series, Interpretation of a.c.f and p.a.c.f plots.</li> <li>4. Test for randomness based on total number of runs.</li> <li>5. Kolmogorov-Smirnov test for goodness-of-fit.</li> <li>6. Test for location using Sign test, Wilcoxon signed. rank test, Wilcoxon rank sum test and Mann-Whitney U-test.</li> <li>7. Test for scale using Mood test, Ansari-Bradley test and Seigel-Tukey test .</li> <li>8. Application of Kruskal-Wallis test.</li> </ol>	26	CO1 CO2 CO3 CO4 CO5 CO6	K1 K2 K3 K4 K5 K6
<p><b><u>UNIT 3: Introduction to Survey Sampling &amp; Design of Experiments</u></b></p> <ol style="list-style-type: none"> <li>1. Selection of SRS with and without replacement estimation of Mean, standard error.</li> <li>2. Stratified random Sampling: allocation of sample to strata by proportional and Neyman's methods. Compare the efficiencies of above two methods relative to SRS.</li> <li>3. Gain in precision in stratified sampling.</li> <li>4. Analysis of CRD, RBD, LSD.</li> <li>5. Analysis of RBD and LSD with one missing observation.</li> <li>6. Analysis of <math>2^2</math> and <math>2^3</math> factorial experiments in CRD, RBD and LSD.</li> <li>7. Analysis of a completely and partially confounded two level factorial design in 2 and 4 blocks.</li> </ol>	26	CO1 CO2 CO3 CO4 CO5 CO6	K1 K2 K3 K4 K5 K6

**Reading/Reference list**

Same as the relevant theory papers

**Evaluation**

<b>Total Marks</b>	100
<b>Mode of Exam</b>	Continuous Assessment

<b>CO</b>	<b>CO Description</b>	<b>Cognitive levels</b>
<b>CO1</b>	<b>Remember</b> fundamental concepts and terminology of survey sampling, design of experiments, multivariate distributions, asymptotic theory, time series analysis, and non-parametric methods.	K1
<b>CO2</b>	<b>Understand</b> the theoretical foundations of SRS, stratified sampling, experimental designs, multivariate probability distributions, CLT-based inference, and non-parametric tests.	K2
<b>CO3</b>	<b>Apply</b> appropriate statistical techniques to analyze sampling data, experimental data, multivariate data, time series, and large-sample and non-parametric problems.	K3
<b>CO4</b>	<b>Analysis</b> of data using ANOVA for experimental designs, efficiency comparisons in sampling, trend and seasonal components in time series, and dependence structures using ACF and PACF.	K4
<b>CO5</b>	<b>Evaluate</b> the suitability and effectiveness of sampling methods, experimental designs, asymptotic approximations, and non-parametric tests for real-world statistical problems.	K5
<b>CO6</b>	<b>Create</b> statistical models, simulations, and interpretations for multivariate distributions, factorial experiments, time series transformations, and inferential procedures.	K6