Annual Teaching Plan

Academic year 2022-2023 | B.Sc-I | Semester I | Department -Statistics

Subject - Statistics | Course -DSC-1004A

Section I- Descriptive Statistics I

Name of teacher – Patil P.C.

Month: August			Module/Unit	Sub-units planned
Lectures 08	Practicals –	Total 08	Unit-1 Introduction to Statistics & Measures of Central Tendency	1. Meaning of primary and secondary data, 2. Basis concept of population and sampling methods. 3. Concept of central tendency.
Month: September				
Lectures 09	Practicals –	Total 09	Unit -1 Measures of Central Tendency	1. A.M., G.M., H.M., and its properties 2. Partition values: Quartile, deciles and percentiles. 3. Comparison between averages
			Unit-2 Measures of Dispersion	1. Concept of dispersion, 2. Absolute and relative measure of dispersion.
Month: October				
Lectures 09	Practicals –	Total 09	Unit-2 Measures of Dispersion	1. Definition of variance and standard deviation with its properties 2. Coefficient of variation
			Unit-3 Moments, Skewness & Kurtosis	1. Moments: Raw and central moments. 2. Relation between raw and central moments. 3. Skewness and kurtosis (concept and types).
Month: November-December				
Lectures 12	Practicals –	Total 12	Unit-4 Theory of Attributes	1. Concept of attributes and some definitions 2. Concept of Consistency 3. Concept of Independence and Association of two attributes. 4. Definition and interpretation of Yule's coefficient of association (Q) and Coefficient of colligation (Y). 5. Relation between Q and Y. Examples

P.C.Patil

Name & signature of teacher

Patil P.C

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Annual Teaching Plan

Academic year 2022-2023 B.Sc-I Semester I Department -Statistics

Subject - Statistics Course -DSC-1004A

Section II- Elementary Probability Theory

Name of teacher - Pawar V. V.

Month: August			Module/Unit	Sub-units planned
Lectures	Practicals	Total	Unit-1 Sample space and Events	1. Deterministic and non-deterministic experiments 2. Definitions: Sample space, Event, Types of events 3. Algebra of events
11	–	11		
Month: September				
Lectures	Practicals	Total	Unit -1 Sample space and Events	1. Definition of Power set. 2. Symbolic representation of given events and Illustrative examples.
12	–	12	Unit-2 Probability	1. Apriori definition of probability, Probability model 2. Axiomatic definition of probability 3. Illustrative examples
Month: October				
Lectures	Practicals	Total	Unit-2 Probability	1. Some theorems on probability 2. Definition of probability in terms of odd ratio.
10	–	10	Unit-3 Conditional Probability& Independence of events	1. Definition of conditional probability, Multiplication theorem of probability 2. Baye's theorem, examples on conditional probability and Baye's theorem. 3. Independence of two events, Pairwise and Mutual Independence for three events. Elementary examples.
Month: November-December				
Lectures	Practicals	Total	Unit-4 Univariate Probability Distributions (finite sample space):	1. Discrete random variable, p.m.f. and c.d.f. 2. Properties of c.d.f. 3. Probability distribution of function of random variable. 4. Median and Mode
19	–	19		

Name & signature of teacher

Pawar V.V

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Annual Teaching Plan

Academic year 2022-2023 B.Sc-I, III Semester I, V Department -Statistics

Subject - Statistics Course -DSC-1004A

Title - **Practical Paper I, V**

Name of teacher – Dr. Kumbhar R. R.

Month: August			Module/Unit	Sub-units planned
Lectures	Practicals	Total		
–	16+10	26	Practical I Practical II	Graphical representation of frequency distribution Measures of central tendency I
Month: September				
–	20+20	40	Practical III Practical IV	Measures of central tendency II Measures of dispersion I
Month: October				
–	16+25	41	Practical V Practical VI Practical VII	Measures of dispersion II Moment, Skewness & Kurtosis I Moment, Skewness & Kurtosis II
Month: November-December				
–	28+30	58	Practical VIII Practical IX	Practical VIII Practical IX

Name & signature of teacher

Dr. R. R. Kumbhar

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Annual Teaching Plan

Academic year 2022-2023 B.Sc-I, II Semester I, III Department -Statistics

Subject - Statistics Course -DSC-1004A

Title - **Practical Paper I**

Name of teacher – Kumbhar S. K.

Month: August			Module/Unit	Sub-units planned
Lectures -	Practicals 32+8	Total 40	Practical I Practical II	Graphical representation of frequency distribution Measures of central tendency I
Month: September				
–	32+20	40	Practical III Practical IV	Measures of central tendency II Measures of dispersion I
Month: October				
–	36+16	52	Practical V Practical VI Practical VII	Measures of dispersion II Moment, Skewness & Kurtosis I Moment, Skewness & Kurtosis II
Month: November-December				
–	56+28	84	Practical VIII Practical IX	Practical VIII Practical IX

Name & signature of teacher

Kumbhar S.K

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-II Semester III Department -Statistics

Subject - Statistics Course -DSC-1004C

Section I- Probability Distributions I

Name of teacher – Patil P.C.

Month: August			Module/Unit	Sub-units planned
Lectures 12	Practicals 16	Total 28	Unit-1 Continuous Univariate Distributions	1. Definition of the continuous sample space, 2. Continuous random variable (r.v.), p.d.f, c.d.f. and its properties 3. Expectation of r.v., expectation of function of r.v., mean, median, mode, quartiles, variance, harmonic mean, raw and central moments, skewness and kurtosis.
Month: September				
Lectures 14	Practicals 16	Total 30	Unit -1 Continuous Univariate Distributions	1. Transformations of univariate continuous random variable and continuous bivariate random variables 2. Methods of transformation
			Unit-2 Continuous Bivariate Distributions	1. Definition of bivariate continuous random variable , p.d.f, c.d.f., 2. Conditional distribution and independence of random variables. 3. Expectation of function of r.v.s, covariance, correlation coefficient, conditional expectation.
Month: October				
Lectures 10	Practicals 16	Total 26	Unit-2 Continuous Bivariate Distributions	1. Transformation of continuous bivariate random variables 2. Distribution of bivariate random variables using Jacobin of transformation. 3. Examples and problems.
			Unit-3 Uniform and Exponential Distribution	1. Uniform distribution 2. Exponential distribution
Month: November-December				
Lectures 17	Practicals 24	Total 41	Unit-4 Normal Distribution	1. Normal distribution with parameters μ & σ^2. Standard normal distribution 2. Properties of Normal distribution 3. Numerical examples

P.C.Patil

Name & signature of teacher

Patil ·P·C

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-II Semester III Department -Statistics

Subject - Statistics Course -DSC-1004C

Section II - Statistical Methods I

Name of teacher – Bhosale A. B.

Month: August			Module/Unit	Sub-units planned
Lectures 11	Practicals 16	Total 27	Unit-1 Multiple linear Regression, Multiple and Partial Correlation (for trivariate data only)	1. Concept of multiple linear regressions. 2. Fitting of regression plane
Month: September				
Lectures 12	Practicals 20	Total 32	Unit-1 Multiple linear Regression, Multiple and Partial Correlation (for trivariate data only)	1. Multiple and partial correlation coefficients and its properties 2. Examples
			Unit- 1 Multiple linear Regression, Multiple and Partial Correlation (for trivariate data only)	1. Properties of multiple correlation coefficient 2. properties of partial correlation coefficient and examples.
Month: October				
Lectures 13	Practicals 08	Total 21	Unit-2 Index Number & Official Statistics	1. Meaning and utility of index numbers. 2. Types of index numbers. 3. Laspeyre's, Paasche's and Fisher's index numbers 4. Tests of index numbers. 5. Cost of living index number
Month: November-December				
Lectures 18	Practicals 32	Total 50	Unit-2 Index Number & Official Statistics	1. National and International official statistical system 2. National Statistical Organization

Name & signature of teacher

Bhosale A. B.

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-III Semester V Department -Statistics

Subject - Statistics Course – DSE-1004E1

Section-I: Probability Distributions I

Name of teacher – Makandar A. M.

Month: August			Module/Unit	Sub-units planned
Lectures 11	Practicals 20	Total 31	Unit-1 Univariate Continuous Probability Distributions	1. Laplace (Double Exponential) Distribution 2. Lognormal Distribution 3. Cauchy Distribution
Month: September				
Lectures 12	Practicals 25	Total 37	Unit -1 Univariate Continuous Probability Distributions	1. Weibull Distribution 2. Relation of Weibull distribution with gamma and exponential distribution, 3. Examples and problems.
			Unit-2 Univariate and Multivariate Probability Distributions	1. Logistic distribution 2. Pareto distribution 3. Power series distribution and particular cases
Month: October				
Lectures 13	Practicals 20	Total 33	Unit-2 Univariate and Multivariate Probability Distributions	1. Multinomial distribution 2. Trinomial distribution as particular case of multinomial distribution.
			Unit-3 Truncated Distributions	1. Truncated distribution as conditional distribution, truncation to the right, left and on both sides. 2. Truncated binomial distribution 3. Truncated Poisson distribution P(m) 4. Truncated normal distribution $N(\mu, \sigma^2)$
Month: November-December				
Lectures 18	Practicals 35	Total 53	Unit-4 Bivariate Normal Distribution	1. p. d. f. of a bivariate normal distribution, 2. Marginal and conditional distributions 3. Conditional expectation and conditional variance

Name & signature of teacher

Makandar A.M

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Academic year 2022 -2023 B.Sc-III Semester V Department -Statistics

Subject - Statistics Course – DSE-1004E1

Section-II: Probability Theory

Name of teacher – Bhosale A. B.

Month: August			Module/Unit	Sub-units planned
Lectures 12	Practicals 40	Total 52	Unit-1 Order Statistics	1. Order statistics: definition, derivation of distribution function and density function of the ith order statistic. 2. Derivation of joint p. d. f. of i -th and j-th order statistics
Month: September				
Lectures 13	Practicals 40	Total 53	Unit-1 Order Statistics	1. Distribution of the sample range and sample median when n is odd. 2. Examples and Problems.
			Unit-2 Convergence and Limit Theorem	1. Convergence: Definition and modes of convergence 2. WLLN i. i. d. random variables
Month: October				
Lectures 11	Practicals 30	Total 41	Unit-2 Convergence and Limit Theorem	1. Central Limit Theorem: Statement and proof 2. Simple examples based on Bernoulli, binomial, Poisson and chi-square distribution.
			Unit-3 Finite Markov Chains	1. Definition, examples and classification of stochastic process 2. Markov chain: Definition and examples of Markov chain, 3. Classification of states, simple problems. 4. Stationary probability distribution, applications. 5. Continuous Markov chain: Pure birth process, Poisson process, birth and death process.
Month: November-December				
Lectures 13	Practicals 60	Total 73	Unit-4 Queuing Theory	1. Basic concepts in queuing theory 2. Distribution of arrival, inter arrival time, departure and service time. 3. Types of queuing models.

Name & signature of teacher

(Bhosale A.B.)

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-III Semester V Department -Statistics

Subject - Statistics Course – DSE-1004E2

Section-I: Sampling Theory

Name of teacher – Patil P.C.

Month: August			Module/Unit	Sub-units planned
Lectures 11	Practicals 40	Total 51	Unit-1 Basic Terminology and Simple Random Sampling	1. Basic Terminology 2. Simple random sampling, SRSWR, SRSWOR 3. SRS for attributes 4. Determination of the sample size
Month: September				
Lectures 14	Practicals 45	Total 59	Unit-2 Stratified Sampling	1. Stratified random sampling 2. Determination of the sample size under proportional and Neyman allocation 3. Comparison amongst SRSWOR, stratification with proportional allocation and stratification with optimum allocation.
Month: October				
Lectures 12	Practicals 30	Total 42	Unit-3 Other Sampling Methods	1. Systematic Sampling: Real life situations, technique of drawing a sample 2. Comparison of SRS, stratified and systematic sampling when population is in linear trend 3. Circular Systematic Sampling. 4. Cluster Sampling, Two Stage and Multi Stage Sampling, 5. Systematic sampling as a particular case of cluster sampling. 6. Comparison of cluster sampling and SRSWOR
Month: November-December				
Lectures 12	Practicals 60	Total 72	Unit-4 Sampling Methods using Auxiliary variables	1. Ratio Method: Concept of auxiliary variable and its use in estimation 2. Situations where Ratio method is appropriate. 3. Relative efficiency of ratio estimators with that of SRSWOR 4. Regression Method: Situations where is appropriate. 5. Relative efficiency of regression estimators over SRSWOR

P.C.Patil

Name & signature of teacher

Patil P.C

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Academic year 2022 -2023 B.Sc-III Semester V Department -Statistics

Subject - Statistics Course – DSE-1004E2

Section-II: Operations Research

Name of teacher – Pawar V. V.

Month: August			Module/Unit	Sub-units planned
Lectures 12	Practicals 40	Total 52	Unit-1Linear programming	1. Concept and formulation of problem as LPP 2. Some definitions 3. Solution of L.P.P.: I. Graphical Method, II. Simplex Method III. Big-M method
Month: September				
Lectures 13	Practicals 45	Total 58	Unit-1Linear programming	1. Duality Theory 2. Examples and problems.
			Unit-2 Transportation and Assignment Problems	1. Transportation problem (T.P.), some definitions 2. Methods of obtaining IBFS of Transportation problem (T. P.) 3. NWCR, Matrix minima and VAM 4. MODI Method for optimal solution
Month: October				
Lectures 11	Practicals 45	Total 56	Unit-2 Transportation and Assignment Problems	1. Assignment Problem(A.P.) 2. A.P. as a particular case of T.P. 3. Hungerian method to solve(A.P.) 4. Sequencing Problem: Some definitions 5. Procedure of processing n jobs on (a) two machines, (b)three machines and (c) m machines.
			Unit-3 Decision Theory	1. Basic concept and some definitions 2. Type of decision making environments. 3. Decision making under uncertainty 4. Decision making under risk
Month: November-December				
Lectures 13	Practicals 60	Total 73	Unit-4 Simulation Techniques	1. Meaning of simulation, 2. Methods of generating random numbers 3. Techniques of generating random numbers for discrete and continuous distributions

Name & signature of teacher

Pawar V.V

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Annual Teaching Plan

Academic year 2022 -2023 B.Com-II Semester III Department -Statistics

Subject - Statistics Course - CC - 1051 C

Section I- Business Statistics I **& B.Sc. I Practical's**

Name of teacher – Makandar A. M.

Month: August			Module/Unit	Sub-units planned
Lectures 27	Practicals 16	Total 43	Unit-1 Introduction to Statistics &Sampling Techniques	1. Meaning and scope of statistics 2. Graphical representation, types of data. 3. Sampling Techniques
Month: September				
Lectures 36	Practicals 20	Total 56	Unit-2 Measures of Central Tendency	1. Concept of central tendency, Mean median and mode, 2. Partition values 3. Empirical relation 4. Examples
Month: October				
Lectures 34	Practicals 16	Total 50	Unit-3 Measures of Dispersion	1. Concept of dispersion and its types 2. Coefficient of variation 3. Examples.
			Unit-4 Analysis of Bivariate Data	1. Correlation: Definition, Types of correlation 2. Methods of studying correlation 3. Illustrative examples.
Month: November-December				
Lectures 51	Practicals 28	Total 79	Unit-4 Analysis of Bivariate Data	1. Concept of regression 2. Lines of regression 3. Regression coefficients and its Properties 4. Illustrative Examples.

Name & signature of teacher

A. M. Makandar

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Annual Teaching Plan

Academic year 2022 -2023 B.Com-II Semester III Department -Statistics

Subject - Statistics Course - CC - 1051 C

Paper I- Business Statistics I & **B.Sc. I Practical's**

Name of teacher – Pawar A. A.

Month: August			Module/Unit	Sub-units planned
Lectures 19	Practicals 16	Total 35	Unit-1 Introduction to Statistics &Sampling Techniques	4. Meaning and scope of statistics 5. Graphical representation, types of data. 6. Sampling Techniques
Month: September				
Lectures 16	Practicals 20	Total 36	Unit-2 Measures of Central Tendency	5. Concept of central tendency, Mean median and mode, 6. Partition values 7. Empirical relation 8. Examples
Month: October				
Lectures 17	Practicals 16	Total 33	Unit-3 Measures of Dispersion	4. Concept of dispersion and its types 5. Coefficient of variation 6. Examples.
			Unit-4 Analysis of Bivariate Data	4. Correlation: Definition, Types of correlation 5. Methods of studying correlation 6. Illustrative examples.
Month: November-December				
Lectures 28	Practicals 28	Total 56	Unit-4 Analysis of Bivariate Data	5. Concept of regression 6. Lines of regression 7. Regression coefficients and its properties 8. Illustrative Examples.

Pawar A-A

Name & signature of teacher

Pawar Ajit A.

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-I Semester II Department -Statistics

Subject - Statistics Course -DSC-1004B

Section I- Descriptive Statistics II

Name of teacher – Patil P.C.

Month: January-February			Module/Unit	Sub-units planned
Lectures 15	Practicals -	Total 15	Unit-1 Correlation	1. Bivariate Random variable 2. Correlation, Types of correlation. 3. Scatter diagram, its utility. 4. Karl Pearson's coefficient of correlation 5. Spearman's rank correlation coefficient
Month: March				
Lectures 09	Practicals -	Total 09	Unit -2 Regression	1. Concept of regression 2. Equations of regression lines 3. Regression coefficients and its properties.
			Unit-3 Multiple Linear Regression & Multiple and Partial Correlation	1. Concept of multiple linear regressions. 2. Fitting of regression plane
Month: April				
Lectures 06	Practicals -	Total 06	Unit-3 Multiple and Partial Correlation	1. Multiple and partial correlation coefficients and its properties 2. Examples
Month: May-June				
Lectures 16	Practicals -	Total 16	Unit-4 Time Series	1. Meaning ,need and utility 2. components of time series 3. Methods of measurement of trend 4. Measurement of seasonal indices

P.C. Patil

Name & signature of teacher

Patil P.C

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-I Semester II Department -Statistics

Subject - Statistics Course -DSC-1004B

Section II- Discrete Probability Distributions

Name of teacher - Pawar V. V.

Month: January-February			Module/Unit	Sub-units planned
Lectures 22	Practicals –	Total 22	Unit-1 Some Standard Discrete Probability Distributions- I	1. One point and two point distributions 2. Bernoulli Distribution 3. Discrete Uniform Distribution
Month: March				
Lectures 11	Practicals –	Total 11	Unit -2 Some Standard Discrete Probability Distributions- II	1. Binomial Distribution 2. Hyper geometric Distribution. 3. Binomial approximation to Hypergeometric distribution
			Unit-3 Discrete Distributions: Poisson, Geometric and Negative Binomial Distribution	1. Poisson Distribution 2. Poisson distribution as a limiting case of Binomial distribution, 3. Examples.
Month: April				
Lectures 11	Practicals –	Total 11	Unit-3 Discrete Distributions: Poisson, Geometric and Negative Binomial Distribution	1. Geometric Distribution: 2. Negative Binomial Distribution
Month: May-June				
Lectures 20	Practicals –	Total 20	Unit-4 Bivariate Discrete Probability Distributions	1. Definition of bivariate discrete random variable ,p.m.f., and c.d.f., 2. Properties of c.d.f. 3. Mathematical Expectation: Definition and it. 4. Conditional mean and variance, covariance and correlation coefficient.

Name & signature of teacher

Pawar V.V

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Annual Teaching Plan

Academic year 2022-2023 B.Sc-I, III Semester II, VI Department -Statistics

Subject - Statistics Course -DSC-1004A

Title - **Practical Paper I**

Name of teacher – Dr. Kumbhar R. R.

Month: January-Feb			Module/Unit	Sub-units planned
Lectures	Practicals	Total		
–	24+25	49	Practical X	Correlation coefficient & Rank correlation coefficient
			Practical XI	Regression (Ungrouped data)
			Practical XII	Correlation coefficient & Regression (Grouped data)
Month: March				
–	16+20	36	Practical XIII	Demography I
			Practical XIV	Demography II
Month: April				
–	16+20	36	Practical XV	Time series analysis
			Practical XVI	Bivariate discrete distributions I
			Practical XVII	Bivariate discrete distributions II
Month: May-June				
–	28+35	63	Practical XVIII	Application of binomial & Hypergeometric Distribution
			Practical XIX	Fitting of binomial & Hypergeometric distribution
			Practical XX	Fitting & Application of Poisson, geometric & Negative binomial distribution

Name & signature of teacher

Dr. R. R. Kumbhar

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Annual Teaching Plan

Academic year 2022-2023 B.Sc-I, II Semester II, IV Department -Statistics

Subject - Statistics Course -DSC-1004A

Title - **Practical Paper I**

Name of teacher – Kumbhar S. K.

Month: January-Feb			Module/Unit	Sub-units planned
Lectures	Practicals	Total	Practical X	Correlation coefficient & Rank correlation coefficient
-	28+20	48	Practical XI	Regression (Ungrouped data)
			Practical XII	Correlation coefficient & Regression (Grouped data)
Month: March				
-	32+16	48	Practical XIII	Demography I
			Practical XIV	Demography II
Month: April				
-	32+16	48	Practical XV	Time series analysis
			Practical XVI	Bivariate discrete distributions I
			Practical XVII	Bivariate discrete distributions II
Month: May-June				
-	52+28	80	Practical XVIII	Application of binomial & Hypergeometric Distribution
			Practical XIX	Fitting of binomial & Hypergeometric distribution
			Practical XX	Fitting & Application of Poisson, geometric & Negative binomial distribution

Name & signature of teacher

Kumbhar S.K

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-II Semester IV Department -Statistics

Subject - Statistics Course -DSC-1004D

Section I- Probability Distributions II

Name of teacher – Patil P. C.

Month: January-February			Module/Unit	Sub-units planned
Lectures 19	Practicals 16	Total 35	Unit-1 Gamma, Beta and Exact Sampling Distributions	1. Gamma distribution 2. Beta distribution of 1st kind
Month: March				
Lectures 13	Practicals 16	Total 29	Unit- 1 Gamma, Beta and Exact Sampling Distributions	1. Beta distribution of 1st kind
			Unit-1 Gamma, Beta and Exact Sampling Distributions	1. Chi-Square distribution 2. Student's t- distribution
Month: April				
Lectures 10	Practicals 16	Total 26	Unit-1 Gamma, Beta and Exact Sampling Distributions	1. Snedecor's F distribution. 2. Inter relation between t, F and χ^2
			Unit-2 Introduction to R	1. Creating, listing and deleting the objects 2. Arithmetic and simple functions
Month: May-June				
Lectures 19	Practicals 32	Total 51	Unit-2 Introduction to R	1. Import and export data. 2. Exploratory data analysis

P C Patil

Name & signature of teacher

Patil · P · C

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-II Semester IV Department -Statistics

Subject - Statistics Course -DSC-1004D

Section II - Introduction to Reliability Theory & Testing of Hypothesis

Name of teacher – Bhosale A. B.

Month: January-February			Module/Unit	Sub-units planned
Lectures 20	Practicals 16	Total 36	Unit-1 Reliability Theory I	1. Binary Systems 2. Reliability of binary System
Month: March				
Lectures 11	Practicals 16	Total 27	Unit-2 Reliability Theory II	1. Ageing Properties 2. Relationship between survival function and hazard function, density function and hazard rate 3. Hazard rate of a series system
Month: April				
Lectures 11	Practicals 16	Total 27	Unit-3 Testing of Hypothesis I	1. Definitions: Population, sample, hypothesis and types of hypothesis, One and two tailed test 2. Type I and type II errors, level of significance, p-value, Critical region, power of test. 3. Large Sample Tests.
Month: May-June				
Lectures 20	Practicals 24	Total 44	Unit-4 Testing of Hypothesis II	1. Exact/Small sample tests (based on t, chi-square and F distribution)

Name & signature of teacher

(Bhosale A.B)

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-III Semester VI Department -Statistics

Subject - Statistics Course – DSE-1004F1

Section-I: Statistical Inference - I

Name of teacher – Makandar A. M.

Month: January-February			Module/Unit	Sub-units planned
Lectures 21	Practicals 20	Total 41	Unit-1 Point Estimation	1. Concept and definition of Point estimation 2. Definition of an estimator (statistic) & its S.E., 3. Properties of estimator 4. Unbiased estimators and results regarding unbiased estimators
Month: March				
Lectures 11	Practicals 25	Total 36	Unit-1 Point Estimation	1. Relative efficiency 2. Minimum Variance Unbiased Estimator and Uniformly Minimum Variance Unbiased Estimator 3. Consistency
			Unit-2 Likelihood and Sufficiency	1. Definition of likelihood function 2. Sufficiency 3. Pitman Koopman form and sufficient statistic
Month: April				
Lectures	Practicals	Total	Unit-2 Likelihood and Sufficiency	1. Fisher information function 2. Concept of minimal sufficient statistic 3. Illustrative examples.
11	35	46	Unit-3 Cramer's Rao Inequality	1. Cramer Rao inequality. 2. Minimum Variance Bound Unbiased Estimator (MVBUE) of $\phi(\theta)$. 3. Some results related to MVBUE
Month: May-June				
Lectures 20	Practicals 40	Total 60	Unit-4 Method of Estimation	1. Method of maximum likelihood 2. Invariance property of MLE, relation between MLE and sufficient statistic. 3. Method of moments 4. Method of minimum chi-square

Name & signature of teacher

Makandar A.M

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Annual Teaching Plan

Academic year 2022 -2023 B.Sc-III Semester VI Department -Statistics

Subject - Statistics Course – DSE-1004F1

Section-II: Statistical Inference II

Name of teacher – Bhosale A. B.

Month: January-February			Module/Unit	Sub-units planned
Lectures 19	Practicals 40	Total 59	Unit-1 Interval Estimation	1. Notion of interval estimation and some definitions 2. Pivotal quantity and its use in obtaining confidence intervals and bounds. 3. Interval estimation for the different cases of normal distribution
Month: March				
Lectures 12	Practicals 40	Total 52	Unit-2 Parametric Test	1. Statistical hypothesis, problems of testing of hypothesis. 2. Most Powerful (MP) test. 3. Neyman - Pearson (NP) lemma 4. Likelihood Ratio Test
Month: April				
Lectures 12	Practicals 30	Total 42	Unit-3 Sequential Test	1. General theory of sequential analysis and its comparison with fixed sample procedure. 2. Wald's SPRT of strength (α, β) 3. Illustrations for standard distributions **4.** Graphical and tabular procedure for carrying SPRT
Month: May-June				
Lectures 21	Practicals 60	Total 81	Unit-4 Non – Parametric Test	1. Notion of non-parametric statistical inference (test) and its comparison with parametric statistical inference. 2. Concept of distribution free statistic. 3. Some non-parametric tests: Run test, Sign test, Wilcoxon's signed rank test, Mann-Whitney U –test, Median test, and Kolmogorov Smirnov test

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Academic year 2022 -2023 B.Sc-III Semester VI Department -Statistics

Subject - Statistics Course – DSE-1004F2

Section-I: Design of Experiment

Name of teacher – Pawar V. V.

Month: January-February			Module/Unit	Sub-units planned
Lectures 16	Practicals 40	Total 56	Unit-1 Simple Design of Experiment I	1. Basic terms in design of experiments, 2. Principles of design of experiments 3. Completely Randomized Design (CRD)
Month: March				
Lectures 11	Practicals 45	Total 56	Unit-2 Simple Design of Experiment II	1. Randomized Block Design (RBD) 2. Latin Square Design (LSD) 3. Missing plot technique for RBD and LSD 4. Identification of real life situations where CRD, RBD and LSD are used.
Month:April				
Lectures 09	Practicals 50	Total 59	Unit-3 Efficiency of design and ANOCOVA	1. Efficiency of design 2. Analysis of Covariance (ANOCOVA) with one concomitant variable: Purpose of ANOCOVA 3. Practical situations 4. Estimation of parameters 5. Preparation of analysis of covariance table.
Month: May – June				
Lectures 19	Practicals 60	Total 79	Unit-4 Factorial Experiment	1. Concept of factorial experiments 2. Definitions of main effects and interaction effects 3. ANOVA for 2^2 and 2^3 factorial experiments arranged in RBD. 4. Total confounding and Partial Confounding 5. Construction of layout in total confounding and partial confounding in 2^3factorial experiment.

Name & signature of teacher

Pawar V.V

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Academic year 2022 -2023 B.Sc-III Semester VI Department -Statistics

Subject - Statistics Course – DSE-1004F2

Section-II: Quality Management and Data Mining

Name of teacher – Patil P. C.

Month: January-February			Module/Unit	Sub-units planned
Lectures 19	Practicals 40	Total 59	Unit-1 Quality Tools	1. Meaning and dimensions of quality 2. Seven magnificent tools of quality 3. Deming's PDCA cycle and its applications.
Month: March				
Lectures 13	Practicals 45	Total 58	Unit-2 Process Control	1. CUSUM chart, tabular form, 2. Moving average and exponentially weighted moving average charts. 3. Six-sigma methodology, 4. DMAIC cycle and case studies
Month: April				
Lectures 10	Practicals 30	Total 40	Unit-3 Product Control	1. Sampling Inspection plans for attribute inspection: Concept of AQL, LTPD, Consumer's risk, and producer's risk, AOQ, AOQL, OC, ASN and ATI. 2. Single and double sampling plans
Month: May-June				
Lectures 19	Practicals 60	Total 79	Unit-4 Data Mining	1. Data preparation for knowledge discovery 2. CRISP and SEEMA methods 3. Supervised and unsupervised learning techniques

P.C.Patil

Name & signature of teacher

Patil.P.C

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Annual Teaching Plan

Academic year 2022 -2023 B.Com-II Semester IV Department -Statistics

Subject - Statistics Course - CC – 1051D

Paper II Business Statistics – II & **B.Sc. I Practical's**

Name of teacher – Makandar A. M.

Month: January-February			Module/Unit	Sub-units planned
Lectures 52	Practicals 24	Total 76	Unit-1 Probability and probability distributions	1.Basic concepts in probability 2.Binomial distribution: Properties and examples 3.Poisson distribution: Properties and examples
Month: March				
Lectures 32	Practicals 16	Total 48	Unit-1 Probability and probability distributions Unit-2 Time Series	1.Normal distribution: Properties and examples 2.Definition, uses and components of time series 3.Methods of determination of trend 4.Numerical examples
Month: April				
Lectures 26	Practicals 16	Total 42	Unit-3 Index Number	1. Meaning and construction of index numbers 2.Types of index numbers 3. Simple and weighted index number. 4. Laspeyre's, Paasche's and Fisher's index numbers. 5.Numerical examples
Month: May-June				
Lectures 49	Practicals 28	Total 77	Unit-4 Statistical Quality Control	1.Introduction to SQC, Process control, Product control 2.Control charts for variables 3.Control charts for Attributes 4.Examples

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Makandar A.M

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Academic year 2022 -2023 B.Com-II Semester IV Department -Statistics

Subject - Statistics Course - CC – 1051D

Paper II Business Statistics – II & **B.Sc. I Practical's**

Name of teacher –Pawar A. A.

Month: January-February			Module/Unit	Sub-units planned
Lectures 26	Practicals 24	Total 50	Unit-1 Probability and probability distributions	1.Basic concepts in probability 2.Binomial distribution: Properties and examples 3.Poisson distribution: Properties and examples
Month: March				
Lectures 15	Practicals 20	Total 35	Unit-1 Probability and probability distributions Unit-2 Time Series	1.Normal distribution: Properties and examples 2.Definition, uses and components of time series 3.Methods of determination of trend 4.Numerical examples
Month: April				
Lectures 15	Practicals 10	Total 25	Unit-3 Index Number	1. Meaning and construction of index numbers 2.Types of index numbers 3. Simple and weighted index number. 4. Laspeyre's, Paasche's and Fisher's index numbers. 5.Numerical examples
Month: May-June				
Lectures 28	Practicals 28	Total 56	Unit-4 Statistical Quality Control	1.Introduction to SQC, Process control, Product control 2.Control charts for variables 3.Control charts for Attributes 4.Examples

Pawar.A.A.

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Pawar A.A

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Academic year 2022-2023 M.Sc-I Semester I Department -Statistics

Subject - Statistics Course - CC-2300A

Paper No. I- REAL ANALYSIS

Name of teacher – Pawar A.A.

Month: August			Module/Unit	Sub-units planned
Lectures 15	Practicals 8	Total 23	Unit-1	1. Set of real numbers, countable and uncountable sets, countability of rational numbers and uncountabilityof the interval (0,1) 2. Supremum and Infimum of bounded sets, limit point of a set, open, closed, dense and compact sets.
Month: September				
Lectures 16	Practicals 20	Total 36	Unit -1	1. Bolzano-Weierstrass and Heine-Borel Theorems (Statements only). 2. Applications of the theorems
			Unit-2	1. Sequence of real numbers, convergence, divergence, 2. Cauchy sequence 3. Convergence of bounded monotone sequence.
Month: October				
Lectures 12	Practicals 16	Total 28	Unit-2	1. Limit inferior and limit superior of the sequences. 2. Series of numbers 3. tests for convergence (without proof) test for absolute convergence 4. convergence of sequences of non-negative terms.
			Unit-3	1. Real valued function, continuous function. 2. Riemann, Riemann -Steltjes Integrals and their common properties. 3. Integration by parts, Fundamental theorem on calculus, 4. mean value theorem, their applications in finding functional of distributions.
Month: November-December				
Lectures 26	Practicals 28,	Total 54	Unit-4	1. Vector and Matrix differentiation 2. Maxima, minima of functions of several variables. 3. Constrained maxima, minima, 4. Lagrange's method, Taylor's theorem, implicit function theorem and their applications. 5. Multiple integrals, Change of variables, Improper integrals, Applications in multivariate distributions.

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Pawar Ajit A.

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Academic year 2022-2023 M.Sc-I Semester I Department -Statistics

Subject - Statistics Course - CC-2301A

Paper No. II- LINEAR ALGEBRA

Name of teacher – Tapakire D.A.

Month: August			Module/Unit	Sub-units planned
Lectures 15	Practicals 4	Total 19	Unit-1	1. Vector space 2. Null space, Gram- Schmidt orthogonalization process.
Month: September				
Lectures 16	Practicals 20	Total 36	Unit -1	1. Orthonormal basis, orthogonal projection of a vector 2. Linear transformations, algebra of matrices, row and column spaces of amatrix, 3. Elementary operations and elementary matrices, rank and inverse of a matrix, Null space and nullity, partitioned matrices.
			Unit-2	1. Types of Matrices 2. Kronecker product, Generalized inverse.
Month: October				
Lectures 14	Practicals 16	Total 30	Unit-2	1. Moore-Penrose generalized inverse 2. Solution of a systemof homogenous and non-homogenous linear equations 3. Theorem related to existence of solution and examples.
			Unit-3	1. Characteristic roots and vectors of a matrix 2. algebraic and geometric multiplicities of a characteristic root, right and left characteristic vectors 3. Orthogonal property of characteristic vectors, Caley-Hamilton Theorem and its applications.
Month: November-December				
Lectures 26	Practicals 28	Total 54	Unit-4	1. Spectral decomposition of a real symmetric matrix, singular value decomposition, Choleskey decomposition 2. Real quadratic forms, reduction and classification, index and signature, extreme of a quadratic form, simultaneous reduction of two quadratic forms.

D.A.Tapkire

Name & signature of teacher

D.A.Tapkire

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Academic year 2022-2023 M.Sc-I Semester I Department -Statistics

Subject - Statistics Course - CC-2302A

Paper No. III-DISTRIBUTION THEORY

Name of teacher – Tapakire D.A.

Month: August			Module/Unit	Sub-units planned
Lectures 15	Practicals 8	Total 23	Unit-1	1. Review of Random experiment 2. Discrete random variables, continuous random variables. 3. Cumulative distribution function (CDF), properties of CDF.
Month: September				
Lectures 17	Practicals 16	Total 33	Unit -1	1. Computation of probabilities of events using CDF, quantiles 2. absolutely continuous and discrete distributions 3. Mixtures of probability distributions 4. Decomposition of mixture CDF into discrete and continuous CDFs 5. expectation and variance of mixture distributions.
			Unit-2	1. Transformations of univariate random variables 2. probability integral transformation.
Month: October				
Lectures 15	Practicals 20	Total 35	Unit-2	1. Concepts of location, scale and shape parameters of distributions with examples. 2. Symmetric distributions and their properties. 3. Moment inequalities
			Unit-3	1. Random vectors, joint distributions, Independence, variance-covariance matrix, joint MGF. Conditional expectation and variances, 2. Transformations of bivariate random variables, Poisson distribution. 3. Convolutions, compound distributions.
Month: November-December				
Lectures 27	Practicals 28	Total 55	Unit-4	1. Sampling distributions of statistics from univariate normal random samples. 2. Distributions of linear and quadratic forms involving normal random variables 3. Fisher Cochran and related theorems. 4. Distribution of an order statistics.

D.A.Tapakire

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Tapkire D.A

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Academic year 2022-2023 M.Sc-I Semester I Department -Statistics

Subject - Statistics Course - CC-2303A

Paper No. IV- ESTIMATION THEORY

Name of teacher – Bhosale A.B.

Month: August			Module/Unit	Sub-units planned
Lectures 15	Practicals –	Total 15	Unit-1	1. Sufficiency principle, minimal sufficient statistic for exponential family, Pitman family. 2. Completeness, bounded completeness, ancillary statistics, Basu's theorem and applications.
Month: September				
Lectures 16	Practicals –	Total 16	Unit-2	1. Problem of point estimation, 2. Unbiased estimators, minimum variance unbiased estimator, 3. Rao- Blackwell theorem and Lehmann-Scheffe theorem and their uses.
Month: October				
Lectures 14	Practicals –	Total 14	Unit-2	1. Necessary and sufficient condition for MVUE and their applications. 2. Fisher information and information matrix, Cramer- Rao inequality, Chapmann-Robinson bounds, 3. Bhattacharya bounds, their applications.
			Unit-3	1. Method of maximum likelihood (MLE) and small sample properties of MLE 2. Method of scoring and application to estimation in multinomial distribution. MLE in non-regular families. 3. Other methods of estimation: method of moments, minimum Chi square. U-Statistics
Month: November-December				
Lectures 26	Practicals –	Total 26	Unit-4	1. The concept of prior distributions 2. posterior distribution 3. Bayes estimation under squared error and absolute error loss functions.

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(Bhosale A.B.)

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Academic year 2022-2023 M.Sc-I Semester I Department -Statistics

Subject - Statistics Course - CC-2304A

Paper No. V- STATISTICAL COMPUTING

Name of teacher – Patil P.C.

Month: August			Module/Unit	Sub-units planned
Lectures 15	Practicals –	Total 15	Unit-1	1. MSEXCEL: Introduction 2. Lookup functions
Month: September				
Lectures 17	Practicals –	Total 17	Unit-2	1. R-software: Introduction to R, data types and objects, operators 2. Built in functions
Month: October				
Lectures 17	Practicals –	Total 17	Unit-3	1. Concept of simulation 2. Algorithms for generating random numbers from well known univariate discrete and continuous distributions
			Unit-3	1. Acceptance-Rejection Technique. Use of random numbers to evaluate integrals 2. Use of random numbers in statistical inference.
Month: November-December				
Lectures 26	Practicals –	Total 26	Unit-4	1. Resampling techniques: Bootstrap methods, Jackknife method, Solution to system of linear equations. 2. Jacobi and Gauss-Seidel methods with convergence analysis. 3. Finding roots of nonlinear equation

P.C. Patil

Name & signature of teacher

Patil P.C

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Academic year 2022-2023 M.Sc-I Semester II Department -Statistics

Subject - Statistics Course - CC-2306B

Paper No. VI- PROBABILITY THEORY

Name of teacher – Tapakire D.A.

Month: January-February			Module/Unit	Sub-units planned
Lectures 30	Practicals 24	Total 54	Unit-1	1. Classes of sets 2. Probability measure, Probability space.
Month-March				
Lectures 15	Practicals 20	Total 35	Unit -2	1. Measurable function, random variable, distribution function of a random variable, 2. simple randomvariable 3. Method of obtaining a random variable as a limit of sequence of simple random variables.
Month- April				
Lectures 15	Practicals 8	Total 23	Unit-2	1. Integration of a measurable function with respect to a measure, expectation of a random variable 2. independence. Characteristic function, simple properties. 3. Inversion theorem and uniqueness property (Statement only).
			Unit-3	1. Monotone convergence theorem, Fatous Lemma, Dominated Convergence theorem, Borel- Cantelli Lemma, and their applications. 2. Modes of convergence
Month: May-June				
Lectures 27	Practicals 24	Total 51	Unit-4	1. Weak and Strong laws of large numbers 2. CLT

D.A.Tapkire

Name & signature of teacher

Tapkire D.A

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Academic year 2022-2023 M.Sc-I Semester II Department -Statistics

Subject - Statistics Course - CC-2307B

Paper No. VII- THEORY OF TESTING OF HYPOTHESIS

Name of teacher – Bhosale A.B.

Month: January-February			Module/Unit	Sub-units planned
Lectures 32	Practicals —	Total 32	Unit-1	1. Problem of testing of Hypothesis, Simple and composite hypotheses. 2. Randomized and non- randomized tests, most powerful test, Neyman-Pearson Lemma and its applications. 3. Determination of minimum sample size to achieve the desired strengths.
Month-March				
Lectures 16	Practicals —	Total 16	Unit -1	1. Monotone likelihood ratio property, UMP test, power function of a test, existence of UMP. 2. Tests for one-sided alternatives. Concept of p-value.
			Unit-2	1. UMP tests for two sided alternatives examples, their existence and non- existence. 2. Generalized Neyman Pearson lemma, unbiased test.
Month-April				
Lectures 13	Practicals —	Total 13	Unit-2	1. UMPU test and their existence in the case of exponential families (Statements of the theorems only). 2. Similar tests, test with Neyman structure.
			Unit-3	1. Problem of confidence intervals 2. UMA and UMAU confidence intervals.
Month: May-June				
Lectures 26	Practicals —	Total 26	Unit-4	1. Likelihood ratio test and its application to standard distribution. 2. Goodness of fit tests based on Chi-square distribution 3. Spearman's Rank Correlation Test; Kendall's Rank Correlation Test; Kruskal-Wallis Test; Fridman's Two-way analysis of variance by ranks.

Name & signature of teacher

(Bhosale A.B.)

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Academic year 2022-2023 M.Sc-I Semester II Department -Statistics

Subject - Statistics Course - CC-2308B

Paper No. VIII- Linear Models and Regression Analysis.

Name of teacher – Tapakire D.A.

Month: January- February			Module/Unit	Sub-units planned
Lectures 28	Practicals 20	Total 48	Unit-1	1. General linear model 2. Guass Markov theorem, variances and Covariance of BLUEs, 3. Distribution of quadratic forms for normal variables
Month- March				
Lectures 15	Practicals 16	Total 31	Unit-2	1. Multiple regression model, Least squares estimate, Properties of LSE, 2. Hypothesis testing 3. Model adequacy checking. 4. Transformations to correct model inadequacies
Month- April				
Lectures 15	Practicals 16	Total 31	Unit-3 Unit-3	1. Multicollinearity. 2. Autocorrelation 3. Parameter estimation using Cochrane-Orcutt method. 4. Variable Selection Procedures
Month: May-June				
Lectures 26	Practicals 28	Total 54	Unit-4	1. Robust Regression:breakdown and efficiency. Asymptotic distribution of M-estimator). 2. Nonlinear Regression Models: nonlinear least squares, transformation to a linear model

D.A.Tapakire

Name & signature of teacher

Tapkire D.A.

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Academic year 2022-2023 M.Sc-I Semester II Department -Statistics

Subject - Statistics Course - CC-2309B

Paper No. IX- DESIGN AND ANALYSIS OF EXPERIMENT

Name of teacher – Pawar A. A.

Month: January-February			Module/Unit	Sub-units planned
Lectures 32	Practicals 20	Total 52	Unit-1	1. Concept of design of experiments (DOE), applications of DOE 2. Analysis of completely randomized design using the fixed effect model and estimation of the model parameters
Month- March				
Lectures 15	Practicals 16	Total 31	Unit-1	1. Comparing pairs of treatment means 2. Comparing treatment means with a control 3. Analyses of randomized complete block design, Latin square design, balanced incomplete block design using fixed effect models and estimation of the model parameters.
Month- April				
Lectures 15	Practicals 16	Total 31	Unit-2	1. Concepts of factorial designs 2. Analysis of replicated and unreplicated 2^k full factorial designs Construction and analysis of 2^{k-p} fractional factorial designs and their alias structures. 3. Design resolution
			Unit-3	1. The 3^k full factorial design, Confounding in 3^k factorial designs. 2. Concept of random effects and mixed effects models, analysis of 2^k factorial designs using the random effect model, 3. Analysis of 2^k factorial designs using the mixed effect model, rules for expected mean squares
Month: May-June				
Lectures 27	Practicals 28	Total 55	Unit-4	1. Response surface methodology 2. Designs for fitting response surfaces 3. The concepts of nested and split-plot designs.

Pawar.A.A

Name & signature of teacher

Pawar A.A

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Academic year 2022-2023 M.Sc-I Semester II Department -Statistics

Subject - Statistics Course - CC-2310B

Paper No. X- SAMPLING THEORY

Name of teacher – Pawar.V.V

Month- January-February			Module/Unit	Sub-units planned
Lectures 28	Practicals –	Total 28	Unit-1	1. Review of concept Simple random sampling with replacement and Simple random sampling without replacement. 2. Stratified sampling 3. Linear systematic sampling and circular systematic sampling 4. Comparison with SRS, and Stratified sampling.
Month- March				
Lectures 16	Practicals –	Total 16	Unit-2	1. PPSWR methods: Cumulative total method, Lahiri's method related 2. Estimation Problems and PPSWOR methods and related estimation of a finite population mean
Month- April				
Lectures 13	Practicals –	Total 13	Unit-3	1. Use of supplementary information for estimation:S ratio and regression estimators and their properties. Unbiased and almost unbiased ratio type estimators, 2. Double sampling, Cluster sampling. Two–stage sampling with equal number of Second stage units, multistage-sampling.
Month: May-June				
Lectures 22	Practicals –	Total 22	Unit-4	1. Non-sampling errors 2. Random response techniques, dichotomous population, Warners model, Multiattribute situations.

Name & signature of teacher

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