



To,

01.07.2019

The Principal,  
P. V. P. Mahavidyalaya, Kavathe Mahankal.  
Dist: Sangli

Subject: Teaching plan and workload of Statistics Department for the year 2019-20

Respected Sir,

I am here with submitting the following documents of Statistics Department for the year 2019-20.

- i) Teaching plan for the year 2019-20.
- ii) Total Workload.
- iii) Teacher wise workload.

Please accept it and do the needful.

Yours sincerely

Dr. M. K. Patil  
Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil      Designation : Associate Professor  
 Class : B.A.I  
 Subject: CGE (Core Generic Elective) Science Technology and Development  
 - Course 1

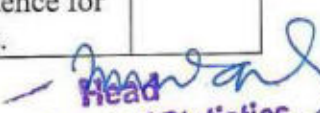
**Semester I**

| Sr. No | Month     | Main Topic/Unit                      | Subtopic   | No. of Periods required |
|--------|-----------|--------------------------------------|--|-------------------------|
| 1      | June      | Introduction                         | Syllabus discussion  | 02                      |
| 2      | July      | Scientific outlook                   | Scientific thinking, Observation, Experimentation,                 | 05                      |
| 3      | August    |                                      | Analysis, Science and superstitions                                | 05                      |
| 4      | September | Science, Technology and Human Health | Blood Groups, AIDS, Addiction,                                     | 05                      |
| 5      | October   |                                      | Need of Cleanliness: "Swachh Bharat Abhiyan" (Clean India Mission) | 05                      |

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil      Designation : Associate Professor  
 Class: B.Sc. I      **Semester I**  
 Department : Statistics      **Paper: II**  
**Paper: Elementary Probability Theory (DSC A8)**

| Sr. No | Month     | Main Topic/Unit                  | Subtopic   | No. of Periods required |
|--------|-----------|----------------------------------|--|-------------------------|
| 1      | June      | Introduction--                   | Syllabus discussion  | 02                      |
| 2      | July      | Sample space and Events          | Random experiments. Sample space, Discrete sample space Event, 1.3: Algebra of events (Union, Intersection, Complementation ). Symbolic representation | 11                      |
| 3      | August    | Probability Axiomatic definition | Apriori, examples. Proof of the theorems on probability, Illustrative examples based on results in 2   | 11                      |
| 4      | September | Conditional Probability          | Definition, Multiplication theorem, Partition of the sample space, Baye's theorem, Examples  | 11                      |
| 5      | October   | Independence of the events       | Concept, Theorems on independence. Pair wise and mutual independence for three events, Examples.   | 10                      |

  
**Head**  
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 P.V.P. Mahavidyalaya,  
 Kavathe Mahankal, Dist.-Sangli.

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil Designation : Associate Professor

Class : B.Sc. II

Paper: V

Department : Statistics

**SEMESTER III**

**Paper: Probability distributions: I**

| Sr. No | Month     | Main Topic/Unit                     | Subtopic  | No. of Periods required |
|--------|-----------|-------------------------------------|---|-------------------------|
| 1      | June      | Introduction                        | Syllabus discussion   | 02                      |
| 2      | July      | Discrete Distributions              | Poisson distribution, Geometric distribution, Negative binomial distribution. Mean, Variance, pgf, recurrence relation, etc.  | 10                      |
| 3      | August    | Continuous univariate distributions | Definition of the continuous sample space with illustrations, Definition of c.r.v., p.d.f., and c.d.f., properties of c.d.f.. Expectation of r.v, raw and central moments, skewness and kurtosis. m.g.f. definition and properties. c.g.f. definition, properties of cgf  | 10                      |
| 4      | September | Continuous Bivariate Distributions  | Definition of bivariate continuous random variable(X, Y), Joint p.d.f., c.d.f Expectation of g(X, Y),<br>i) $E(X \pm Y) = E(X) \pm E(Y)$ , ii) $E[E(X/Y)] = E(X)$ .<br>If X and Y are independent r.v.s. then<br>(i) $E(XY) = E(X) E(Y)$ ,<br>(ii) $M_{X+Y}(t) = M_X(t) M_Y(t)$   | 10                      |
| 5      | October   | Transformations of continuous r.v.  | Transformation of univariate continuous r.v.: Distribution of $Y=g(X)$ , where g is monotonic or non monotonic using (i) Jacobian of transformation, (ii) Distribution function and (iii) m.g.f. methods. Transformation of continuous bivariate r.v.s.: Distribution of bivariate r.v.s. using Jacobian of transformation. | 10                      |

  
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**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil      Designation : Associate Professor  
 Class : B.A.I  
 Subject: CGE (Core Generic Elective) Science Technology and Development  
 : Course 2

**Semester II**

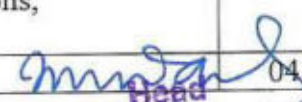
| Sr. No | Month    | Main Topic/Unit                                  | Subtopic  | No. of Periods required |
|--------|----------|--|---|-------------------------|
| 1      | November | Introduction                                     | Syllabus Discussion   | 02                      |
| 2      | December | Means of Communications & Information Technology | History of communication, IT, Computer,   | 05                      |
| 3      | January  |  | Computer Network, Internet, Viruses, GIS, GPS   | 05                      |
| 4      | February | Science Technology in Space and Ocean Research   | Beginning Of Satellite Era in the World, Rocket Technology, Artificial Satellite-Types and uses | 05                      |
| 5      | March    |  | Satellite Programme of India, Importance of Oceanic Study, Indian Institute of Oceanography     | 05                      |

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil      Designation : Associate Professor  
 Class: B.Sc. I  
 Department : Statistics  
**Paper: II      Paper: Discrete Probability Distributions (DSC B8)**

**Semester II**

| Sr. No | Month    | Main Topic/Unit                     | Subtopic  | No. of Periods required |
|--------|----------|-------------------------------------|---|-------------------------|
| 1      | November | Section II                          | Syllabus discussion, Introduction   | 05                      |
| 2      | December | Univariate Probability distribution | Discrete random variable pmf, cdf, Median and mode, Examples  | 10                      |
| 3      | January  | Mathematical Expectation            | Defn, Result on expectation, Mean, Variance, Effect of change of origin and scale on expectation, Examples.   | 10                      |
| 4      | February | Discrete distributions              | One point, Two point, Bernoulli, Binomial Hypergeometric distributions  | 10                      |
| 5      | March    | Bivariate Discrete Distribution     | Joint p.m.f., and c.d.f., Properties of c.d.f, concept of marginal and conditional probability distribution, independence of two discrete r.v.s, Theorems on expectations, $Cov(aX+bY,cX+dY)$ , | 10                      |
| 6      | April    | Revision                            | Tests and Revision  | 04                      |

  
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**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil Designation : Associate Professor


Class : B.Sc. II

Paper: VII

Department : Statistics

Paper: Continuous Probability Distributions-II SEMESTER IV

| Sr. No | Month    | Main Topic/Unit                        | Subtopic  | No. of Periods required |
|--------|----------|--|---|-------------------------|
| 1      | November |  | Introduction to the Syllabus  | 02                      |
| 2      | December | Uniform and Exponential Distribution   | Uniform distribution: p.d.f c.d.f., sketch of p.d.f and c.d.f. m.g.f., mean, variance, moments. Distribution of (i) $(X-a) / (b-a)$ , ii) $(b-X) / (b-a)$ , (iii) $Y = F(x)$ , where $F(x)$ is cdf of $x$<br>$X \sim \text{Exp}$ , Sketch of p.d.f, c.d.f., m.g.f., c.g.f., mean, variance, C.V., moments, cumulants, median, quartiles, lack of memory property, | 06                      |
| 3      | January  | Gamma and Beta Distributions           | Definition, pdf, mean and variance, Moments, Mode, Skewness and Kurtosis, examples  | 06                      |
| 4      | February | Normal Distribution                    | Definition, pdf, mean and variance, Moments, Mode, Skewness and Kurtosis, Properties of Normal probability curve, examples  | 10                      |
| 5      | March    | Chisquare distribution, T distribution | Definition, pdf, mean and variance, Moments, Mode, Skewness and Kurtosis, mgf, additive property, examples  | 10                      |
| 6      | April    | F distribution                         | Definition, pdf, mean and variance, Moments, Mode, Skewness and Kurtosis, mgf, additive property, examples<br>Interrelation between t, F and $\chi^2$ .   | 11                      |

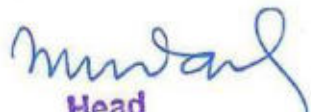
  
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P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil      Designation : Associate Professor  
Department : Statistics      Subject : B. Sc. I (Practical) Paper-I

| Sr. No | Month     | Main Topic/Unit  | No. of Periods required |
|--------|-----------|--|-------------------------|
| 1      | June      | --   |                         |
| 2      | July      | Graphical representation,<br>Measures of central tendency -I   | 12                      |
| 3      | August    | Measures of central tendency -II<br>Measures of dispersion-I<br>Measures of dispersion-II              | 16                      |
| 4      | September | Moments, Skewness and Kurtosis for ungrouped data,<br>Moments, Skewness and Kurtosis for grouped data, | 12                      |
| 5      | October   | Correlation for ungrouped data I<br>Correlation for grouped data II                                    | 12                      |
| 6      | November  | Regression I<br>Regression II  | 4                       |
| 7      | December  | Attributes I, Attribute II<br>Applications of Binomial and Hypergeometric distributions,               | 16                      |
| 8      | January   | Multiple Regression, Multiple and Partial<br>Correlation   | 16                      |
| 9      | February  | Bivariate Discrete Distribution I<br>Bivariate Discrete Distribution II                                | 16                      |
| 10     | March     | Practical on Computer and Revision   | 16                      |

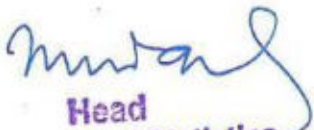
  
**Head**  
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P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2019-20**

Name of the Teacher : Dr. M. K. Patil      Designation : Associate Professor  
Department : Statistics                      Subject : B. Sc. II (Practical) Paper-II

| Sr. No | Month     | Main Topic/Unit  | No. of Periods required |
|--------|-----------|--|-------------------------|
| 1      | June      | --   |                         |
| 2      | July      | Fitting of discrete Uniform,<br>Fitting of Binomial distribution,<br>Fitting of Hypergeometric distributions.  | 16                      |
| 3      | August    | Fitting of Poisson distribution.<br>Fitting of Geometric distribution.<br>Fitting of negative binomial distribution  | 16                      |
| 4      | September | Model sampling from discrete Uniform dist.<br>Model Sampling from Binomial distribution<br>Model sampling from Hypergeometric distributions.                         | 16                      |
| 5      | October   | Model sampling from Poisson distribution.<br>Model sampling from Geometric distribution.   | 12                      |
| 6      | November  | Model sampling from Negative Binomial distribution<br>Fitting of continuous Uniform distribution   | 8                       |
| 7      | December  | Fitting of Exponential distribution<br>Fitting of Normal distribution  | 16                      |
| 8      | January   | Model Sampling from continuous Uniform and Exponential distribution<br>Model Sampling from Normal distribution<br>Application of Normal and Exponential Distribution | 16                      |
| 9      | February  | Fitting of Binomial, Poisson and Negative Binomial using MS-EXCEL<br>Fitting of Exponential and Normal distribution using MS-EXCEL                                   | 16                      |
| 10     | March     | Revision, Journal Completion, Exam   | 8                       |

  
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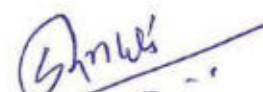
P. V. P. Mahavidyalaya Kavathe Mahankal


**Teaching Plan 2019-2020 (Semester I)**

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.A.I (S.T.D.-I)   |                  | B. Sc. I (Paper I)  |                 |           |                 |
|-----------------|--|------------------|---|-----------------|-----------|-----------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No.of<br>Lects. |
| Jun             | Introduction, syllabus discussion.   | 02               | Introduction, Meaning & Scope of Statistics, sample and population  | 03              | 01        | 04              |
| July            | Contribution of eminent Scientists in fundamental Sciences: Einstein, Newton, Edison, Dr. Homi J. Bhabha                             | 08               | Nature of data: Primary, Secondary, Qualitative, Quantitative, Scales of Measurements, Averages: Mean, Mode, Median, Def <sup>n</sup> , properties, Merits, Demerits Comparison of averages, Relation, problems | 12              | 04        | 16              |
| August          | Contribution of eminent Scientists in fundamental Sciences: Dr. M.S. Swaminathan, Dr. A.P. J. Abdul Kalam, Power Resources in India: | 08               | Measures of Dispersion: Absolute & Relative, Range, Q.D., M.D., S.D., C.V., Def <sup>n</sup> , properties, Merits & Demerits, Formulae, Comparison, Problems.   | 10              | 04        | 16              |
| Sept.           | Conventional Non Conventional, Solar energy, Wind energy, hydel power energy, Bio-energy, Geo- thermal energy,                       | 08               | Moments: Raw, Central Def <sup>n</sup> , properties, Relation Skew ness: Concept, Measures, Problems. Kurtosis: Concept, Measures, Problems. Attributes, concept, notation,                                     | 12              | 04        | 16              |
| Oct./<br>Nov.   | Atomic energy, Carbon Credit   | 05               | Consistency, Independence, Association, relation between Q & Y, examples  | 09              | 02        | 08              |

  
Sub Teacher

  
Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

P. V. P. Mahavidyalaya Kavathe Mahankal

**Teaching Plan 2019-2020 (Semester III )**

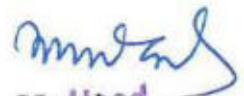
Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.Com.II (B. Statistics-I)   |                  | B. Sc. II (Paper VI)  |                 |           |                 |
|-----------------|--|------------------|---|-----------------|-----------|-----------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No.of<br>Lects. |
| June            | Introduction, Meaning & Scope of Statistics  | 03               | -   | -               | -         | -               |
| July            | Sampling techniques: Population & Sample , Census method, Sampling method, SRSWRSRSWOR, Stratified , Simple bar diagram , Pie chart Measures of Central Tendency : Concept, def <sup>n</sup> | 16               | Demography: Need of vital statistics, examples Mortality rates, fertility rates, population growth rates, GRR, NRR, CDR, SDR, ASDR, STDR, CBR, GFR, ASFR, TFR, Multiple linear regression, concept. | 12              | 04        | 16              |
| August          | Mean, Mode, Median, Def <sup>n</sup> , properties, Merits & Demerits, examples Measures of Dispersion: Absolute & Relative, Range, Q.D., M.D., S.D.,   | 16               | notation, plane of regression, correlation matrix, residual, means & variance, properties, Examples & problems.   | 12              | 04        | 16              |
| Sept.           | C.V., Def <sup>n</sup> , properties, Merits & Demerits, problems, Correlation, Types, methods, Karl Pearson & Spearman Rank Formulae , examples Regression: Concept,                         | 16               | Concept of Multiple & Partial correlation, derivation of formula , properties, Examples & problems. Sampling unit, elementary unit, frame Census, sampling method advantages of sampling            | 12              | 04        | 16              |
| Oct.            | Lines of regression, regression coefficients & properties, Numeric problems.   | 10               | Methods of sampling, SRSWR & SRSWOR, Errors in sampling, non-response error, results on SRSWR & SRSWOR  | 09              | 03        | 12              |



Sub Teacher



Head  
Department of Statistics  
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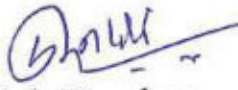
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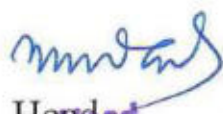
Teaching Plan 2019-2020 (Semester IV)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.Com. II (B. Statistics-II)  |           | B. Sc. II (Paper VIII: Statistical Methods )  |              |           |               |
|-----------------|---|-----------|---|--------------|-----------|---------------|
|                 | Unit//Subunit   | No. Lects | Theory  | No. of Lects | Practical | No. of Lects. |
| November        | -   | -         | -   | -            | -         | -             |
| December        | Time Series: Definition, Components, Methods of determination of trend, Seasonal Variations by Simple Average Method. Numerical examples.   | 15        | Time Series: Definition, Components, Methods of determination of trend, additive, multiplicative model, utility, seasonal variations measurement        | 11           | 04        | 16            |
| January         | S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, Mean & Range chart np-chart & C-chart. Numerical examples.  | 15        | S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, Mean & Range chart np-chart & C-chart. Numerical examples.            | 13           | 04        | 16            |
| February        | Index Numbers: Need, meaning, Price, Quality and Value based simple (unweighted) & Weighted index numbers, Laspeyre's, Paasche's and Fisher's index numbers, examples.                  | 15        | Tests of Hypothesis Various terms in testing, Large sample tests for means, proportions and correlation coefficients based on Normal distribution.      | 12           | 04        | 16            |
| March           | Probability and Probability Distributions: Probability: Events, laws of Probability, Examples. Binomial & Normal Distribution: Mean and Variance, Properties of normal curve, Examples. | 15        | Small sample tests based on chi square, t & F distribution, for testing variances, means, test of goodness of fit, test for independence of attributes. | 12           | 03        | 12            |

  
Sub Teacher

  
Head  
Department of Statistics  
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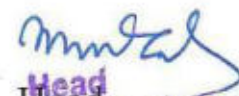
Teaching Plan 2019-2020 (Semester II)

Sub:- Statistics  
Koshti

Name of Teacher :- V. V.

| Class/<br>Month | B.A.I (S.T.D.-II)   |                  | B. Sc. I (Paper III)  |                 |           |                 |
|-----------------|---|------------------|---|-----------------|-----------|-----------------|
|                 | Unit//Subunit   | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No.of<br>Lects. |
| November        | Disaster management:<br>types, importance of study  | 02               | Bivariate data, Correlation<br>concept, types, examples   | 02              | 01        | 04              |
| December        | Meaning, reasons,<br>measures<br>1. Earth quake<br>2. Flood<br>3. Drought<br>4. Fire  | 08               | Co-variance, Methods<br>of studying correlation,<br>properties, simple<br>examples. Regression-<br>concept, definition,<br>Lines of regression,   | 12              | 04        | 16              |
| January         | Meaning, reasons,<br>measures<br>1. Accident<br>2. Crowd  | 08               | fitting of a line of reg.,<br>regression coefficients,<br>properties, examples,<br>Index Numbers: Need,<br>meaning, problems in<br>construction   | 12              | 04        | 16              |
| February        | Science Technology in<br>Space & Ocean<br>research: satellite era,<br>rocket technology, S.<br>L.V., importance of<br>ocean study | 08               | Price, Quality and Value<br>based simple<br>(unweighted) &<br>Weighted index nos.<br>Laspeyre's, Paasche's<br>and Fisher's index<br>numbers, Tests of index<br>numbers, base shifting,<br>deflating | 12              | 04        | 16              |
| March           | Indian institute of<br>oceanography, revision   | 04               | Cost of living index<br>numbers, methods ,uses  | 07              | 02        | 08              |

  
Sub Teacher

  
Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

To,

01.09.2020

The Principal,  
P. V. P. Mahavidyalaya, Kavathe Mahankal.  
Dist: Sangli

Subject: Teaching plan and workload of Statistics Department for the year 2020-21

Respected Sir,

I am here with submitting the following documents of Statistics Department for the year 2020-21

- i) Teaching plan for the year 2020-21
- ii) Total Workload.
- iii) Teacher wise workload.

Please accept it and do the needful.

Yours sincerely

Dr. M. K. Patil **Head**  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
 Class : B.A.I

**Subject:** CGE (Core Generic Elective) Science Technology and  
 Development- Course 1

**Semester I (Online)**

| Sr. No | Month     | Main Topic/Unit             | Subtopic   | No. of Periods required |
|--------|-----------|-----------------------------|--|-------------------------|
| 1      | September | Introduction                | Syllabus discussion  | 02                      |
| 2      | October   | Scientific outlook          | Scientific thinking, Observation, Experimentation,                 | 05                      |
| 3      | November  |                             | Analysis, Science and superstitions                                | 05                      |
| 4      | December  | Science,                    | Blood Groups, AIDS, Addiction,                                     | 05                      |
| 5      | January   | Technology and Human Health | Need of Cleanliness: "Swachh Bharat Abhiyan" (Clean India Mission) | 05                      |

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
 Class: B.Sc. I      **Semester I**

Department : Statistics

**Paper: II**

**Paper: Elementary Probability Theory (DSC A8) (Online)**

| Sr. No | Month     | Main Topic/Unit                  | Subtopic   | No. of Periods required |
|--------|-----------|----------------------------------|--|-------------------------|
| 1      | September | Introduction--                   | Syllabus discussion  | 02                      |
| 2      | October   | Sample space and Events          | Random experiments. Sample space, Discrete sample space Event, 1.3: Algebra of events (Union, Intersection, Complementation ). Symbolic representation | 11                      |
| 3      | November  | Probability Axiomatic definition | Apriori, examples. Proof of the theorems on probability, Illustrative examples based on results in 2   | 11                      |
| 4      | December  | Conditional Probability          | Definition, Multiplication theorem, Partition of the sample space, Baye's theorem, Examples  | 11                      |
| 5      | January   | Independence of the events       | Concept, Theorems on independence. Pairwise and mutual independence for three events, Examples.  | 10                      |

*M. K. Patil*  
**Head**  
 Department of Statistics  
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Annual Teaching Plan 2020-2021


Name of the Teacher : Dr. M. K. Patil Designation : Professor

Class : B.Sc. II Paper: V

Department : Statistics SEMESTER III

Paper: Probability distributions: I (DSC-7C) (Online)

| Sr. No | Month     | Main Topic/Unit                     | Subtopic  | No. of Periods required |
|--------|-----------|-------------------------------------|---|-------------------------|
| 1      | September | Introduction                        | Syllabus discussion   | 02                      |
| 2      | October   | Discrete Distributions              | Poisson distribution, Geometric distribution, Negative binomial distribution. Mean, Variance, pgf, recurrence relation, etc.  | 10                      |
| 3      | November  | Continuous univariate distributions | Definition of the continuous sample space with illustrations, Definition of c.r.v., p.d.f., and c.d.f., properties of c.d.f. Expectation of r.v, raw and central moments, skewness and kurtosis. m.g.f. definition and properties. c.g.f. definition, properties of cgf   | 10                      |
| 4      | December  | Continuous Bivariate Distributions  | Definition of bivariate continuous random variable (X, Y), Joint p.d.f., c.d.f. Expectation of g(X, Y),<br>i) $E(X \pm Y) = E(X) \pm E(Y)$ , ii) $E[E(X/Y)] = E(X)$ .<br>If X and Y are independent r.v.s. then<br>(i) $E(XY) = E(X)E(Y)$ ,<br>(ii) $M_{X+Y}(t) = M_X(t)M_Y(t)$   | 10                      |
| 5      | January   | Transformations of continuous r.v.  | Transformation of univariate continuous r.v.: Distribution of $Y=g(X)$ , where g is monotonic or non monotonic using (i) Jacobian of transformation, (ii) Distribution function and (iii) m.g.f. methods. Transformation of continuous bivariate r.v.s.: Distribution of bivariate r.v.s. using Jacobian of transformation. | 10                      |

  
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**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

Name of the Teacher : Dr. M. K. Patil Designation : Professor  
 Class : B.A.I

**Subject:** CGE (Core Generic Elective) Science Technology and Development  
**:Course 2 Semester II (Online)**

| Sr. No | Month | Main Topic/Unit                                  | Subtopic  | No. of Periods required |
|--------|-------|--|---|-------------------------|
| 1      | March | Introduction                                     | Syllabus Discussion   | 02                      |
| 2      | April | Means of Communications & Information Technology | History of communication, IT, Computer,   | 05                      |
| 3      | May   |  | Computer Network, Internet, Viruses, GIS, GPS   | 05                      |
| 4      | June  | Science Technology in Space and Ocean Research   | Beginning Of Satellite Era in the World, Rocket Technology, Artificial Satellite-Types and uses | 05                      |
| 5      | July  |  | Satellite Programme of India, Importance of Oceanic Study, Indian Institute of Oceanography     | 05                      |

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

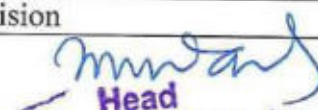
Name of the Teacher : Dr. M. K. Patil Designation : Professor

Class: B.Sc. I

Semester II Department : Statistics

**Paper: II Paper: Discrete Probability Distributions (DSC B8) (Online)**

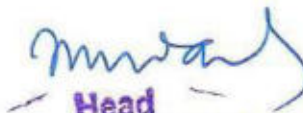
| Sr. No | Month  | Main Topic/Unit                     | Subtopic   | No. of Periods required |
|--------|--------|-------------------------------------|--|-------------------------|
| 1      | March  | Section II                          | Syllabus discussion, Introduction  | 05                      |
| 2      | April  | Univariate Probability distribution | Discrete random variable pmf, cdf, Median and mode, Examples   | 10                      |
| 3      | May    | Mathematical Expectation            | Defn, Result on expectation, Mean, Variance, Effect of change of origin and scale on expectation, Examples.  | 10                      |
| 4      | June   | Discrete distributions              | One point, Two point, Bernoulli, Binomial Hypergeometric distributions   | 10                      |
| 5      | July   | Bivariate Discrete Distribution     | Joint p.m.f., and c.d.f., Properties of c.d.f, concept of marginal and conditional probability distribution, independence of two discrete r.v.s, Theorems on expectations, $Cov(aX+bY, cX+dY)$ , | 10                      |
| 6      | August | Revision                            | Tests and Revision   | 04                      |

  
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**Annual Teaching Plan 2020-2021**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
 Class : B.Sc. II      Paper: VII  
 Department : Statistics  
 Paper: Probability Distributions-II(DSC-7D)SEMESTER IV (Online)

| Sr. No | Month    | Main Topic/Unit                        | Subtopic  | No. of Periods required |
|--------|----------|--|---|-------------------------|
| 1      | February |  | Introduction to the Syllabus  | 02                      |
| 2      | March    | Uniform and Exponential Distribution   | Uniform distribution: p.d.f c.d.f., sketch of p.d.f and c.d.f. m.g.f., mean, variance, moments. Distribution of (i) $(X-a) / (b-a)$ , ii) $(b-X) / (b-a)$ , (iii) $Y = F(x)$ , where $F(x)$ is cdf of $x$<br>$X \sim \text{Exp}$ , Sketch of p.d.f, c.d.f., m.g.f., c.g.f., mean, variance, C.V., moments, cumulants, median, quartiles, lack of memory property, | 06                      |
| 3      | April    | Gamma and Beta Distributions           | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, examples  | 06                      |
| 4      | May      | Normal Distribution                    | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, Properties of Normal probability curve, examples  | 10                      |
| 5      | June     | Chisquare distribution, T distribution | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, mgf, additive property, examples  | 10                      |
| 6      | July     | F distribution                         | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, mgf, additive property, examples<br>Interrelation between t, F and $\chi^2$ .   | 11                      |

  
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**Annual Teaching Plan 2020-2021**

Name of the Teacher :Dr. M. K. Patil    Designation : Professor  
Department : Statistics                      Subject : B. Sc. I (Practical) Paper-I  
(Online)


| Sr. No | Month    | Main Topic/Unit  | No. of Periods required |
|--------|----------|--|-------------------------|
| 1      | October  | --   |                         |
| 2      | November | Graphical representation,<br>Measures of central tendency -I   | 12                      |
| 3      | December | Measures of central tendency -II<br>Measures of dispersion-I<br>Measures of dispersion-II              | 16                      |
| 4      | January  | Moments, Skewness and Kurtosis for ungrouped data,<br>Moments, Skewness and Kurtosis for grouped data, | 12                      |
| 5      | February | Correlation for ungrouped data I<br>Correlation for grouped data II                                    | 12                      |
| 6      | March    | Regression I<br>Regression II  | 4                       |
| 7      | April    | Attributes I, Attribute II<br>Applications of Binomial and Hypergeometric distributions,               | 16                      |
| 8      | May      | Index number I, Index number II  | 16                      |
| 9      | June     | Bivariate Discrete Distribution I<br>Bivariate Discrete Distribution II                                | 16                      |
| 10     | July     | Practical on Computer and Revision   | 16                      |

  
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**Annual Teaching Plan 2020-2021**

Name of the Teacher :Dr. M. K. Patil      Designation : Professor  
 Department : Statistics                      Subject : B. Sc. II (Practical) Paper-II  
 (Online)

| Sr. No | Month     | Main Topic/Unit  | No. of Periods required |
|--------|-----------|--|-------------------------|
| 1      | September | --   |                         |
| 2      | October   | Fitting of discrete Uniform,<br>Fitting of Binomial distribution,<br>Fitting of Hypergeometric distributions.                                | 16                      |
| 3      | November  | Fitting of Poisson distribution.<br>Fitting of Geometric distribution.<br>Fitting of negative binomial distribution                          | 16                      |
| 4      | December  | Model sampling from discrete Uniform dist.<br>Model Sampling from Binomial distribution<br>Model sampling from Hypergeometric distributions. | 16                      |
| 5      | January   | Model sampling from Poisson distribution.<br>Model sampling from Geometric distribution.   | 12                      |
| 6      | February  | Model sampling from Negative Binomial distribution<br>Fitting of continuous Uniform distribution   | 8                       |
| 7      | March     | Fitting of Exponential distribution<br>Fitting of Normal distribution  | 16                      |
| 8      | April     | Model Sampling from continuous Uniform and Exponential distribution<br>Model Sampling from Normal distribution                               | 16                      |
| 9      | May       | Fitting of Binomial, Poisson and Negative Binomial using MS-EXCEL<br>Fitting of Exponential and Normal distribution using MS-EXCEL           | 16                      |
| 10     | June      | Revision, Journal Completion, Exam   | 8                       |

  
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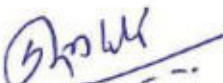
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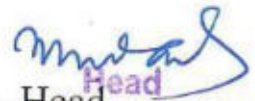
**Teaching Plan 2020-2021 (Semester I)**

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.A.I (S.T.D.-I)  |                  | B. Sc. I (Paper I)  |                 |           |                 |
|-----------------|---|------------------|---|-----------------|-----------|-----------------|
|                 | Unit//Subunit   | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No.of<br>Lects. |
| Sept            | Introduction, syllabus discussion.  | 05               | Introduction, Meaning & Scope of Statistics, sample and population  | 07              | 01        | 04              |
| Oct/<br>Nov     | Contribution of eminent Scientists in fundamental Sciences: Einstein, Newton, Edison, Dr. Homi J. Bhabha                              | 05               | Nature of data: Primary, Secondary, Qualitative, Quantitative, Scales of Measurements, Averages: Mean, Mode, Median, Def <sup>n</sup> , properties, Merits, Demerits Comparison of averages, Relation, problems | 08              | 02        | 08              |
| Dec/<br>Jan     | Contribution of eminent Scientists in fundamental Sciences: Dr. M.S. Swamiinathan, Dr. A.P. J. Abdul Kalam, Power Resources in India: | 08               | Measures of Dispersion: Absolute & Relative, Range, Q.D., M.D., S.D., C.V., Def <sup>n</sup> , properties, Merits & Demerits, Formulae, Comparison, Problems.   | 10              | 02        | 08              |
| Feb             | Conventional Non Conventional, Solar energy, Wind energy, hydel power energy, Bio-energy, Geo- thermal energy,                        | 08               | Moments: Raw, Central Def <sup>n</sup> , properties, Relation Skew ness: Concept, Measures, Problems. Kurtosis: Concept, Measures, Problems. Attributes, concept, notation,                                     | 12              | 02        | 08              |
| Mar             | Atomic energy, Carbon Credit  | 05               | Consistency, Independence, Association, relation between Q & Y, examples  | 09              | 02        | 08              |

  
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Teaching Plan 2020-2021 (Semester II)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.A.I (S.T.D.-II)   |                  | B. Sc. I (Paper III)  |                 |           |                 |
|-----------------|---|------------------|---|-----------------|-----------|-----------------|
|                 | Unit//Subunit   | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No.of<br>Lects. |
| April           | Disaster management:<br>types, importance of study  | 02               | Bivariate data, Correlation<br>concept, types, examples   | 02              | 01        | 04              |
| May             | Meaning, reasons,<br>measures<br>1. Earth quake<br>2. Flood<br>3. Drought<br>4. Fire  | 08               | Co-variance, Methods<br>of studying correlation,<br>properties, simple<br>examples. Regression-<br>concept, definition,<br>Lines of regression,   | 12              | 04        | 16              |
| Jun             | Meaning, reasons,<br>measures<br>1. Accident<br>2. Crowd  | 08               | fitting of a line of reg.,<br>regression coefficients,<br>properties, examples,<br>Index Numbers: Need,<br>meaning, problems in<br>construction   | 12              | 04        | 16              |
| July            | Science Technology in<br>Space & Ocean<br>research: satellite era,<br>rocket technology, S.<br>L.V., importance of<br>ocean study | 08               | Price, Quality and Value<br>based simple<br>(unweighted) &<br>Weighted index nos.<br>Laspeyre's, Paasche's<br>and Fisher's index<br>numbers, Tests of index<br>numbers, base shifting,<br>deflating | 12              | 04        | 16              |
| Aug             | Indian institute of<br>oceanography, revision   | 04               | Cost of living index<br>numbers, methods ,uses  | 07              | 02        | 08              |

  
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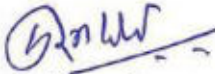
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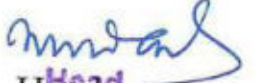
**Teaching Plan 2020-2021 (Semester III)**

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B. Com. II (B. Statistics-I)   |                  | B. Sc. II (Paper VI)  |                 |           |                  |
|-----------------|--|------------------|---|-----------------|-----------|------------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No. of<br>Lects. |
| Aug             | Introduction   |                  | -   | -               | -         | -                |
| Sept/Oct        | Meaning & Scope of Statistics Sampling techniques: Population & Sample , Census method, Sampling method, SRSWRSWOR, Stratified , Simple bar diagram , Pie chart                | 16               | Demography: Need of vital statistics, examples Mortality rates, fertility rates, population growth rates, GRR, NRR, CDR, SDR, ASDR, STDR, CBR, GFR, ASFR, TFR, Multiple linear regression, concept. | 12              | 04        | 16               |
| Nov/Dec         | Measures of Central Tendency : Concept, def <sup>n</sup> Mean, Mode, Median, Definition, properties, Merits & Demerits, examples, Measures of Dispersion: Absolute & Relative, | 16               | notation, plane of regression, correlation matrix, residual, means & variance, properties, Examples & problems.   | 12              | 04        | 16               |
| Jan             | Range, Q.D., S.D., C.V., Def <sup>n</sup> , properties, Merits & Demerits, problems, Correlation, Types, methods, Karl Pearson & Spearman Rank Formulae , examples             | 16               | Concept of Multiple & Partial correlation, derivation of formula, properties, Examples & problems. Sampling unit, elementary unit, frame Census, sampling method advantages of sampling             | 12              | 04        | 16               |
| Feb             | Regression: Concept, Lines of regression, regression coefficients & properties, Numeric problems.  | 13               | Methods of sampling, SRSWR & SRSWOR, Errors in sampling, non-response error, results on SRSWR & SRSWOR  | 09              | 03        | 12               |

  
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Teaching Plan 2020-2021 (Semester IV)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.Com. II (B. Statistics-II)  |           | B. Sc. II (Paper VIII: Statistical Methods)   |              |           |               |
|-----------------|---|-----------|---|--------------|-----------|---------------|
|                 | Unit//Subunit   | No. Lects | Theory  | No. of Lects | Practical | No. of Lects. |
| April           | Time Series: Definition, Components, Methods of determination of trend, Seasonal Variations by Simple Average Method. Numerical examples.   | 15        | Time Series: Definition, Components, Methods of determination of trend, additive, multiplicative model, utility, seasonal variations measurement        | 11           | 04        | 16            |
| May             | S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, Mean & Range chart np-chart & C-chart. Numerical examples.  | 15        | S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, Mean & Range chart np-chart & C-chart. Numerical examples.            | 13           | 04        | 16            |
| Jun             | Index Numbers: Need, meaning, Price, Quality and Value based simple (unweighted)& , Weighted index numbers, Laspeyre's, Paasche's and Fisher's index numbers, examples.                 | 15        | Tests of Hypothesis Various terms in testing, Large sample tests for means, proportions and correlation coefficients based on Normal distribution.      | 12           | 04        | 16            |
| July            | Probability and Probability Distributions: Probability: Events, laws of Probability, Examples. Binomial & Normal Distribution: Mean and Variance, Properties of normal curve, Examples. | 15        | Small sample tests based on chi square, t & F distribution, for testing variances, means, test of goodness of fit, test for independence of attributes. | 12           | 03        | 12            |

  
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P. V. P. Mahavidyalaya Kavathe Mahankal

**Teaching Plan 2020-2021 (Semester VI)**


Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class / Month | B.Sc. III, STATISTICS - XV<br>(DSE-F15: Sampling Theory)   |               | B.Sc. III, Practical VI<br>(Design of Experiments and Sampling Methods)   |               |
|---------------|--|---------------|---|---------------|
|               | Unit//Subunit  | No. of Lects. | Expt.   | No. of Lects. |
| April         | Basic Definitions and Fundamentals,<br><b>Simple Random Sampling:</b> SRSWOR, SRSWR and basic concepts. Probability of Selection of a Sample and a Unit. Estimation of population mean and variance. Estimation of variance and Confidence interval estimation. Sample size determination.   | 12            | 8. Simple Random Sampling for (i) Variables (ii) Attributes.<br>9. Determination of sample size in SRS for (i) Variables (ii) Attributes. | 10            |
| May           | <b>Stratified Sampling:</b> Basic concepts and sampling procedure. Advantages of Stratified Sampling and Estimation of Population Mean and Variance. Sample allocation and the Variances of stratum mean under allocations. Allocation, variance under allocations, proportions.   | 12            | 10. Stratified Random Sampling-I<br>11. Stratified Random Sampling-II   | 10            |
| Jun           | <b>Systematic Sampling:</b> Basic fundamentals, definitions and estimation of population mean. Various results of systematic sampling and its relation to other sampling schemes. Idea of Circular Systematic Sampling.<br><b>Cluster Sampling:</b> Basic concepts, Estimation of population mean and Variance with equal size clusters. Comparison of cluster sampling with simple random sampling. Systematic sampling as a particular case of cluster sampling. Idea of two stage and multistage sampling | 12            | 14. Systematic Sampling<br>15. Cluster Sampling.  | 10            |

|      |   |    |   |    |
|------|---|----|---|----|
| July | <p><b>Ratio Method of Estimation:</b> Basic concepts and Bias of Ratio Estimator. Mean Squared Error of Ratio Estimator. Efficiency of Ratio Estimator, Upper Limit of Ratio Estimator and estimate of MSE. Ratio Estimator in Stratified Sampling.</p> <p><b>Regression Method of Estimation:</b> Basics and fundamentals, Regression estimates with pre-assigned regression coefficient, estimate of variance. Bias and Mean Squared Error of the Regression Estimates, Comparison with Sample Random Sampling. Regression method in stratified sampling.</p> | 12 | <p>12. Ratio method of estimation<br/>13. Regression method of estimation</p> | 10 |
|------|---|----|---|----|

  
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P. V. P. Mahavidyalaya Kavathe Mahankal

Teaching Plan 2020-2021 (Semester V)

Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class / Month | B.Sc. III, STATISTICS - XI<br>(DSE-E11: Design of Experiments)  |               | B.Sc. III, Practical VI<br>(Design of Experiments)  |               |
|---------------|---|---------------|---|---------------|
|               | Unit/Subunit  | No. of Lects. | Expt.   | No. of Lects. |
| Sept          | <b>1.1: Basic Concepts,</b><br><b>1.2: Completely Randomized Design (CRD):</b> i) Application, layout, mathematical model, assumptions and interpretations.ii) Estimation of parameters, Standard Error(SE), iii) BOX-PLOT's, Visual inspection, iv)Technique of one-way ANOVA, v) Chochran's theorem (without proof), vi)Model adequacy  | 12            | -   | -             |
| Oct           | <b>1.3: Randomized Block Design (RBD):</b> i) Application, layout, mathematical model, assumptions and interpretations, ii)Estimation of parameters, iii) BOX-PLOT's, Visual inspection, iv)Technique of two-way ANOVA, iv) Related testing procedures and their interpretations, vii)Idea, Situations of missing plot technique, single missing observation analysis.<br><b>1.4: Latin Square Design (LSD):</b> i) Application, layout, mathematical model, assumptions and interpretations.ii) Estimation of parameters, Standard Error(SE), iii) BOX-PLOT's, Visual inspection.  | 12            | 1. Analysis of CRD and RBD, Efficiency of RBD over CRD.   | 5             |
| Nov / Dec     | <b>1.4: Latin Square Design (LSD):</b> iv)Related tests and their interpretations, test for equality of two specified treatment effects,comparison of treatment effects using critical difference, v)Analysis of LSD with single missing observation, vi)Identification of real life situations where CRD, RBD and LSD are used.<br><b>2.1: Analysis of non- normal data in CRD, RBD, LSD using:</b> i)Square root transformation for counts.ii)Sin-1 (.) transformation for proportions. iii)Kruskal Wallis test. <b>2.2: Efficiency of design:</b> i) Concept and definition of efficiency of a design. ii)Efficiency of RBD over CRD. iii)Efficiency of LSD over CRD and LSD over RBD. | 12            | 2. Analysis of LSD and efficiency of LSD over CRD and RBD.<br>3. Missing plot technique for RBD and LSD with single missing observations. | 10            |

|     |  |   |  |    |
|-----|--|---|--|----|
| Jan | <b>2.3: Factorial Experiments:</b> i)General description of factorial experiments, $2^2$ & $2^3$ factorial experiments arranged in RBD. ii)Definitions of main effects and interaction effects in $2^2$ and $2^3$ factorial experiments. iii)Model assumptions and its interpretation.   | 6 | 4. Analysis of Variance for non-normal data. (CRD, RBD, LSD)<br>5. Kruskal-Walli's test for non-normal data(CRD,RBD,LSD) | 10 |
| Feb | <b>2.3: Factorial Experiments:</b> iv)Preparations of ANOVA table by Yate's procedure, test for main effects and interaction effects. v)General idea and purpose of confounding in factorial experiments.<br><b>vi)Total &amp; Partial Confounding:</b> ANOVA table, Testing main effects and interaction effects. viii)Construction of layout in total confounding and partial confounding in $2^3$ factorial experiment. | 6 | 6. Analysis of $2^2$ and $2^3$ factorial experiment.<br>7. Partial and total confounding                                 | 10 |



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**Teaching Plan 2020-2021 (Semester VI)**

Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class /<br>Month | B.Sc. III, STATISTICS - XIII<br>(DSE-F13: Probability Theory and Applications)  |                  |
|------------------|---|------------------|
|                  | Unit//Subunit   | No. of<br>Lects. |
| April            | <b>Unit-1: Order Statistics and Convergence:</b><br><b>1.1: Order Statistics:</b> Order statistics for a random sample of size $n$ from a continuous distribution, Joint distribution, definition, derivation of distribution function and density function of the $i$ th order statistic, particular cases, Derivation of joint p.d.f., distribution of the sample range & Median, Examples and problems.<br><b>1.2: Convergence and Limit Theorem:</b>                  | 12               |
| May              | <b>1.3: Chebychev's Inequality:</b> Chebychev's inequality for discrete and continuous distributions.Examples.<br><b>1.4: Weak Law of Large Numbers and Central Limit Theorem:</b> statement and proof for i. i. d. random variables with finite variance.<br><b>1.5 Central Limit Theorem:</b> Statement & proof based on m. g. f., simple examples based on Bernoulli, binomial, Poisson and chi-square distribution.   | 12               |
| Jun              | <b>Unit-2: Reliability Theory:</b><br><b>2.1: Binary System:</b> Block diagrams, definition of binary coherent structure and illustrations. Coherent system of components at most three, (a) Series, (b) Parallel, (c) 2 out of 3: Minimal cut, minimal path representation of system.<br><b>2.2: Reliability of binary System:</b> Reliability of systems $h(p)$ , when components are independent and identically distributed with common probability $p$ of operating. | 12               |

|      |   |    |
|------|---|----|
| July | <p><b>2.3:Ageing Properties:</b> Definitions of hazard rate, hazard function, survival function. Concept of distributions with increasing and decreasing failure rate (IFR, DFR). Relationship between survival function and hazard function, density function and hazard rate. Derivations of results: (1) Hazard rate of a series system of components having independent life times is summation of component hazard rates.(2) Life time of series system of independent components with independent IFR life times is IFR.</p> <p><b>2.4: Examples on exponential distribution.</b></p> | 12 |
|------|---|----|



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Teaching Plan 2020-2021 (Semester V)

Sub:- Statistics

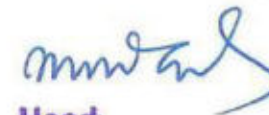
Name of Teacher :- A. P. Patil

| Class /<br>Month | B.Sc. III, STATISTICS - IX<br>(DSE-E13: Probability Distributions)   |                  | B.Sc. III, Practical IV, (Probability Distributions)   |                  |
|------------------|--|------------------|--|------------------|
|                  | Unit/Subunit   | No. of<br>Lects. | Expt.  | No. of<br>Lects. |
| Sept             | Unit-1: Univariate and Multivariate Probability Distributions<br>1.1:Laplace (Double Exponential) Distribution<br>1.2 :Lognormal Distribution<br>1.3:Cauchy Distribution   | 12               | 1. Model sampling from Laplace and Cauchy distributions.   | 5                |
| Oct              | 1.4: Weibull Distribution.<br>1.5: Logistic distribution.<br>1.6: Pareto distribution.<br>1.7:Power series distribution.<br>1.8: Multinomial distribution.   | 12               | 2.Model sampling from log-normal and Weibull distributions.<br>3. Model sampling from logistic distribution.<br>4. Model sampling from Pareto distribution.  | 15               |
| Nov /<br>Dec     | 2.2:Bivariate Normal Distribution: p.d.f., marginal and conditional distributions, identification of parameters, conditional expectation and conditional variance, regression of Y on X and of X on Y., independence and uncorrelated-ness imply each other, m. g. f and moments. Distribution of $aX + bY + c$ , where a, b and c are real numbers. Cauchy distribution as the distribution of $Z = X/Y$ . Examples and problems. | 12               | 7.Model sampling from bivariate normal distribution.<br>8. Fitting of log-normal distribution.<br>9. Fitting of Weibull distribution.<br>14. Applications of multinomial distribution.<br>15. Applications of bivariate normal distribution. | 25               |

|     |  |   |   |    |
|-----|--|---|---|----|
| Jan | Unit-2: Truncated Distributions: 2.1: Truncated distribution as conditional distribution, truncation to the right, left and on both sides.<br>Binomial distribution $B(n, p)$ left truncated at $X = 0$ ,<br>Poisson distribution $P(\lambda)$ , left truncated at $X = 0$ | 6 | 5. Model sampling from truncated binomial and Poisson distributions.<br>12. Fitting of truncated binomial distribution.<br>13. Fitting of truncated Poisson distribution. | 15 |
| Feb | 2.1: Normal distribution truncated:<br>(i) to the left below $a$ , (ii) to the right above $b$ , (iii) to the left below $a$ , and to the right above $b$ ,<br>Exponential distribution with parameter $\theta$ left truncated below $a$ .                                 | 6 | 6. Model sampling from truncated normal and exponential distributions.<br>10. Fitting of logistic distribution.<br>11. Fitting of Pareto distribution.                    | 15 |



Subject teacher



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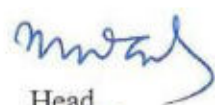
Teaching Plan 2020-2021 (Semester V)

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class / Month | B.Sc. III Statistics-XII<br>(DSE-E16: R-Programming and Quality Management)  |               | B.Sc. III Practical VII<br>(R- Programming, Quality Management and Operations Research) |               |
|---------------|--|---------------|---|---------------|
|               | Unit/Subunit   | No. of Lects. | Expt.   | No. of Lects. |
| Sept          | Introduction: History, Feathers of R, Character sets, Identifiers: Variable, Constants, Symbolic constant, key words, Data Types and Data Structure  | 6             | 1. Data input/output  | 5             |
| Oct           | Operators: Arithmetic, relational, logical, assignment, increasing, decreasing, special Operators, Character vectors, Input and output functions, Data Import and Export Function, Basic built-in function | 12            | 2. Diagrammatic and Graphical representation of data                                    | 5             |
| Nov / Dec     | Programming: Algorithm, flow chart, Structure of Programming<br>Conditional Statements: If, if else, Loops: for, while, Unconditional Statements   | 12            | 3. R-Programming (Measures of Central Tendency and Dispersion)                          | 5             |
| Jan           | Writing of your own functions, Diagrams and Graphs, Writing Simple programmes  | 12            | 4. Simulation-I using R discrete distribution   | 5             |
| Feb           | Quality Tools: Meaning and dimensions of quality, quality philosophy, Magnificent tools of quality, Deming's PDCA cycle.   | 6             | 5. Simulation-II using R continuous distribution  | 5             |

  
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P. V. P. Mahavidyalaya Kavathe Mahankal

Teaching Plan 2020-2021 (Semester VI)

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class / Month | B.Sc. III, STATISTICS - XIV<br>(DSE-F14: Statistical Inference-II)   |               | B.Sc. III Practical V<br>(Statistical Inference)   |               |
|---------------|--|---------------|--|---------------|
|               | Unit//Subunit  | No. of Lects. | Expt.  | No. of Lects. |
| April         | Interval Estimation: Notion of interval estimation, Definition of confidence interval, length of confidence interval, confidence bounds. Definition of pivotal quantity and its use in obtaining confidence intervals and bounds. Interval estimation for the different cases  | 12            | 5.Interval estimation of location and scale parameters of normal distribution.<br>6.Interval estimation of difference of location and ratio of scale parameters of normal distributions.                         | 10            |
| May           | Parametric tests: Statistical hypothesis, problems of testing of hypothesis, definitions and illustrations of (i) simple hypothesis (ii) composite hypothesis, critical region, Type I and Type II error, probabilities of type I and Type II errors. Power of a test, p-value, size of a test, level of significance, problem of controlling probabilities of type I and Type II errors. MP Test and UMP test | 12            | 7.Interval estimation for population proportion and difference between two Population proportions.<br>8.Interval estimation for population median (using order statistics and limiting Distribution of median).  | 10            |
| Jun           | Likelihood Ratio (LR) Test: Procedure of LR test, statement of its properties, LR test involving mean and variance of normal population for two sided alternative hypothesis only.   | 12            | 9.Construction of MP test.<br>10.Construction of UMP test.   | 10            |
| July          | Sequential Probability Ratio Test  | 12            | 11.Construction of SPRT for Binomial, Poisson distributions, graphical representation of procedure.<br>12. Construction of SPRT for exponential and normal distributions, graphical representation of procedure. | 10            |

  
Subject teacher

  
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P.V.P. Mahavidyalaya Kavathe Mahankal


**Teaching Plan 2020-2021 (Semester I)**

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class /<br>Month | B.Sc. I   | Practical Paper- |
|------------------|---|------------------|
|                  | I   |                  |
|                  | Unit//Subunit   | No. of<br>Lects. |
| Sep              | 1. Graphical presentation of the frequency distribution (Histogram, frequency polygon, frequency curve, Location of Mode, Ogive curves, Location of Partition values).                                    | 4                |
| Oct/Nov          | 2. Measures of Central Tendency I (ungrouped data).<br>3. Measures of Central Tendency II (grouped data).   | 8                |
| Dec/Jan          | 4. Measures of the Dispersion I (ungrouped data).<br>5. Measures of the Dispersion II (grouped data).   | 8                |
| Feb              | 6. Moments, Skewness and Kurtosis I (ungrouped data).<br>7. Moments, Skewness and Kurtosis II (grouped data).<br>8. Correlation coefficient and Spearman's rank correlation coefficient (ungrouped data). | 12               |
| Mar              | 9. Correlation coefficient (grouped data).  | 4                |

  
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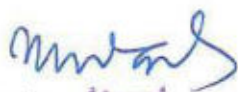
**Teaching Plan 2020-2021 (Semester I)**

Sub:- Statistics

Name of Teacher :- S.S.Bhosale

| Class / Month | B.Sc. I<br>Practical Paper-I   |               |
|---------------|--|---------------|
|               | Unit//Subunit  | No. of Lects. |
| April         | Regression I (ungrouped data).   | 4             |
| May           | Regression II (grouped data).<br>Attributes I (Missing frequencies and consistency).<br>Attributes II (Association and independence).  | 12            |
| Jun           | Applications of Binomial and Hypergeometric Distribution.<br>Index Numbers-I. (Computations of index numbers).<br>Index Numbers-II (Tests of adequacy, Shifting of base, cost of living index number).   | 12            |
| July          | Bivariate Discrete distribution I. (Marginal and conditional distribution, computation of probabilities of events).<br>Bivariate Discrete distribution II (Expectations /conditional expectations / variances /conditional variance /covariance / correlation coefficient) | 8             |
| Aug           | Using MS-EXCEL: Diagrammatic and Graphical presentation, Compute A.M., G.M., H.M., Variance, C.V., M.D.<br>Using MS-EXCEL: Moments, Correlation and Regression (ungrouped data).   | 8             |

  
Subject teacher

  
Head Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli:

P.V.P. Mahavidyalaya Kavathe Mahankal


**Teaching Plan 2020-2021 (Semester V)**

Sub:- Statistics

Name of Teacher :- S. S.  
Bhosale

| Class / Month | B.Sc. III Statistics-X<br>(DSE-E14: Statistical Inference-I)  |              | B.Sc. III Practical V<br>(Statistical Inference I)                       |               |
|---------------|---|--------------|--|---------------|
|               | Unit/Subunit  | No. of Lects | Expt.  | No. of Lects. |
| Sept          | Introduction, basic concepts.<br>Point estimation: Definition of an estimator, standard error.  | 6            | 1.Point estimation by Method of Moment for Discrete Distributions.       | 5             |
| Oct           | Properties of estimator: Unbiased estimator, biased estimator Proof of the results. Examples. Concept of Minimum Variance. UMVUE.   | 12           | 2.Point estimation by Method of Moment for Continuous Distributions      | 5             |
| Nov / Dec     | Consistency: Definition, Proof of the results. Likelihood function.<br>Sufficiency: Concept of sufficiency, Definition of sufficient statistic<br>Neyman factorization criterion, Pitmann-Koopman form. | 12           | 3.Point estimation by Method of Maximum Likelihood (for one parameters). | 5             |
| Jan           | Definition of Information function, amount of information contained in a sample, concept of minimal sufficient statistic. Examples.   | 12           | 4.Point estimation by Method of Maximum Likelihood (for one parameters). | 5             |
| Feb           | Cramer Rao Inequality: Definition of Minimum Variance Bound Unbiased Estimator (MVBUE). Proof of the results Examples.<br>Methods of Estimation   | 12           | -  | -             |

  
Subject teacher

  
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Department of Statistics  
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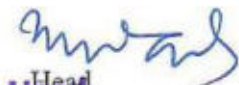
**Teaching Plan 2020-2021 (Semester VI)**

Sub:- Statistics

Name of Teacher :- S.S.Bhosale

| Class / Month | B.Sc. III, STATISTICS - XI<br>(DSE-F16: Operations Research)   |              | B.Sc. III Practical VII<br>(R Programming, Quality management and Operations Research ) |               |
|---------------|--|--------------|---|---------------|
|               | Unit//Subunit  | No. of Lects | Expt.   | No. of Lects. |
| April         | 1.1: Linear programming: Basic concepts, formulation of problem as L.P. problem. Definitions, Solution of L.P.P. Graphical Method, Simplex Method. | 12           | 1.Solution of LPP by Simplex Method   | 5             |
| May           | IBFS not readily available, Big-M method, Duality Theory. Examples and problems. Transportation problem(T.P.), MODI method, examples and problems. | 12           | 2.Solution of LLP by Big-M method.<br>3.Transformation problem                          | 10            |
| Jun           | Assignment Problem,Hungarian method, examples and problems. Sequencing Problemexamples and problems. Queuing Theory                                | 12           | 4. Assignment problem.  | 5             |
| July          | Distribution of arrival, inter arrival time, departure and service times. Examples and problems. CUSUM chart                                       | 12           | 5.Sequencing Problem.<br>6. CUSUM Chart   | 10            |

  
Subject teacher

  
Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

To,

01.07.2020

The Principal,  
P. V. P. Mahavidyalaya, Kavathe Mahankal.  
Dist: Sangli

Subject: Teaching plan and workload of Statistics Department for the year 2020-21

Respected Sir,

I am here with submitting the following documents of Statistics Department for the year 2020-21

- i) Teaching plan for the year 2020-21
- ii) Total Workload.
- iii) Teacher wise workload.

Please accept it and do the needful.

Yours sincerely



**Head**  
Dr. M. K. Pail  
Department of Statistics  
P.V.P. Mahavidyalaya  
Kavathe Mahankal, Dist.-Sangli.

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
 Class : B.A.I  
**Subject:** CGE (Core Generic Elective) Science Technology and  
 Development- **Course 1**  
**Semester I**

| Sr. No. | Month     | Main Topic/Unit                      | Subtopic   | No. of Periods required |
|---------|-----------|--------------------------------------|--|-------------------------|
| 1       | June      | Introduction                         | Syllabus discussion  | 02                      |
| 2       | July      | Scientific outlook                   | Scientific thinking, Observation, Experimentation,                 | 05                      |
| 3       | August    |                                      | Analysis, Science and superstitions                                | 05                      |
| 4       | September | Science, Technology and Human Health | Blood Groups, AIDS, Addiction,                                     | 05                      |
| 5       | October   |                                      | Need of Cleanliness: "Swachh Bharat Abhiyan" (Clean India Mission) | 05                      |

*M. K. Patil*

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

**Head**  
 Department of Statistics  
 P.V.P. Mahavidyalaya,  
 Kavathe Mahankal, Dist.-Sar

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
 Class: B.Sc. I      **Semester I** Department : Statistics  
**Paper: II**  
**Paper: Elementary Probability Theory (DSC A8)**

| Sr. No. | Month     | Main Topic/Unit                  | Subtopic   | No. of Periods required |
|---------|-----------|----------------------------------|--|-------------------------|
| 1       | June      | Introduction--                   | Syllabus discussion  | 02                      |
| 2       | July      | Sample space and Events          | Random experiments. Sample space, Discrete sample space Event, 1.3: Algebra of events (Union, Intersection, Complementation ). Symbolic representation | 11                      |
| 3       | August    | Probability Axiomatic definition | Apriori, examples. Proof of the theorems on probability ,Illustrative examples based on results in 2   | 11                      |
| 4       | September | Conditional Probability          | Definition, Multiplication theorem, Partition of the sample space, Baye's theorem, Examples  | 11                      |
| 5       | October   | Independence of the events       | Concept, Theorems on independence. Pair wise and mutual independence for three events, Examples.   | 10                      |

**Head**  
 Department of Statistis  
 P.V.P. Mahavidyalay  
 Kavathe Mahankal, Dist.-

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2020-2021**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor

Class : B.A.I

**Subject:** CGE (Core Generic Elective) Science Technology and Development

**:Course 2**

**Semester II**

| Sr. No. | Month    | Main Topic/Unit                                  | Subtopic  | No. of Periods required |
|---------|----------|--|---|-------------------------|
| 1       | November | Introduction                                     | Syllabus Discussion   | 02                      |
| 2       | December | Means of Communications & Information Technology | History of communication, IT, Computer,   | 05                      |
| 3       | January  |  | Computer Network, Internet, Viruses, GIS, GPS   | 05                      |
| 4       | February | Science Technology in Space and Ocean Research   | Beginning Of Satellite Era in the World, Rocket Technology, Artificial Satellite-Types and uses | 05                      |
| 5       | March    |  | Satellite Programme of India, Importance of Oceanic Study, Indian Institute of Oceanography     | 05                      |

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2020-2021**

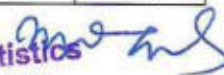
Name of the Teacher : Dr. M. K. Patil      Designation : Professor

Class: B.Sc. I

**Semester II** Department of Statistics

**Paper: II      Paper: Discrete Probability Distributions (DSC B8)**

| Sr. No. | Month    | Main Topic/Unit                     | Subtopic   | No. of Periods required |
|---------|----------|-------------------------------------|--|-------------------------|
| 1       | November | Section II                          | Syllabus discussion, Introduction  | 05                      |
| 2       | December | Univariate Probability distribution | Discrete random variable pmf, cdf, Median and mode, Examples   | 10                      |
| 3       | January  | Mathematical Expectation            | Defn, Result on expectation, Mean, Variance, Effect of change of origin and scale on expectation, Examples.  | 10                      |
| 4       | February | Discrete distributions              | One point, Two point, Bernoulli, Binomial Hypergeometric distributions   | 10                      |
| 5       | March    | Bivariate Discrete Distribution     | Joint p.m.f., and c.d.f., Properties of c.d.f, concept of marginal and conditional probability distribution, independence of two discrete r.v.s, Theorems on expectations, $Cov(aX+bY, cX+dY)$ , | 10                      |
| 6       | April    | Revision                            | Tests and Revision   | 04                      |

  
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 Kavathe Mahankal, Dist.-Sangli

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2020-2021**

Name of the Teacher :Dr. M. K. Patil      Designation : Professor  
Department : Statistics                      Subject : **B. Sc. I (Practical) Paper-I**

| Sr. No | Month     | Main Topic/Unit  | No. of Periods required |
|--------|-----------|--|-------------------------|
| 1      | June      | --   |                         |
| 2      | July      | Graphical representation,<br>Measures of central tendency -I   | 12                      |
| 3      | August    | Measures of central tendency -II<br>Measures of dispersion-I<br>Measures of dispersion-II              | 16                      |
| 4      | September | Moments, Skewness and Kurtosis for ungrouped data,<br>Moments, Skewness and Kurtosis for grouped data, | 12                      |
| 5      | October   | Correlation for ungrouped data I<br>Correlation for grouped data II                                    | 12                      |
| 6      | November  | Regression I<br>Regression II  | 4                       |
| 7      | December  | Attributes I, Attribute II<br>Applications of Binomial and Hypergeometric distributions,               | 16                      |
| 8      | January   | Index number I, Index number II  | 16                      |
| 9      | February  | Bivariate Discrete Distribution I<br>Bivariate Discrete Distribution II                                | 16                      |
| 10     | March     | Practical on Computer and Revision   | 16                      |

**Head**  
**Department of Statistics**  
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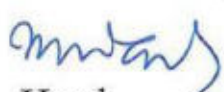
Teaching Plan 2021-2022 (Semester I)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.A.I (S.T.D.-I)   |                  | B. Sc. I (Paper I)  |                 |           |                 |
|-----------------|--|------------------|---|-----------------|-----------|-----------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No.of<br>Lects. |
| Oct/<br>Nov     | Introduction, syllabus discussion. Contribution of eminent Scientists in fundamental Sciences: Einstein, Newton,                         | 05               | Introduction, Meaning & Scope of Statistics, sample and population  | 08              | 01        | 04              |
| Dec             | Contribution of eminent Scientists : Dr. Homi J. Bhabha, Dr. M.S. Swamiinathan, Dr. A.P. J. Abdul Kalam,                                 | 08               | Nature of data: Primary, Secondary, Qualitative, Quantitative, Scales of Measurements, Averages: Mean, Mode, Median, Def <sup>n</sup> , properties, Merits, Demerits Comparison of averages, Relation, problems                     | 12              | 04        | 16              |
| Jan             | Power Resources in India: Conventional Non Conventional, Solar energy, Wind energy, hydel power energy, Bio-energy, Geo- thermal energy, | 08               | Measures of Dispersion: Absolute & Relative, Range, Q.D., M.D., S.D., C.V., Def <sup>n</sup> , properties, Moments: Raw, Central Def <sup>n</sup> , properties, Relation Skew ness: Concept, Measures, Problems. Kurtosis: Concept, | 12              | 04        | 16              |
| Feb             | Atomic energy, Carbon Credit   | 02               | Attributes, concept, notation, Consistency, Independence, Association , relation between Q & Y, examples  | 06              | 01        | 04              |

  
Sub Teacher

  
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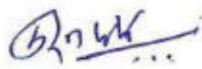
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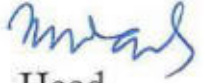
**Teaching Plan 2021-2022 (Semester III)**

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B. Com. II (B. Statistics-I)   |                  | B. Sc. II (Paper VI)  |                 |           |                  |
|-----------------|--|------------------|---|-----------------|-----------|------------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No. of<br>Lects. |
| Oct<br>/Nov     | Meaning & Scope of<br>Statistics Sampling<br>techniques: Population &<br>Sample , Census method,<br>Sampling method,<br>SRSWRSRSWOR,<br>Stratified , Simple bar<br>diagram , Pie chart   | 14               | Demography: Need of<br>vital statistics, examples<br>Mortality rates, fertility<br>rates, population growth<br>rates, GRR, NRR, CDR,<br>SDR, ASDR, STDR,<br>CBR, GFR, ASFR, TFR,<br>Sampling unit,<br>elementary unit, frame<br>Census, sampling method | 12              | 04        | 16               |
| Dec             | Measures of Central<br>Tendency : Concept, def <sup>n</sup><br>Mean, Mode, Median,<br>Definition, properties,<br>Merits & Demerits,<br>examples, Measures of<br>Dispersion: Absolute &<br>Relative, Range, Q.D.,<br>S.D., C.V., Def <sup>n</sup> , properties, | 16               | advantages of sampling<br>Methods of sampling,<br>SRSWR & SRSWOR,<br>Errors in sampling, non-<br>response error, results on<br>SRSWR & SRSWOR<br>Multiple linear regression,<br>concept. notation   | 12              | 04        | 16               |
| Jan             | Correlation, Types,<br>methods, Karl Pearson &<br>Spearman Rank Formulae ,<br>examples<br>Regression: Concept,<br>Lines of regression,   | 16               | Plane of regression,<br>correlation matrix,<br>residual, means &<br>variance, properties,<br>Examples & problems.<br>Concept of Multiple &<br>Partial correlation,  | 12              | 04        | 16               |
| Feb             | Regression coefficients &<br>properties, Numeric<br>problems.  | 08               | Derivation of formula,<br>properties, Examples &<br>problems.   | 09              | 03        | 12               |

  
Sub Teacher

  
Head  
Head  
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P. V. P. Mahavidyalaya Kavathe Mahankal

Teaching Plan 2021-2022 (Semester V)


Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class / Month | B.Sc. III, STATISTICS - IX<br>(DSE-E13: Probability Distributions)  |               | B.Sc. III, Practical IV, (Probability Distributions)   |               |
|---------------|---|---------------|--|---------------|
|               | Unit//Subunit   | No. of Lects. | Expt.  | No. of Lects. |
| Oct/Nov       | Unit-1: Univariate and Multivariate Probability Distributions<br>1.1:Laplace (Double Exponential) Distribution<br>1.2 :Lognormal Distribution, 1.3:Cauchy Distribution,<br>1.4: Weibull Distribution, 1.5: Logistic distribution.<br>1.6: Pareto distribution, 1.7:Power series distribution.   | 15            | 1. Model sampling from Laplace and Cauchy distributions.   | 5             |
| Dec           | Unit-2: Truncated Distributions: 2.1: Truncated distribution as conditional distribution, truncation to the right, left and on both sides. Binomial distribution $B(n, p)$ left truncated at $X = 0$ , Poisson distribution $P(\lambda)$ , left truncated at $X = 0$ , 2.1: Normal distribution truncated: (i) to the left below $a$ , (ii) to the right above $b$ , (iii) to the left below $a$ , and to the right above $b$ , Exponential distribution with parameter $\Theta$ left truncated below $a$ . | 15            | 2.Model sampling from log-normal and Weibull distributions.<br>3. Model sampling from logistic distribution.<br>4. Model sampling from Pareto distribution.  | 15            |
| Jan           | 2.2:Bivariate Normal Distribution: p.d.f., marginal and conditional distributions, identification of parameters, conditional expectation and conditional variance, regression of $Y$ on $X$ and of $X$ on $Y$ .,  | 12            | 7.Model sampling from bivariate normal distribution.<br>8. Fitting of log-normal distribution.<br>9. Fitting of Weibull distribution.<br>14. Applications of multinomial distribution.<br>15. Applications of bivariate normal distribution. | 25            |

|     |  |   |   |    |
|-----|--|---|---|----|
| Feb | <p>Independence and uncorrelated-ness imply each other, m. g. f and moments. Distribution of <math>aX + bY + c</math>, where a, b and c are real numbers. Cauchy distribution as the distribution of <math>Z = X/Y</math>.<br/>Examples and problems.<br/>1.8: Multinomial distribution.</p> | 6 | <p>5. Model sampling from truncated binomial and Poisson distributions.<br/>12. Fitting of truncated binomial distribution.<br/>13. Fitting of truncated Poisson distribution.<br/>6. Model sampling from truncated normal and exponential distributions.<br/>10. Fitting of logistic distribution.<br/>11. Fitting of Pareto distribution.</p> | 30 |
|-----|--|---|---|----|

  
Subject teacher

  
Head  
Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist.-Sangli.

P. V. P. Mahavidyalaya Kavathe Mahankal


Teaching Plan 2021-2022 (Semester V)

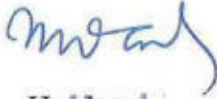
Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class / Month | B.Sc. III, STATISTICS - XI<br>(DSE-E11: Design of Experiments)  |               | B.Sc. III, Practical VI (Design of Experiments)   |               |
|---------------|---|---------------|---|---------------|
|               | Unit/Subunit  | No. of Lects. | Expt.   | No. of Lects. |
| Oct/Nov       | <b>1.1: Basic Concepts,</b><br><b>1.2: Completely Randomized Design (CRD):</b> i) Application, layout, mathematical model, assumptions and interpretations.ii) Estimation of parameters, Standard Error(SE), iii) BOX-PLOT's, Visual inspection, iv)Technique of one-way ANOVA, v) Chochran's theorem (without proof), vi)Model adequacy  | 12            | -   | -             |
| Dec           | <b>1.3: Randomized Block Design (RBD):</b> i) Application, layout, mathematical model, assumptions and interpretations, ii)Estimation of parameters, iii) BOX-PLOT's, Visual inspection, iv)Technique of two-way ANOVA, iv) Related testing procedures and their interpretations, vii)Idea, Situations of missing plot technique, single missing observation analysis.<br><b>1.4: Latin Square Design (LSD):</b> i) Application, layout, mathematical model, assumptions and interpretations.ii) Estimation of parameters, Standard Error(SE), iii) BOX-PLOT's, Visual inspection.  | 12            | 1. Analysis of CRD and RBD, Efficiency of RBD over CRD.   | 5             |
| Jan           | <b>1.4: Latin Square Design (LSD):</b> iv)Related tests and their interpretations, test for equality of two specified treatment effects,comparison of treatment effects using critical difference, v)Analysis of LSD with single missing observation, vi)Identification of real life situations where CRD, RBD and LSD are used.<br><b>2.1: Analysis of non- normal data in CRD, RBD, LSD using:</b> i)Square root transformation for counts.ii)Sin-1 (.) transformation for proportions. iii)Kruskal Wallis test. <b>2.2: Efficiency of design:</b> i) Concept and definition of efficiency of a design. ii)Efficiency of RBD over CRD. iii)Efficiency of LSD over CRD and LSD over RBD. | 12            | 2. Analysis of LSD and efficiency of LSD over CRD and RBD.<br>3. Missing plot technique for RBD and LSD with single missing observations. | 10            |

|     |  |    |  |    |
|-----|--|----|--|----|
| Feb | <p><b>2.3: Factorial Experiments:</b> iv)Preparations of ANOVA table by Yate's procedure, test for main effects and interaction effects. v)General idea and purpose of confounding in factorial experiments.</p> <p>vi)<b>Total &amp; Partial Confounding:</b> ANOVA table, Testing main effects and interaction effects. viii)Construction of layout in total confounding and partial confounding in <math>2^3</math> factorial experiment.</p> <p>2.3: Factorial Experiments: i)General description of factorial experiments, <math>2^2</math> &amp; <math>2^3</math> factorial experiments arranged in RBD. ii)Definitions of main effects and interaction effects in <math>2^2</math> and <math>2^3</math> factorial experiments.</p> <p>iii)Model assumptions and its interpretation.</p> | 12 | <p>4. Analysis of Variance for non-normal data. (CRD, RBD, LSD)</p> <p>5. Kruskal-Walli's test for non-normal data(CRD,RBD,LSD),</p> <p>6. Analysis of <math>2^2</math> and <math>2^3</math> factorial experiment.</p> <p>7. Partial and total confounding</p> | 20 |
|-----|--|----|--|----|

  
Subject teacher

  
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Teaching Plan 2021-2022 (Semester VI)


Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class /<br>Month | B.Sc. III, STATISTICS - XIII<br>(DSE-F13: Probability Theory and Applications)  |                  |
|------------------|---|------------------|
|                  | Unit//Subunit   | No. of<br>Lects. |
| March/<br>April  | <b>Unit-1: Order Statistics and Convergence:</b><br><b>1.1: Order Statistics:</b> Order statistics for a random sample of size $n$ from a continuous distribution, Joint distribution, definition, derivation of distribution function and density function of the $i$ th order statistic, particular cases, Derivation of joint p.d.f., distribution of the sample range & Median, Examples and problems.<br><b>1.2: Convergence and Limit Theorem:</b>                  | 12               |
| May              | <b>1.3: Chebychev's Inequality:</b> Chebychev's inequality for discrete and continuous distributions.Examples.<br><b>1.4: Weak Law of Large Numbers and Central Limit Theorem:</b> statement and proof for i. i. d. random variables with finite variance.<br><b>1.5 Central Limit Theorem:</b> Statement & proof based on m. g. f., simple examples based on Bernoulli, binomial, Poisson and chi-square distribution.   | 12               |
| Jun              | <b>Unit-2: Reliability Theory:</b><br><b>2.1: Binary System:</b> Block diagrams, definition of binary coherent structure and illustrations. Coherent system of components at most three, (a) Series, (b) Parallel, (c) 2 out of 3: Minimal cut, minimal path representation of system.<br><b>2.2: Reliability of binary System:</b> Reliability of systems $h(p)$ , when components are independent and identically distributed with common probability $p$ of operating. | 12               |

|      |   |    |
|------|---|----|
| July | <p><b>2.3:Ageing Properties:</b> Definitions of hazard rate, hazard function, survival function. Concept of distributions with increasing and decreasing failure rate (IFR, DFR). Relationship between survival function and hazard function, density function and hazard rate. Derivations of results: (1) Hazard rate of a series system of components having independent life times is summation of component hazard rates.(2) Life time of series system of independent components with independent IFR life times is IFR.</p> <p><b>2.4: Examples on exponential distribution.</b></p> | 12 |
|------|---|----|

  
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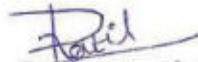
Teaching Plan 2021-2022 (Semester VI)

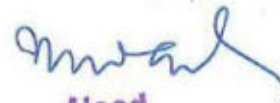
Sub:- Statistics

Name of Teacher :- A. P. Patil

| Class / Month   | B.Sc. III, STATISTICS - XV<br>(DSE-F15: Sampling Theory)   |               | B.Sc. III, Practical VI<br>(Design of Experiments and Sampling Methods)   |               |
|-----------------|--|---------------|---|---------------|
|                 | Unit/Subunit   | No. of Lects. | Expt.   | No. of Lects. |
| March/<br>April | Basic Definitions and Fundamentals,<br><b>Simple Random Sampling:</b> SRSWOR, SRSWR and basic concepts. Probability of Selection of a Sample and a Unit. Estimation of population mean and variance. Estimation of variance and Confidence interval estimation. Sample size determination.   | 12            | 8. Simple Random Sampling for (i) Variables (ii) Attributes.<br>9. Determination of sample size in SRS for (i) Variables (ii) Attributes. | 10            |
| May             | <b>Stratified Sampling:</b> Basic concepts and sampling procedure. Advantages of Stratified Sampling and Estimation of Population Mean and Variance. Sample allocation and the Variances of stratum mean under allocations. Allocation, variance under allocations, proportions.   | 12            | 10. Stratified Random Sampling-I<br>11. Stratified Random Sampling-II   | 10            |
| Jun             | <b>Systematic Sampling:</b> Basic fundamentals, definitions and estimation of population mean. Various results of systematic sampling and its relation to other sampling schemes. Idea of Circular Systematic Sampling.<br><b>Cluster Sampling:</b> Basic concepts, Estimation of population mean and Variance with equal size clusters. Comparison of cluster sampling with simple random sampling. Systematic sampling as a particular case of cluster sampling. Idea of two stage and multistage sampling | 12            | 14. Systematic Sampling<br>15. Cluster Sampling.  | 10            |

|      |   |    |  |     |
|------|---|----|--|-----|
| July | <p><b>Ratio Method of Estimation:</b> Basic concepts and Bias of Ratio Estimator. Mean Squared Error of Ratio Estimator. Efficiency of Ratio Estimator, Upper Limit of Ratio Estimator and estimate of MSE. Ratio Estimator in Stratified Sampling.</p> <p><b>Regression Method of Estimation:</b> Basics and fundamentals, Regression estimates with pre-assigned regression coefficient, estimate of variance. Bias and Mean Squared Error of the Regression Estimates, Comparison with Sample Random Sampling. Regression method in stratified sampling.</p> | 12 | <p>12. Ratio method of estimation</p> <p>13. Regression method of estimation</p> | 10. |
|------|---|----|--|-----|

  
Subject teacher

  
Head  
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**Teaching Plan 2021-2022 (Semester V)**

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class / Month | B.Sc. III Statistics-XII<br>(DSE-E16: R-Programming and Quality Management)   |              | B.Sc. III Practical VII<br>(R- Programming, Quality Management and Operations Research) |               |
|---------------|---|--------------|---|---------------|
|               | Unit//Subunit   | No. of Lects | Expt.   | No. of Lects. |
| Oct 2021      | Introduction: History, Feathers of R, Character sets, Identifiers: Variable, Constants, Symbolic constant, key words, Data Types and Data Structure   | 6            | 1. Data input/output  | 5             |
| Nov 2021      | Operators: Arithmetic, relational, logical, assignment, increasing, decreasing, special Operators, Character vectors, Input and output functions, Data Import and Export Function, Basic built-in function                        | 12           | 2. Diagrammatic and Graphical representation of data                                    | 5             |
| Dec 2021      | Programming: Algorithm, flow chart, Structure of Programming<br>Conditional Statements: If, if else, Loops: for, while, Unconditional Statements<br>Writing of your own functions, Diagrams and Graphs, Writing Simple programmes | 12           | 3. R- Programming (Measures of Central Tendency and Dispersion)                         | 5             |
| Jan 2022      | Quality Tools: Meaning and dimensions of quality, quality philosophy, Magnificent tools of quality, Deming's PDCA cycle   | 12           | 4. Simulation-I using R discrete distribution   | 5             |
| Feb 2022      | Examinations  |              | 5. Simulation-II using R continuous distribution  | 5             |

  
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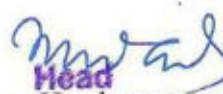
Teaching Plan 2020-2021 (Semester VI)

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class / Month           | B.Sc. III, STATISTICS - XIV<br>(DSE-F14: Statistical Inference-II)   |              | B.Sc. III Practical V<br>(Statistical Inference )  |               |
|-------------------------|--|--------------|--|---------------|
|                         | Unit//Subunit  | No. of Lects | Expt.  | No. of Lects. |
| March/<br>April<br>2022 | Interval Estimation: Notion of interval estimation, Definition of confidence interval, length of confidence interval, confidence bounds. Definition of pivotal quantity and its use in obtaining confidence intervals and bounds. Interval estimation for the different cases  | 12           | 5.Interval estimation of location and scale parameters of normal distribution.<br>6.Interval estimation of difference of location and ratio of scale parameters of normal distributions.                         | 10            |
| May<br>2022             | Parametric tests: Statistical hypothesis, problems of testing of hypothesis, definitions and illustrations of (i) simple hypothesis (ii) composite hypothesis, critical region, Type I and Type II error, probabilities of type I and Type II errors. Power of a test, p-value, size of a test, level of significance, problem of controlling probabilities of type I and Type II errors. MP Test and UMP test | 12           | 7.Interval estimation for population proportion and difference between two Population proportions.<br>8.Interval estimation for population median (using order statistics and limiting Distribution of median).  | 10            |
| June<br>2022            | Likelihood Ratio (LR) Test: Procedure of LR test, statement of its properties, LR test involving mean and variance of normal population for two sided alternative hypothesis only.   | 12           | 9.Construction of MP test.<br>10.Construction of UMP test.   | 10            |
| July<br>2022            | Sequential Probability Ratio Test<br>Examinations  | 12           | 11.Construction of SPRT for Binomial, Poisson distributions, graphical representation of procedure.<br>12. Construction of SPRT for exponential and normal distributions, graphical representation of procedure. | 10            |

  
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**P.V.P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2021-22**

**B.Sc. III (Semester VI)**

Sub:- Statistics

Name of Teacher :- G. D. Satpute

| Class/<br>Month | <b>B.Sc. III STATISTICS - XIV ( Statistical inference-II)</b>   |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/Subunit  | No.<br>Lects | Practical | No.<br>Lects |
| Mar             | Introduction, Interval Estimation & It's Notions, Definition. Length and confidence bounds of confidence interval, pivotal quantity and its use to obtaining confidence Intervals and bounds. Interval estimation for: Mean and Variance of normal distribution, difference between means of normal distribution and mean of exponential distribution.  | 11           | 02        | 20           |
| Apr             | Interval estimation for : Ratio of variances for samples from two independent normal populations, Population proportion and difference of two population proportions, Statistical hypothesis, problems of testing of hypothesis, def. simple and composite hypothesis, C. R., Type I and Type II error and probabilities of two errors. Power of a test, p-value, size of a test, level of significance, problem of controlling probabilities of type I and Type II errors.   | 12           | 03        | 20           |
| May             | Definition of MP test. Statement and proof of Neyman- Pearson lemma for MP test. Examples on MP test. Power function of a test, power curve, definition of Uniformly Most Powerful test, Use of NP lemma for constructing UMP test of level $\alpha$ for one-sided alternative. Computation of powers for standard probability distributions. Likelihood Ratio Test Procedure statement & its properties, LR test involving mean and variance of normal population for this alternative hypothesis $H_0: \mu = \mu_0$ v/s $H_1: \mu \neq \mu_0$ and $H_0: \sigma^2 = \sigma_0^2$ v/s $H_1: \sigma^2 \neq \sigma_0^2$                                  | 12           | 03        | 20           |
| June            | General theory of sequential analysis and procedure. Test for binomial, Poisson, exponential and normal Distributions & Graphical and tabular procedure for test. Non-parametric tests: Notion, comparison with parametric statistical, Concept of distribution free statistic. And test i) Run test for randomness and run test for equality of distributions. ii) Sign test for one sample and two sample paired observations iii) Wilcoxon's signed rank test for one sample and two samples paired observations iv) Mann-Whitney U-test (Two independent samples) v) Median test vi) Kolmogorov Smirnov test for one and two independent samples. | 10           | 03        | 15           |

*G. D. Satpute*  
Sub Teacher

*G. D. Satpute*  
Head Head  
Department of Statistics  
P.V.P. Mahavidyalaya  
Kavathe Mahankal, Dist.-S.

P.V.P. Mahavidyalaya Kavathe Mahankal

**Teaching Plan 2021-2022 (Semester V)**

Sub:- Statistics

Name of Teacher :- S.S.  
Bhosale

| Class / Month | B.Sc. III Statistics-X<br>(DSE-E14: Statistical Inference-I)  |               | B.Sc. III Practical V<br>(Statistical Inference I)                       |               |
|---------------|---|---------------|--|---------------|
|               | Unit//Subunit   | No. of Lects. | Expt.  | No. of Lects. |
| Oct           | Introduction, basic concepts. Point estimation: Definition of an estimator, standard error. Properties of estimator: Unbiased estimator, biased estimator Proof of the results. Examples.                                     | 12            | 1.Point estimation by Method of Moment for Discrete Distributions.       | 5             |
| Nov           | Concept of Minimum Variance. UMVUE. Consistency: Definition, Proof of the results. Likelihood function. Sufficiency: Concept of sufficiency,  | 12            | 2.Point estimation by Method of Moment for Continuous Distributions      | 5             |
| Dec           | Definition of sufficient statistic Neyman factorization criterion, Pitmann-Koopman form. Definition of Information function, amount of information contained in a sample , concept of minimal sufficient statistic. Examples. | 12            | 3.Point estimation by Method of Maximum Likelihood (for one parameters). | 5             |
| Jan           | Cramer Rao Inequality:Definition of Minimum Variance Bound Unbiased Estimator (MVBUE). Proof of the results Examples.Methods of Estimation.MME,MLE.Examples   | 12            | 4.Point estimation by Method of Maximum Likelihood (for one parameters). | 5             |
| Feb           | Semester Examination  | -             | -  | -             |

  
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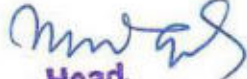
**Teaching Plan 2021-2022 (Semester VI)**

Sub:- Statistics

Name of Teacher :- S.S.Bhosale

| Class / Month   | B.Sc. III, STATISTICS - XI<br>(DSE-F16: Operations Research)  |              | B.Sc. III Practical VII<br>(R Programming, Quality management and Operations Research ) |               |
|-----------------|---|--------------|---|---------------|
|                 | Unit//Subunit   | No. of Lects | Expt.   | No. of Lects. |
| March/<br>April | Linear programming: Basic concepts, formulation of problem as L.P. problem. Definitions, Solution of L.P.P. Graphical Method, Simplex Method. IBFS not readily available, Big-M method.       | 16           | 1.Solution of LPP by Simplex Method   | 5             |
| May             | Big-M method: Examples, Duality Theory. Examples and problems. Transportation problem(T.P.), MODI method, examples and problems. Assignment Problem, Hungarian method, examples and problems. | 16           | 2.Solution of LLP by Big-M method.<br>3.Transformation problem                          | 10            |
| Jun             | Sequencing Problem : examples and problems. Queuing Theory<br>Distribution of arrival, inter arrival time, departure and service times. Examples and problems. Simulation Technique           | 16           | 4. Assignment problem.<br>5.Sequencing Problem.   | 10            |
| July            | Semester Examination  |              | Practical Examination   |               |

  
Subject teacher

  
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Department of Statistics  
P.V.P. Mahavidyalaya,  
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To,

01.08.2022

The Principal,  
P. V. P. Mahavidyalaya, Kavathe Mahankal.  
Dist: Sangli

Subject: Teaching plan and workload of Statistics Department for the year 2022-23

Respected Sir,

I am here with submitting the following documents of Statistics Department for the year 2022-2023

- i) Teaching plan for the year 2022-2023
- ii) Total Workload.
- iii) Teacher wise workload.

Please accept it and do the needful.

Yours sincerely

Dr. M. K. Patil  
Department of Statistics

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2022-2023**


Name of the Teacher : Dr. M. K. Patil      Designation : Professor

Class : B.A.I

**Subject:** CGE (Core Generic Elective) Science Technology and  
Development- Course 1

**Semester I**

| Sr. No | Month     | Main Topic/Unit                      | Subtopic   | No. of Periods required |
|--------|-----------|--------------------------------------|--|-------------------------|
| 1      | August    | Introduction                         | Syllabus discussion  | 02                      |
| 2      | September | Scientific outlook                   | Scientific thinking, Observation, Experimentation,                 | 05                      |
| 3      | October   |                                      | Analysis, Science and superstitions                                | 05                      |
| 4      | November  | Science, Technology and Human Health | Blood Groups, AIDS, Addiction,                                     | 05                      |
|        |           |                                      | Need of Cleanliness: "Swachh Bharat Abhiyan" (Clean India Mission) | 05                      |
| 5      | December  | Revision                             | Nature of question papers. Tests                                   | 05                      |

  
**Head**  
**Department of Statistics**  
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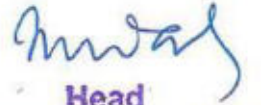
**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2022-2023**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
Class:                      B.Sc. I                                      Semester I Department : Statistics

**Paper: II**

**Paper: Elementary Probability Theory (DSC A8)**

| Sr. No | Month     | Main Topic/Unit   | Subtopic  | No. of Periods required |
|--------|-----------|---|---|-------------------------|
| 1      | August    | Introduction--  | Syllabus discussion   | 02                      |
| 2      | September | Sample space and Events, Probability Axiomatic definition.        | Random experiments. Sample space, Discrete sample space Event, 1.3: Algebra of events (Union, Intersection, Complementation ). Symbolic representation. Apriori, examples. Proof of the theorems on probability , Illustrative examples based on results in 2 | 11                      |
| 3      | October   | Conditional Probability   | Definition, Multiplication theorem, Partition of the sample space, Baye's theorem, Examples   | 11                      |
| 4      | November  | Independence of the events  | Concept, Theorems on independence. Pairwise and mutual independence for three events, Examples.   | 11                      |
| 5      | December  | Univariate Probability Distributions and Mathematical Expectation | Definition of discrete r.v., Pdf, cdf, Median, Mode, Expectation of Random Variable and theorems on expectations. Pgf and effect of change of origin and scale on pgf.  | 10                      |

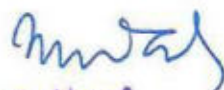


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**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2022-2023**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor  
 Class : B.Sc. II      Paper: V  
 Department : Statistics      **SEMESTER III**  
**Paper: Probability distributions: I (DSC-7C)**

| Sr. No | Month     | Main Topic/Unit                     | Subtopic  | No. of Periods required |
|--------|-----------|-------------------------------------|---|-------------------------|
| 1      | August    | Introduction                        | Syllabus discussion   | 02                      |
| 2      | September | Discrete Distributions              | Poisson distribution, Geometric distribution, Negative binomial distribution. Mean, Variance, pgf, recurrence relation, etc.  | 10                      |
| 3      | October   | Continuous univariate distributions | Definition of the continuous sample space with illustrations, Definition of c.r.v., p.d.f., and c.d.f., properties of c.d.f.. Expectation of r.v, raw and central moments, skewness and kurtosis. m.g.f. definition and properties. c.g.f. definition, properties of cgf  | 10                      |
| 4      | November  | Continuous Bivariate Distributions  | Definition of bivariate continuous random variable(X, Y), Joint p.d.f., c.d.f. Expectation of g(X, Y),<br>i) $E(X \pm Y) = E(X) \pm E(Y)$ , ii) $E[E(X/Y)] = E(X)$ .<br>If X and Y are independent r.v.s. then<br>(i) $E(XY) = E(X)E(Y)$ ,<br>(ii) $M_{X+Y}(t) = M_X(t)M_Y(t)$  | 10                      |
| 5      | December  | Transformations of continuous r.v.  | Transformation of univariate continuous r.v.: Distribution of $Y=g(X)$ , where g is monotonic or non monotonic using (i) Jacobian of transformation, (ii) Distribution function and (iii) m.g.f. methods. Transformation of continuous bivariate r.v.s.: Distribution of bivariate r.v.s. using Jacobian of transformation. | 10                      |

  
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**Kavathe Mahankal, Dist.-Sangli.**

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2022-2023**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor

Class : B.A.I

**Subject:** CGE (Core Generic Elective) Science Technology and Development  
**:Course 2** **Semester II**

| Sr. No | Month    | Main Topic/Unit                                  | Subtopic  | No. of Periods required |
|--------|----------|--|---|-------------------------|
| 1      | January  | Introduction                                     | Syllabus Discussion   | 02                      |
| 2      | February | Means of Communications & Information Technology | History of communication, IT, Computer,   | 05                      |
| 3      | March    |  | Computer Network, Internet, Viruses, GIS, GPS   | 05                      |
| 4      | April    | Science Technology in Space and Ocean Research   | Beginning Of Satellite Era in the World, Rocket Technology, Artificial Satellite-Types and uses | 05                      |
| 5      | May      |  | Satellite Programme of India, Importance of Oceanic Study, Indian Institute of Oceanography     | 05                      |

**P.V.P. Mahavidyalaya, Kavathe Mahankal**

**Annual Teaching Plan 2022-2023**

Name of the Teacher :Dr. M. K. Patil      Designation : Professor

Class: B.Sc. I

**Semester II** Department : Statistics

**Paper: II Paper: Discrete Probability Distributions (DSC B8)**

| Sr. No | Month    | Main Topic/Unit                 | Subtopic   | No. of Periods required |
|--------|----------|---------------------------------|--|-------------------------|
| 1      | January  | Bivariate Discrete Distribution | Joint p.m.f., and c.d.f., Properties of c.d.f, concept of marginal and conditional probability distribution, independence of two discrete r.v.s, Theorems on expectations, $Cov(aX+bY, cX+dY)$ , | 05                      |
| 2      | February | Mathematical Expectation        | $E(X+Y)=E(X)+E(Y)$<br>$E(XY)= E(X)*E(Y)$<br>$Cov(aX+bY, Cx+dY)$ , p.g.f and its properties   | 10                      |
| 3      | March    | Discrete distributions          | One point, Two point, Bernoulli, Binomial, Hypergeometric distributions  | 10                      |
| 4      | April    | Discrete distributions          | Poisson distribution. Geometric distribution, Negative binomial distribution.  | 10                      |
| 5      | May      |                                 | Examples and revision  | 10                      |

*M.K. Patil*  
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**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2022-2023**

Name of the Teacher : Dr. M. K. Patil      Designation : Professor

Class : B.Sc. II

Paper: VII

Department : Statistics

Paper: Probability Distributions-II(DSC-7D) SEMESTER IV

| Sr. No | Month    | Main Topic/Unit                        | Subtopic  | No. of Periods required |
|--------|----------|--|---|-------------------------|
| 1      | January  |  | Introduction to the Syllabus  | 02                      |
| 2      | February | Uniform and Exponential Distribution   | Uniform distribution: p.d.f c.d.f., sketch of p.d.f and c.d.f. m.g.f., mean, variance, moments. Distribution of (i) $(X-a) / (b-a)$ , ii) $(b-X) / (b-a)$ , (iii) $Y = F(x)$ , where $F(x)$ is cdf of $x$<br>$X \sim \text{Exp}$ , Sketch of p.d.f, c.d.f., m.g.f., c.g.f., mean, variance, C.V., moments, cumulants, median, quartiles, lack of memory property, | 06                      |
| 3      | March    | Gamma and Beta Distributions           | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, examples  | 06                      |
| 4      | April    | Normal Distribution                    | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, Properties of Normal probability curve, examples  | 10                      |
| 5      | May      | Chisquare distribution, T distribution | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, mgf, additive property, examples  | 10                      |
| 6      | May      | F distribution                         | Definition, pdf, mean and variance , Moments, Mode , Skewness and Kurtosis, mgf, additive property, examples<br>Interrelation between t, F and $\chi^2$ .   | 11                      |

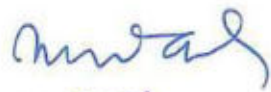


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**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2022-2023**

Name of the Teacher : Dr. M. K. Patil    Designation : Professor  
Department : Statistics    Subject : B. Sc. I (Practical) Paper-I

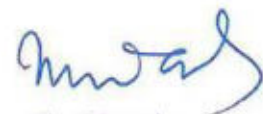
| Sr. No | Month     | Main Topic/Unit   | No. of Periods required |
|--------|-----------|---|-------------------------|
| 1      | September | Data handling using MS-Excel  | 08                      |
| 2      | October   | Computations using MS-Excel<br>Diagrammatic and Graphical representation.   | 12                      |
| 3      | November  | Measures of central tendency<br>Measures of dispersion.   | 16                      |
| 4      | December  | Moments, Skewness and Kurtosis.   | 12                      |
| 5      | January   | Use of random numbers to draw SRSWOR,<br>SRSWR, Stratified and Systematic sample.<br>Computation of probabilities using Bayes' theorem.   | 12                      |
| 6      | February  | Correlation coefficient and Regression for<br>ungrouped data.<br>Correlation coefficient and Regression for grouped<br>data.  | 12                      |
| 7      | March     | Spearman's rank correlation coefficient<br>Attributes, (Missing frequencies, consistency,<br>association and independence).<br>Demography (Computations of Fertility rates,<br>Mortality rates and Growth rates)<br>Applications of Binomial and Hypergeometric<br>distributions. | 16                      |
| 8      | April     | Applications of Uniform, Binomial and<br>Hypergeometric distribution.<br>Applications of Poisson, Geometric and Negative<br>Binomial distribution.  | 16                      |
| 9      | May       | Bivariate Discrete Distribution I<br>Bivariate Discrete Distribution II<br>Case Study   | 16                      |

  
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**Annual Teaching Plan 2022-2023**

Name of the Teacher :Dr. M. K. Patil      Designation : Professor  
Department : Statistics                      Subject : B. Sc. II (Practical) Paper-II

| Sr. No | Month     | Main Topic/Unit  | No. of Periods required |
|--------|-----------|--|-------------------------|
| 1      |           | --   |                         |
| 2      | September | Fitting of discrete Uniform,<br>Fitting of Binomial distribution,<br>Fitting of Hypergeometric distributions.                                | 16                      |
| 3      | October   | Fitting of Poisson distribution.<br>Fitting of Geometric distribution.<br>Fitting of negative binomial distribution                          | 16                      |
| 4      | November  | Model sampling from discrete Uniform dist.<br>Model Sampling from Binomial distribution<br>Model sampling from Hypergeometric distributions. | 16                      |
| 5      | December  | Model sampling from Poisson distribution.<br>Model sampling from Geometric distribution.   | 12                      |
| 6      | January   | Model sampling from Negative Binomial distribution<br>Fitting of continuous Uniform distribution   | 8                       |
| 7      | February  | Fitting of Exponential distribution<br>Fitting of Normal distribution  | 16                      |
| 8      | March     | Model Sampling from continuous Uniform and Exponential distribution<br>Model Sampling from Normal distribution                               | 16                      |
| 9      | April     | Fitting of Binomial, Poisson and Negative Binomial using MS-EXCEL<br>Fitting of Exponential and Normal distribution using MS-EXCEL           | 16                      |
| 10     | May       | Revision, Journal Completion, Exam   | 8                       |

  
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Teaching Plan 2022-2023 (Semester II)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.A.I (S.T.D.-II)  |                  | B. Sc. I (Paper III)   |                 |           |                 |
|-----------------|--|------------------|--|-----------------|-----------|-----------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory   | No. of<br>Lects | Practical | No.of<br>Lects. |
| Jan             | Disaster management:<br>types, importance of study   | 04               | Bivariate data, Correlation<br>concept, types, examples,<br>Co-variance, properties  | 06              | 02        | 08              |
| Feb             | Meaning, reasons,<br>measures<br>1. Earth quake<br>2. Flood<br>3. Drought<br>4. Fire                                 | 08               | Methods of studying<br>correlation, properties,<br>simple examples.<br>Regression- concept,<br>definition, Lines of<br>regression.   | 12              | 04        | 16              |
| Mar             | Meaning, reasons,<br>measures<br>5. Accident<br>6. Crowd<br>Science Technology in<br>Space & Ocean<br>research:      | 08               | fitting of a line of reg.,<br>regression coefficients,<br>properties, examples,<br>Attributes : concept,<br>various definitions,<br>notation, Consistency, its<br>conditions, examples                         | 12              | 04        | 16              |
| April           | Satellite era, Artificial<br>Satellites : Types, uses<br>rocket technology, S.<br>L.V., importance of<br>ocean study | 08               | Concepts : Independence,<br>Association , relation<br>between Q & Y, examples<br>Demography : concept of<br>vital statistics, Mortality<br>& fertility rates, CDR,<br>SDR, ASDR, STDR,<br>CBR, GFR, ASFR, TFR, | 12              | 04        | 16              |
| May             | Indian institute of<br>oceanography, revision  | 02               | Population growth rates,<br>GRR, NRR, interpretation   | 03              | 01        | 04              |

  
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Teaching Plan 2022-2023 (Semester IV)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.Com. II (B. Statistics-II)   |           | B. Sc. II (Paper VIII: Statistical Methods )   |              |           |               |
|-----------------|--|-----------|--|--------------|-----------|---------------|
|                 | Unit//Subunit  | No. Lects | Theory   | No. of Lects | Practical | No. of Lects. |
| Jan             | Time Series: Definition, Components, Methods of determination of trend.  | 08        | Time Series: Definition, Components, Methods of determination of trend.  | 03           | 02        | 08            |
| Feb             | Seasonal Variations by Simple Average Method. Numerical examples. S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, Mean & Range chart np-chart & C-chart. Numerical examples.                           | 16        | Models : Additive, multiplicative utility, seasonal variation measurement, example S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, concept Construction Mean & Range chart, limits | 12           | 04        | 16            |
| Mar             | Index Numbers: Need, meaning, Price, Quality and Value based simple (unweighted) & Weighted index numbers, problems in construction of index numbers, uses, examples.  | 16        | Attribute charts : p-chart & C-chart, examples. Tests of Hypothesis : Various terms in testing, Large sample tests for means, proportions and correlation coefficients.  | 12           | 04        | 16            |
| Apr             | Laspeyre's, Paasche's and Fisher's index numbers, examples. Probability and Probability Distributions: Probability: Events, laws of Probability, Examples. Binomial & Normal Distribution: Def <sup>n</sup> , p.d.f., Mean and Variance. | 16        | Small sample tests Concept, Theorem, Tests based on chi square distribution : for testing variance, goodness of fit, test for independence of attributes, Yates correction.  | 12           | 04        | 16            |
| May             | Properties of normal curve, Examples to find area, probability.  | 04        | Tests based on t & F distribution, for testing means, variances, paired  | 06           | 01        | 04            |

  
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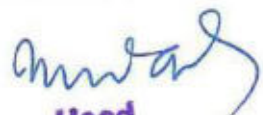
Teaching Plan 2022-2023 (Semester I)

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.A.I (S.T.D.-I)   |                  | B. Sc. I (Paper I)   |                 |           |                 |
|-----------------|--|------------------|--|-----------------|-----------|-----------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory   | No. of<br>Lects | Practical | No.of<br>Lects. |
| Aug             | Introduction, syllabus discussion. Contribution of eminent Scientists in fundamental Sciences: Einstein, Edison      | 05               | Introduction, Meaning & Scope of Statistics, Names of Statistical Organizations sample and population, methods of sampling   | 09              | 01        | 08              |
| Sep             | Contribution of eminent Scientists: Lui Pashcher, Dr. Homi J. Bhabha, Dr. M.S. Swamiinathan,                         | 08               | Nature of data: Primary, Secondary, Qualitative, Quantitative, Scales of Measurements, Classification, Tabulation, Diagrammatic & Graphical representation, Box plot                               | 12              | 03        | 16              |
| Oct             | Dr. A.P. J. Abdul Kalam, Resource: Concept and Importance, Types of Power Resource, Non-Conventional Power Resources | 06               | Concept of central tendency Requirements, types, Mean, Mode, Median, GM, HM, Definition, properties, Merits, Demerits, derivation of formula, Comparison of averages, Relation, numerical problems | 08              | 03        | 12              |
| Nov             | Solar energy, Wind energy, Hydel power energy, Bio-energy, Geo- thermal energy,                                      | 08               | Measures of Dispersion: Absolute & Relative, Range, Q.D., M.D., S.D., C.V., Def <sup>n</sup> , properties, Moments: Raw, Central Def <sup>n</sup> , properties, Relation                           | 12              | 03        | 16              |
| Dec             | Nuclear energy, Tidal energy, Carbon Credit  | 03               | Skew ness: Concept, Measures, Kurtosis: Concept, Measures, Num Problems.   | 04              | 01        | 08              |

  
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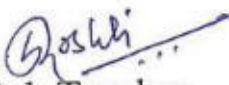
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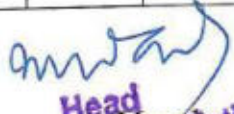
**Teaching Plan 2022-2023 (Semester III)**

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B. Com. II (B. Statistics-I)   |                  | B. Sc. II (Paper VI)  |                 |           |                  |
|-----------------|--|------------------|---|-----------------|-----------|------------------|
|                 | Unit//Subunit  | No. of<br>Lects. | Theory  | No. of<br>Lects | Practical | No. of<br>Lects. |
| Aug             | Introduction, Meaning & Scope of Statistics Sampling techniques: Population & Sample, Census, Sampling   | 04               | Introduction, Demography: meaning, Need of vital statistics, Mortality rates: CDR, SDR and STDR.  | 04              | 01        | 04               |
| Sep             | SRSWR & SRSWOR, Stratified, Simple bar diagram, Pie chart Measures of Central Tendency : Concept, types, definition, requirements.                                     | 16               | Fertility rates : CBR,GFR,ASFR, TFR Population growth rates, GRR, NRR. Sampling & elementary unit, sampling frame Census, sampling method, it's advantages. | 12              | 03        | 16               |
| Oct             | A. Mean, Mode, Median, Quartiles, Definition, properties, Merits & Demerits, Relation between mean, mode and median Numerical examples,                                | 10               | Methods of sampling, SRSWR & SRSWOR, Errors in Sampling, non-response error, results on SRSWR & SRSWOR Multiple regression, concept                         | 09              | 02        | 12               |
| Nov             | Measures of Dispersion: Concept, methods, Absolute & Relative, Range, Q.D., S.D.,C.V., Def <sup>n</sup> , properties, Correlation : Concept, types Positive & negative | 16               | Yule's Notation, derivation of Plane of regression, Correlation matrix, residual, mean, variance & Co-variance, properties, Examples & problems.            | 12              | 03        | 16               |
| Dec             | Karl Pearson & Spearman Rank methods, examples Regression: Concept, Lines of regression, Regression coefficients & their properties, Numeric examples.                 | 14               | Concept of Multiple & Partial correlation, Derivation of formula, properties, Numerical examples & problems   | 11              | 02        | 12               |

  
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**P.V.P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2022-23**

**B.Sc. III (Semester VI)**

Sub:- Statistics

Name of Teacher :- G. D. Satpute

| Class/<br>Month | <b>B.Sc. III STATISTICS - XIV ( Statistical inference-II)</b>   |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/Subunit  | No.<br>Lects | Practical | No.<br>Lects |
| Jan             | Introduction, Interval Estimation & It's Notions, Definition. Length and confidence bounds of confidence interval, pivotal quantity and its use to obtaining confidence Intervals and bounds. Interval estimation for: Mean and Variance of normal distribution, difference between means of normal distribution and mean of exponential distribution.  | 9            | 02        | 15           |
| Feb             | Interval estimation for : Ratio of variances for samples from two independent normal populations, Population proportion and difference of two population proportions, Statistical hypothesis, problems of testing of hypothesis, def. simple and composite hypothesis, C. R., Type I and Type II error and probabilities of two errors. Power of a test, p-value, size of a test, level of significance, problem of controlling probabilities of type I and Type II errors.   | 12           | 03        | 20           |
| Mar             | Definition of MP test. Statement and proof of Neyman- Pearson lemma for MP test. Examples on MP test. Power function of a test, power curve, definition of Uniformly Most Powerful test, Use of NP lemma for constructing UMP test of level $\alpha$ for one-sided alternative. Computation of powers for standard probability distributions. Likelihood Ratio Test Procedure statement & its properties, LR test involving mean and variance of normal population for this alternative hypothesis $H_0: \mu = \mu_0$ v/s $H_1: \mu \neq \mu_0$ and $H_0: \sigma^2 = \sigma_0^2$ v/s $H_1: \sigma^2 \neq \sigma_0^2$                                  | 12           | 03        | 20           |
| Apr             | General theory of sequential analysis and procedure. Test for binomial, Poisson, exponential and normal Distributions & Graphical and tabular procedure for test. Non-parametric tests: Notion, comparison with parametric statistical, Concept of distribution free statistic. And test i) Run test for randomness and run test for equality of distributions. ii) Sign test for one sample and two sample paired observations iii) Wilcoxon's signed rank test for one sample and two samples paired observations iv) Mann-Whitney U-test (Two independent samples) v) Median test vi) Kolmogorov Smirnov test for one and two independent samples. | 12           | 03        | 20           |

*Gemesha*  
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**P.V.P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2022-23**  
**B.Sc. III ( Statistical inference-I) (Semester V)**

Sub:- Statistics

Name of Teacher :- G. D. Satpute

| <b>B.Sc. III ( Statistical inference-I)</b> |  |            |                    |
|---|--|------------|--------------------|
| Month                                       | Unit/Subunit (Theory)  | No. Lects. | No. of Practicals. |
| Sep   | Introduction, Statistical inference meaning, Notation of a parameter, parameter space, general problem of estimation, Introduction to estimating parameter using point and interval estimation, Def <sup>n</sup> of Point estimation, estimator, estimates, distinction between estimator and estimate.  | 12         | -                  |
| Oct   | Properties of estimator: i) Unbiased estimator, Biased estimator, Positive and Negative Bias, examples of unbiased and biased estimator, Proof of the results of unbiased, examples. ii) Efficiency, relative efficiency, examples, MVUE, UMVUE, results on it. Examples.  | 9          | 01                 |
| Nov   | iii) Consistency: Definition, result of Consistency, Likelihood function. Def <sup>n</sup> , Examples. iv) Sufficiency: Concept of sufficiency, Definition of sufficient statistic, Neyman factorization criterion, Pitmann- Koopman criterion, Properties of sufficient statistic, Fisher Information function. Definition of Information function. | 12         | 01                 |
| Dec   | Statement and proof of Cramer Rao Inequality. Definition of Minimum Variance Bound Unbiased Estimator, Methods of Estimation, Method of Maximum Likelihood (MLE), Definition, Derivation of MLE, Method of Moments. Derivation of moment estimators for standard distributions.  | 12         | 02                 |

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**P. V. P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2022-23**

**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class/<br>Month | <b>B.Sc. III STATISTICS - XII (R programming and quality management)</b>   |              |           |              |
|-----------------|--|--------------|-----------|--------------|
|                 | Unit/ Subunit  | No.<br>Lects | Practical | No.<br>Lects |
| Sept            | History, Features of R, Character sets, Variable, Constants, Symbolic constant, key words, Data Types and Data Structure, Arithmetic, relational, logical, assignment, increasing, decreasing, special operators, Character vectors, Input and output functions, Data Import and Export function, Basic built-in function.   | 12           | 02        | 20           |
| Oct             | Algorithm, flow chart, Structure of programme, Conditional Statements: If, if else, Loops: for, while, Unconditional Statements, Writing of your own functions, Diagrams and Graphs, Simple programmes   | 12           | 02        | 20           |
| Nov             | Simple programmes in R, Meaning and dimensions of quality, quality philosophy, and Magnificent tools of quality: Histogram, Check sheet, Pareto diagram, cause and effect diagram, scatter diagram, control chart, flow chart. Deming's PDCA cycle. CUSUM chart, tabular form, use of these charts for monitoring process mean. Moving average and exponentially weighted moving average charts. Introduction to six-sigma methodology, DMAIC cycle and case studies | 12           | 02        | 20           |
| Dec             | Sampling Inspection plans for attribute: Concept of AQL, LTPD, Consumer's risk, and producer's risk, AOQ, AOQL, OC, ASN and ATI. Description of Single and double sampling plans with determination of above constants.  | 9            | 02        | 15           |

  
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**Teaching Plan 2022-23**

**B.Sc. III (Semester VI)**

Sub: - Statistics

Name of Teacher: - S. S. Patil

| Class/<br>Month | B.Sc. III STATISTICS - XVI (Operation Research)   |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/Subunit  | No.<br>Lects | Practical | No.<br>Lects |
| Jan             | Basic concepts, Statement of the Linear Programming Problem (LPP), formulation of problem as L.P. problem. Definition of (i) a slack variable, (ii) a surplus variable, L.P. problem in (i) canonical form, (ii) standard form. Definition of (i) a solution, (ii) a feasible solution, (iii) basic variable and non-basic variable, (iv) a basic feasible solution, (v) a degenerate and a non-degenerate solution, (vi) an optimal solution, Solution of L.P.P.: i. Graphical Method ii. Simplex Method introduction of artificial variable, Big-M method, modified objective function, modifications and applications of simplex method to L.P.P., criterion for no solution, Duality Theory | 09           | 02        | 15           |
| Feb             | Transportation problem, balanced and unbalanced T. P., Methods of obtaining initial basic feasible solution of T.P. (a) North West corner rule (b) Method of matrix minima (least cost method), (c) Vogel's approximation (VAM), MODI method of obtaining Optimal solution of T. P, uniqueness and non-uniqueness of optimal solutions, degenerate solution, examples and problems. Assignment Problem, Sequencing Problem, examples and problems.  | 12           | 02        | 20           |
| March           | Queuing Theory essential features of queuing system, input source, queue configuration, queue discipline, service mechanism, Operating characteristics of queuing system, transient-state and steady state, queue length, general relationship among system characteristics. Probability distribution in queuing system   | 12           | 02        | 20           |
| April           | Simulation Techniques: Meaning of simulation, Monte Carlo simulation, advantages and disadvantages of simulation, definition and properties of random numbers, generation of pseudo random numbers, Techniques of generating random numbers from uniform distribution, Tests for randomness and uniformity distribution, random variate generation using inverse cdf method, random variate generation from   | 12           | 01        | 20           |

  
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**P.V.P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2022-23**


**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- P. M. Patil

| Class/<br>Month | B.Sc. III STATISTICS-IX<br>(DSE-E13: Probability Distributions.)   |                    |           |                    |
|-----------------|--|--------------------|-----------|--------------------|
|                 | Unit/Subunit   | No.<br>Of<br>Lect. | Practical | No.<br>Of<br>Lect. |
| Sept            | Unit-1: Univariate and Multivariate Probability Distributions.<br>1.1: Laplace (Double Exponential) Distributions<br>1.2: Lognormal Distributions<br>1.3: Cauchy Distributions<br>1.4: Weibull Distributions<br>1.5: Logistic Distributions<br>1.6: Pareto Distributions   | 12                 | 02        | 20                 |
| Oct             | 1.7: Power series distributions.<br>1.8: Multinomial distributions.<br>Unit-2: Truncated Distributions and Bivariate Normal Distributions.<br>2.1: Truncated distribution as conditional distribution, truncation to the right, left and on both sides. Binomial distribution (n, p) left truncated at $X=0$ . probability mass function (p. m f), mean, variance  | 12                 | 02        | 20                 |
| Nov             | Poisson distribution $P(\lambda)$ , left truncated at $X=0$ . probability mass function (p.m. f), mean, variance. Normal distribution $N(\mu, \sigma^2)$ truncated (i) to the left below a, (ii) to the right above b, (iii) to the left below a, and to the right above b, its p.d.f. and mean. Exponential distribution with parameter $\theta$ left truncated below a, p.d.f, mean and variance. examples and problems on above distribution.<br>2.2: Bivariate Normal Distribution. Probability density function (p.d.f) of $BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ . Marginal and conditional distributions. | 12                 | 02        | 20                 |
| Dec             | Bivariate Normal Distributions: identification of parameters, conditional expectation and conditional variance, regression of Y on X and X on Y, independence and uncorrelatedness imply each other, m. g. f. and moments. Distribution of $Ax+By+c$ , where a, b, c are real no.s. Cauchy distribution as the distribution of $Z=X/Y$ where $(x, y) \sim BN(0,0,1,1,\rho)$ , Examples and Problems.   | 9                  | 01        | 15                 |

  
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**Teaching Plan 2022-23**

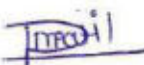
**B.Sc. III (Semester VI)**

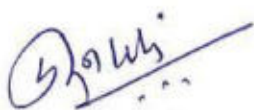
Sub: - Statistics

Name of Teacher: -P. M. Patil

| Class/<br>Month | B.Sc. III STATISTICS-XV<br>(DSE-F15:Sampling Theory.)  |                    |           |                 |
|-----------------|--|--------------------|-----------|-----------------|
|                 | Unit/Subunit   | No.<br>of<br>Lect. | Practical | No. of<br>Lect. |
| Jan             | <p><b>Unit- 1: Simple and Stratified Random Sampling: 1.1: Simple Random Sampling:</b> i) Revision of Simple random sampling, Procedure of drawing SRSWOR and SRSWR using (a) random number table (b) software. ii) Sample mean (<math>\bar{y}</math>) as an estimator of population mean, derivation of its expectation, standard error and estimator of standard error under SRSWOR and SRSWR iii) <math>N\bar{y}</math> as an estimator of population total, derivation of its expectation, standard error and estimator of standard error under SRSWOR and SRSWR iv) Sampling of dichotomous attributes. Estimation of population proportion, Sample proportion (p) as an estimator of population proportion (P), derivation of its expectation, standard error using (SRSWOR). <math>Np</math> as an estimator of total number of units in the population possessing the attribute of interest, derivation of its expectation, standard error and estimator of standard error. 1.2: Determination of the sample size: Determination of the sample size (n) under SRSWOR for variables and attributes given i) Margin of error and confidence coefficient. ii) Coefficient of variation of the estimator and confidence coefficient.</p> | 09                 | 02        | 15              |
| Feb             | <p><b>1.3: Stratified Sampling:</b> i) Real life situations where stratification is appropriate. ii) Procedure of drawing stratified sample using (a) random number table (b) software given the sampling frame. iii) Description of stratified sampling method where sample is drawn from individual stratum using SRSWOR method. (a) <math>\bar{y}_st</math> as an estimator of population mean <math>Y</math>, derivation of its expectation, standard error and estimator of standard error. (b) <math>N\bar{y}_st</math> as an estimator of population total, derivation of its expectation, standard error and estimator of standard error. iv) Problem of allocation: Proportional allocation, Neyman's allocation and optimum allocation, derivation of the expressions for the standard errors of the above estimators when these allocations are used. v) Comparison amongst SRSWOR, stratification with proportional allocation and stratification with optimum allocation. Gain in precision due to stratification. 20 vi) Cost and variance analysis in stratified random sampling, minimization of variance for fixed cost, minimization of cost for</p>   | 12                 | 02        | 20              |

|       |  |    |    |    |
|-------|--|----|----|----|
|       | fixed variance, optimum allocation as a particular case of optimization in cost and variance analysis.   |    |    |    |
| March | <p><b>Unit2: Other Sampling Methods: 2.1: Systematic Sampling:</b>i) Real life situations where systematic sampling is appropriate. Techniques of drawing a sample using systematic sampling (when the population size is multiple of sample size). ii) Estimation of the population mean and population total, standard error of these estimators. iii) Comparison of systematic sampling with SRSWOR. iv) Comparison of systematic sampling with SRSWOR and stratified sampling in the presence of linear trend. v) Idea of Circular Systematic Sampling. <b>2.2: Cluster Sampling:</b>i) Real life situations where cluster sampling is appropriate. Techniques of drawing a sample using cluster sampling. ii) Estimation of the population mean and population total (with equal size clusters), standard error of these estimators.</p>  | 12 | 02 | 20 |
| April | <p>iii) Systematic sampling as a particular case of cluster sampling. <b>2.3: Two-stage and Multi-stage sampling:</b> Idea of two stage and multistage sampling <b>2.4: Ratio Method:</b>i) Concept and rationale of auxiliary variable and its use in estimation ii) Situations where Ratio method is appropriate. iii) Ratio estimators of the population mean and population total and their standard errors (without derivations), estimators of these standard errors. iv) Relative efficiency of ratio estimators with that of SRSWOR. <b>2.5: Regression Method:</b>i) Situations where Regression method is appropriate. ii) Regression estimators of the population mean and population total and their standard errors (without derivations), estimators of these standard errors. iii) Comments regarding bias in estimation. iv) Relative efficiency of regression estimators with that of a) SRSWOR b) Ratio estimator.</p> | 12 | 02 | 20 |

  
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**Teaching Plan 2022-23**

**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- P. M. Patil

| Class/<br>Month | B.Sc. III STATISTICS - XI<br>(DSE-E15: Design of Experiments.)   |                    |           |                    |
|-----------------|--|--------------------|-----------|--------------------|
|                 | Unit/Subunit   | No.<br>Of<br>Lect. | Practical | No.<br>Of<br>Lect. |
| Sept            | <b>Unit 1: Simple Designs of Experiments:</b><br><b>1.1: Basic Concepts:</b><br>i) Basic terms in design of experiments:<br>ii) Basic principles of design of experiments:<br>iii) Choice of size and shape of a plot for uniformity trials, the empirical formula for the variance per unit area of plots.<br><b>1.2: Completely Randomized Design (CRD):</b>   | 12                 | 02        | 20                 |
| Oct             | <b>1.3: Randomized Block Design (RBD):</b><br><b>1.4: Latin Square Design (LSD):</b> Application of the principles of design of experiments in RBD, LSD layout model, assumptions and interpretations. Identification of real life situations where CRD, RBD and LSD are used.   | 12                 | 02        | 20                 |
| Nov             | <b>Unit 2: Analysis of Non-Normal Data, Efficiency and Factorial Experiments:(18 hours)</b><br><b>2.1: Analysis of non-normal data in CRD, RBD, LSD using</b> i) Square root transformation for counts. ii) Sin-1 (.) transformation for proportions. iii) Kruskal Wallis test. <b>2.2: Efficiency of design:</b><br>i) Concept and definition of efficiency of a design. ii) Efficiency of RBD over CRD. iii) Efficiency of LSD over CRD and LSD over RBD.<br><b>2.3: Factorial Experiments:</b> i) General description of factorial experiments, 22 & 23 factorial experiments arranged in RBD. ii) Definitions of main effects and interaction effects in 22 and 23 factorial experiments. iii) Model assumptions and its interpretation. | 12                 | 02        | 20                 |
| Dec             | <b>2.3: Factorial Experiments:</b> iv) Preparations of ANOVA table by Yate's procedure, test for main effects and interaction effects. v) General idea and purpose of confounding in factorial experiments. vi) Total confounding (Confounding only one interaction): ANOVA table, testing main effects and interaction effects. vii) Partial Confounding (Confounding only one interaction per replicate): ANOVA table. Testing main effects and interaction effects. viii) Construction of layout in total confounding and partial confounding in 23 factorial experiment.   | 9                  | 01        | 15                 |

  
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**Teaching Plan 2022-23**

**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- P. M. Patil

| Class/<br>Month | B.Sc. III STATISTICS - XIII<br>(DSE-F13: Probability Theory and Applications.)   |                    |           |                    |
|-----------------|--|--------------------|-----------|--------------------|
|                 | Unit/Subunit   | No.<br>Of<br>Lect. | Practical | No.<br>Of<br>Lect. |
| Jan             | <p><b>Unit-1: Order Statistics and Convergence:</b><br/> <b>1.1: Order Statistics:</b> Order statistics for a random sample of size <math>n</math> from a continuous distribution, Joint distribution, definition, derivation of distribution function and density function of the <math>i</math>th order statistic, particular cases for <math>i=1</math> and <math>i=n</math>, Derivation of joint p. d. f. of <math>i</math>th and <math>j</math>th order statistics, statement of distribution of the sample range, Distribution of the sample median when <math>n</math> is odd. Examples and problems. <b>1.2: Convergence and Limit Theorem:</b> Convergence -Definition of convergence of sequence of random variables (a) in probability, (b) in distribution, (c) in quadratic mean. If <math>X \xrightarrow{P} X_0</math> then <math>g(X) \xrightarrow{P} g(X_0)</math> where <math>g</math> is continuous function without proof. Examples and problems.</p> | 09                 | 02        | 15                 |
| Feb             | <p><b>1.3: Chebychev's Inequality:</b> Chebychev's inequality for discrete and continuous distributions. Examples.<br/> <b>1.4: Weak Law of Large Numbers and Central Limit Theorem:</b> Weak law of large numbers (WLLN)- statement and proof for i. i. d. random variables with finite variance.<br/> <b>1.5 Central Limit Theorem:</b> Statement and proof for i.i.d. random variables with finite variance, proof based on m. g. f., simple examples based on Bernoulli, binomial, Poisson and chi-square distribution..</p>   | 12                 | 02        | 20                 |
| March           | <p><b>Unit-2: Reliability Theory:</b><br/> <b>2.1: Binary System:</b> Block diagrams, definition of binary coherent structure and illustrations. Coherent system of components at most three, (a) Series, (b) Parallel, (c) 2 out of 3: Minimal cut, minimal path representation of system.<br/> <b>2.2: Reliability of binary System:</b> Reliability of systems <math>h(p)</math>, when components are independent and identically distributed with common probability <math>p</math> of operating.</p>  | 12                 | 02        | 20                 |
| April           | <p><b>2.3: Ageing Properties:</b> Definitions of hazard rate, hazard function, survival function. Concept of distributions with increasing and decreasing failure rate (IFR, DFR). Relationship between survival function and hazard function, density function and hazard rate. Derivations of results: (1) Hazard rate of a series system of components having independent life times is summation of component hazard rates (2) Life time of series</p>   | 9                  | 02        | 20                 |

|  |   |  |  |  |
|--|---|--|--|--|
|  | system of independent components with independent IFR life times is IFR, 2.4: Examples on exponential distribution. |  |  |  |
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Head  
Department of Statistics  
P.V.P. Mahavidyalaya,  
Kaveri Taluk, Dist. Sangli.  
Department of Statistics



To,

01.08.2023

The Head,  
Department of Statistics.  
P. V. P. Mahavidyalaya, Kavathe Mahankal.  
Dist: Sangli

Subject: Teaching plan and workload of Statistics Department for the year 2023-24

Respected Sir,

I am herewith submitting the following documents of Statistics Department for the year 2023-24

- i) Teaching plan for the year 2023-24
- ii) Total Workload.
- iii) Teacher wise workload.

Please accept it and do the needful.

Yours sincerely

Dr. M. K. Patil  
Department of Statistics

**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2023-2024**

Name of the Teacher : Dr. M. K. Patil Designation : Professor Class: B.Sc. I

**Semester I Department : Statistics Paper: II**

**Paper: Elementary Probability Theory (DSC A8)**

| Sr. No | Month     | Main Topic/Unit   | Subtopic  | No. of Periods required |
|--------|-----------|---|---|-------------------------|
| 1      | July      | Introduction--  | Syllabus discussion   | 02                      |
| 2      | August    | Sample space and Events, Probability Axiomatic definition.        | Random experiments. Sample space, Discrete sample space Event, 1.3: Algebra of events (Union, Intersection, Complementation ).Symbolic representation. Apriori, examples. Proof of the theorems on probability ,Illustrative examples based on results in 2 | 11                      |
| 3      | September | Conditional Probability   | Definition, Multiplication theorem, Partition of the sample space, Baye's theorem, Examples   | 11                      |
| 4      | October   | Independence of the events  | Concept, Theorems on independence. Pairwise and mutual independence for three events, Examples.   | 11                      |
| 5      | November  | Univariate Probability Distributions and Mathematical Expectation | Definition of discrete r.v., Pdf, cdf, Median, Mode, Expectation of Random Variable and theorems on expectations. Pgf and effect of change of origin and scale on pgf.  | 10                      |

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( Dr. M. K. Patil )


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**Department of Statistics**  
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**P.V.P. Mahavidyalaya, Kavathe Mahankal**  
**Annual Teaching Plan 2023-2024**

Name of the Teacher :Dr. M. K. Patil Designation : Professor Class: B.Sc. I  
Semester II Department : Statistics Paper: II Paper: Discrete Probability  
Distributions (DSC B8)

| Sr. No | Month    | Main Topic/Unit                 | Subtopic   | No. of Periods required |
|--------|----------|---------------------------------|--|-------------------------|
| 1      | January  | Bivariate Discrete Distribution | Joint p.m.f., and c.d.f., Properties of c.d.f, concept of marginal and conditional probability distribution, independence of two discrete r.v.s, Theorems on expectations, $Cov(aX+bY, cX+dY)$ , | 05                      |
| 2      | February | Mathematical Expectation        | $E(X+Y)=E(X)+E(Y)$<br>$E(XY)= E(X)*E(Y)$<br>$Cov(aX+bY, Cx+dY)$ , p.g.f and its properties   | 10                      |
| 3      | March    | Discrete distributions          | One point, Two point, Bernoulli, Binomial, Hypergeometric distributions  | 10                      |
| 4      | April    | Discrete distributions          | Poisson distribution.<br>Geometric distribution,<br>Negative binomial<br>distribution.   | 10                      |
| 5      | May      |                                 | Examples and revision  | 10                      |

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**(Dr. M. K. Patil)**

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**Annual Teaching Plan 2023-2024**

Name of the Teacher : Dr. M. K. Patil Designation : Professor Department :  
Statistics Subject : B. Sc. I (Practical) Paper-I

| Sr. No | Month     | Main Topic/Unit  | No. of Periods required |
|--------|-----------|--|-------------------------|
| 1      | August    | Data handling using MS-Excel   | 08                      |
| 2      | September | Computations using MS-Excel<br>Diagrammatic and Graphical representation.  | 12                      |
| 3      | October   | Measures of central tendency<br>Measures of dispersion.  | 16                      |
| 4      | November  | Moments, Skewness and Kurtosis.  | 12                      |
| 5      | December  | Use of random numbers to draw SRSWOR,<br>SRSWR, Stratified and Systematic sample.<br>Computation of probabilities using Bayes' theorem.  | 12                      |
| 6      | January   | Correlation coefficient and Regression for ungrouped data.<br>Correlation coefficient and Regression for grouped data.   | 12                      |
| 7      | February  | Spearman's rank correlation coefficient<br>Attributes, (Missing frequencies, consistency, association and independence).<br>Demography (Computations of Fertility rates, Mortality rates and Growth rates)<br>Applications of Binomial and Hypergeometric distributions. | 16                      |
| 8      | March     | Applications of Uniform, Binomial and Hypergeometric distribution.<br>Applications of Poisson, Geometric and Negative Binomial distribution.   | 16                      |
| 9      | April     | Bivariate Discrete Distribution I<br>Bivariate Discrete Distribution II<br>Case Study  | 16                      |

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*M.K. Patil*  
(Dr. M.K. Patil)

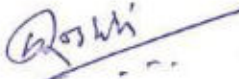
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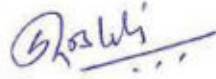
**Teaching Plan 2023-2024 (Semester I)**

Sub: - Statistics  
Class: B.Sc. I

Paper I: - Descriptive Statistics - I  
Name of Teacher: - V. V. Koshti

| Class/<br>Month | Theory   | No. of<br>Lects. |
|-----------------|--|------------------|
| July            | Introduction, Meaning & Scope of Statistics, Names of Statistical Organizations, sample and population, methods of sampling  | 09               |
| Aug             | Nature of data: Primary, Secondary, Qualitative, Quantitative, Scales of Measurements, Classification, Tabulation, Diagrammatic & Graphical representation, Box plot   | 12               |
| Sept            | Concept of central tendency<br>Requirements, types, Mean, Mode, Median, GM, HM, Definition, properties, Merits, Demerits, derivation of formula, Comparison of averages, Relation, numerical problems                              | 12               |
| Oct             | Measures of Dispersion: Absolute & Relative, Range, Q.D., M.D., S.D., C.V., Definition, properties, Moments: Raw, Central Definition, properties, Relation Skewness: Concept, Measures, Kurtosis: Concept, Measures, Num Problems. | 12               |
| Nov             | Examination and Diwali Vacation  |                  |

  
Sub Teacher

  
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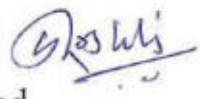
**Teaching Plan 2023-2024 (Semester III)**

Sub: - Statistics  
Class: B.Com. II

Paper I: - Business Statistics - I  
Name of Teacher: - S. S. Patil

| Class/<br>Month | Unit//Subunit  | No. of<br>Lects. |
|-----------------|--|------------------|
| July            | Introduction, Meaning & Scope of Statistics, Nature of data<br>Sampling techniques: Population & Sample, Census, Sampling,<br>SRSWR & SRSWOR, Stratified, Classification, Tabulation   | 08               |
| Aug             | Diagrams: Simple bar diagram, Pie chart.<br>Graphs : Histogram, Ogive curves<br>Measures of Central Tendency: Concept, types, requirements.<br>A. Mean : Combined mean ,Properties, merits and demerits  | 16               |
| Sep             | Median & Quartiles : Definition, merits and demerits<br>Mode: Definition, merits and demerits<br>Relation between mean, mode and median Numerical examples.<br>Measures of Dispersion: Concept, methods, Absolute & Relative   | 16               |
| Oct             | Range, Q.D., S.D., Variance, C.D. , C.V., Definition, properties,<br>merits and demerits, Numerical examples.<br>Correlation : Concept, types, Positive & negative Karl Pearson &<br>Spearman Rank methods , examples ,<br>Regression: Concept, Lines of Regression. | 16               |
| Nov             | Regression coefficients & their properties, Numeric examples.  | 04               |

  
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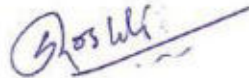
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**Teaching Plan 2023-2024 (Semester III)**

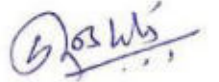
Sub: - Statistics  
Class: B.Sc. II

Paper I: - Statistical Methods - I  
Name of Teacher: - V. V. Koshti

| Class/<br>Month | Theory   | No. of<br>Lects |
|-----------------|--|-----------------|
| July            | Index Numbers: Need, meaning, problems in construction, Price, Quality and Value based simple (unweighted) & Weighted index nos. Laspeyre's, Paasche's and Fisher's index numbers.   | 06              |
| Aug             | Cost of living index number, definition, construction, uses. Tests of index numbers, base shifting, deflating, purchasing power of money. Uses of index numbers. Multiple Regressions: Concept, Yule's Notation, derivation of Plane of regression, Correlation, matrix, residual, mean, variance & co-variance. | 12              |
| Sep             | Properties of residuals, Examples and problems. Concept of Multiple correlations, Derivation of formula, properties, Numerical examples & problems.  | 12              |
| Oct             | Concept of Partial correlations, Derivation of formula, Properties, Numerical examples & problems. National Income: Definitions of Marshal, Pigou, Fisher. Different concepts of National Income. Methods of estimating national income and difficulties   | 12              |
| Nov             | Importance of National Income  | 03              |



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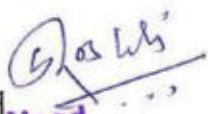
**Teaching Plan 2023-2024 (Semester III)**

Sub: - Statistics  
Class: B.Sc. II

Practical Paper III  
Name of Teacher: - V. V. Koshti

| Class/<br>Month | Theory  | No. of<br>Lects |
|-----------------|---|-----------------|
| July            | Index Numbers -I<br>Index Numbers -II   | 08              |
| Aug             | Multiple Regression Equations<br>Multiple Correlation Coefficients  | 16              |
| Sep             | Partial Correlation Coefficients<br>National Income   | 16              |
| Oct             | Time Series: Computation of secular trend & Seasonal component<br>SQC: Control Charts for Variables (Range and Mean chart).<br>SQC: Control Charts for Attributes (p, np and C- charts) | 20              |
| Nov             | Examination and Diwali Vacation   |                 |
| Dec             | Applications of Trinomial & Bivariate Poisson Distribution  | 16              |
| Jan             | Practical on Basic Terminologies in testing of Hypothesis, Large sample tests for mean, proportion & Correlation Coefficients   | 20              |
| Feb             | Applications of chi square, t and F- Statistic  | 20              |
| Mar             | Sketching of discrete and Continuous Probability Distributions  | 08              |

  
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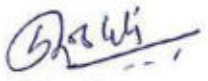
**Teaching Plan 2023-2024 (Semester IV)**

Sub: - Statistics

Name of Teacher:- V. V. Koshti

| Class/<br>Month | B. Sc. II (Paper VIII: Statistical Methods )   |                    |
|-----------------|--|--------------------|
|                 | Theory   | No. of<br>Lectures |
| Dec             | Time Series: Definition, Components, Methods of determination of trend. Models: Additive, Multiplicative utility, seasonal variation measurement, examples.  | 10                 |
| Jan             | S.Q.C.: Concept, purpose, need and advantages. Chance and Assignable causes, Control Chart, concept, and types. Construction of Mean & Range chart, limits. Attribute charts: p-chart & C-chart, examples.   | 12                 |
| Feb             | Tests of Hypothesis: Various terms in testing, Large sample tests for means, proportions and correlation coefficients. Fisher's Z- transformation.   | 12                 |
| Mar             | Small sample tests Concept, Theorem, Tests based on chi square distribution: for testing variance, goodness of fit, test for independence of attributes, Yates correction. t- test for population means, paired t test. F- test for equality of two variances. | 12                 |

  
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**Teaching Plan 2023-2024 (Semester IV)**

Sub:- Statistics

Name of Teacher :- V. V. Koshti

| Class/<br>Month | B.Com. II (B. Statistics-II)  |                    |
|-----------------|---|--------------------|
|                 | Unit//Subunit   | No. of<br>Lectures |
| Nov             | Time Series: Definition, Components, examples   | 03                 |
| Dec             | Methods of determination of trend. Seasonal Variations by Simple Average Method, Numerical examples. S.Q.C.: Concept need and advantages. Chance and Assignable causes, Control Chart, Mean & Range chart np-chart & C-chart. Numerical examples. Index Numbers: Need, meaning, | 16                 |
| Jan             | Price, Quality and Value based simple (unweighted) & Weighted index numbers, problems in construction of index numbers, uses and examples. Laspeyre's, Paasche's and Fisher's index numbers, examples.  | 16                 |
| Feb             | Probability and Probability Distributions: Probability: Events, laws of Probability, Examples. Binomial Poisson & Normal Distribution: Def <sup>n</sup> , p.d.f., Mean and Variance.  | 16                 |
| Mar             | Properties of normal curve, Examples to find area, probability.   | 09                 |

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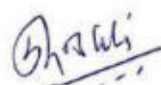
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**Teaching Plan 2023 -2024 (Semester II)**

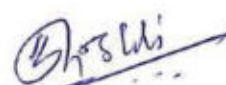
Sub: - Statistics

Name of Teacher: - V. V. Koshti

| Class/<br>Month | B. Sc. I (Paper III)  |                    |
|-----------------|---|--------------------|
|                 | Theory  | No. of<br>Lectures |
| Nov             | Introduction to syllabus, Demography : meaning, concept of vital statistics, its collection, general definition of vital event.   | 03                 |
| Dec             | Mortality & fertility rates, CDR, SDR, ASDR, STDR, CBR, GFR, ASFR, TFR, Population growth rates, GRR, NRR, interpretation, Life table: Construction, types and uses in insurance.<br>Correlation concept, types, examples, Bivariate data, Co-variance, properties, Scatter diagram method of studying correlation. | 10                 |
| Jan             | Methods of studying correlation: Karl Pearson's and Spearman's Rank Correlation coefficient, properties, simple examples.<br>Regression- concept, definition, Lines of regression.  | 12                 |
| Feb             | Fitting of a line of regression by the method of least squares.<br>regression coefficients, properties, examples.<br>Attributes: concept, various definitions, notation, Consistency, its conditions, examples. Concept of: Independence.   | 12                 |
| Mar             | Concept of Association, relation between Q & Y, examples and problems, different correlation coefficients. Revision.  | 06                 |



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**P.V.P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2023-24**

**B.Sc. III (Semester VI)**

Sub:- Statistics

Name of Teacher :- S. M. Zarekar

| Class/<br>Month | B.Sc. III STATISTICS - XIII<br>(DSE-F13: Probability Theory and Applications.)  |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/Subunit  | No. Of Lect. | Practical | No. Of Lect. |
| Jan             | <b>Unit-1: Order Statistics and Convergence:</b><br><b>1.1: Order Statistics:</b> Order statistics for a random sample of size $n$ from a continuous distribution, Joint distribution, definition, derivation of distribution function and density function of the $i$ th order statistic, Examples and problems.<br><b>1.2: Convergence and Limit Theorem:</b> Convergence - Definition of convergence of sequence of random   | 12           | 02        | 15           |
| Feb             | <b>1.3: Chebychev's Inequality:</b> Chebychev's inequality for discrete and continuous distributions. Examples.<br><b>1.4: Weak Law of Large Numbers and Central Limit Theorem:</b> Weak law of large numbers (WLLN)- statement and proof for i. i. d. random variables with finite variance.<br><b>1.5 Central Limit Theorem:</b> Statement and proof for i.i.d. random variables with finite variance, proof based on m. g. f., simple examples based on Bernoulli, binomial, Poisson and chi-square distribution.. | 12           | 02        | 20           |
| March           | <b>Unit-2: Reliability Theory:</b><br><b>2.1: Binary System:</b> Block diagrams, definition of binary coherent structure and illustrations. Coherent system of components at most three, (a) Series, (b) Parallel, (c) 2 out of 3: Minimal cut, minimal path representation of system.<br><b>2.2: Reliability of binary System:</b> Reliability of systems $h(p)$ , when components are independent and identically distributed with common probability $p$ of operating.   | 12           | 02        | 20           |
| April           | <b>2.3: Ageing Properties:</b> Definitions of hazard rate, hazard function, survival function. Concept of distributions with increasing and decreasing failure rate (IFR, DFR). Relationship between survival function and hazard function, density function and hazard rate. Derivations of results: (1) Hazard rate of a series system of components having independent life times is summation of component hazard rates Examples on exponential distribution.   | 12           | 02        | 20           |

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**Teaching Plan 2023-24**

**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- P. M. Patil

| Class/<br>Month           | B.Sc. III STATISTICS - XI<br>(DSE-E15: Design of Experiments.)   |                    |           |                    |
|---------------------------|--|--------------------|-----------|--------------------|
|                           | Unit/Subunit   | No.<br>Of<br>Lect. | Practical | No.<br>Of<br>Lect. |
| July<br><del>Sept</del>   | <b>Unit 1: Simple Designs of Experiments:</b><br><b>1.1: Basic Concepts:</b><br>i) Basic terms in design of experiments:<br>ii) Basic principles of design of experiments:<br>iii) Choice of size and shape of a plot for uniformity trials, the empirical formula for the variance per unit area of plots.  | 9                  | 02        | 20                 |
| August<br><del>Sept</del> | <b>1.2: Completely Randomized Design (CRD):</b><br><b>1.3: Randomized Block Design (RBD):</b><br><b>1.4: Latin Square Design (LSD):</b> Application of the principles of design of experiments in RBD, LSD layout model, assumptions and interpretations. Identification of real life situations where CRD, RBD and LSD are used.  | 12                 | 02        | 20                 |
| Sept<br><del>Oct</del>    | <b>Unit 2: Analysis of Non-Normal Data, Efficiency and Factorial Experiments: (18 hours)</b><br><b>2.1: Analysis of non-normal data in CRD, RBD, LSD using</b><br>i) Square root transformation for counts. ii) Sin-1 (.) transformation for proportions. iii) Kruskal Wallis test.<br><b>2.2: Efficiency of design:</b><br>i) Concept and definition of efficiency of a design. ii) Efficiency of RBD over CRD. iii) Efficiency of LSD over CRD and LSD over RBD.<br><b>2.3: Factorial Experiments:</b><br>i) General description of factorial experiments, 22 & 23 factorial experiments arranged in RBD. ii) Definitions of main effects and interaction effects in 22 and 23 factorial experiments. iii) Model assumptions and its interpretation. | 12                 | 02        | 20                 |
| Oct.<br><del>Sept</del>   | <b>2.3: Factorial Experiments:</b><br>iv) Preparations of ANOVA table by Yate's procedure, test for main effects and interaction effects. v) General idea and purpose of confounding in factorial experiments. vi) Total confounding (Confounding only one interaction): ANOVA table, testing main effects and interaction effects. vii) Partial Confounding (Confounding only one interaction per replicate): ANOVA table. Testing main effects and interaction effects. viii) Construction of layout in total confounding and partial confounding in 23 factorial experiment.  | 12                 | 01        | 15                 |

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**Teaching Plan 2023-24**

**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- P. M. Patil

| Class/<br>Month | B.Sc. III STATISTICS-IX<br>(DSE-E13: Probability Distributions.)  |                    |           |                    |
|-----------------|---|--------------------|-----------|--------------------|
|                 | Unit/Subunit  | No.<br>Of<br>Lect. | Practical | No.<br>Of<br>Lect. |
| Jul             | Unit-1: Univariate and Multivariate Probability Distributions.<br>1.1: Laplace (Double Exponential) Distributions<br>1.2: Lognormal Distributions<br>1.3: Cauchy Distributions<br>1.4: Weibull Distributions  | 9                  | 02        | 20                 |
| Aug             | 1.5: Logistic Distributions<br>1.6: Pareto Distributions<br>1.7: Power series distributions.<br>1.8: Multinomial distributions.<br>Unit-2: Truncated Distributions and Bivariate Normal Distributions.<br>2.1: Truncated distribution as conditional distribution, truncation to the right, left and on both sides. Binomial distribution (n, p) left truncated at X=0. probability mass function (p. m f), mean, variance  | 12                 | 02        | 20                 |
| Sep             | Poisson distribution $P(\lambda)$ , left truncated at X=0. probability mass function (p.m. f), mean, variance. Normal distribution $N(\mu, \sigma^2)$ truncated (i) to the left below a, (ii) to the right above b, (iii) to the left below a, and to the right above b, its p.d.f. and mean. Exponential distribution with parameter $\theta$ left truncated below a, p.d.f, mean and variance. examples and problems on above distribution.<br>2.2: Bivariate Normal Distribution. Probability density function (p.d.f) of $BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ . Marginal and conditional distributions. | 12                 | 02        | 20                 |
| Oct             | Bivariate Normal Distributions: identification of parameters, conditional expectation and conditional variance, regression of Y on X and X on Y, independence and uncorrelatedness imply each other, m. g. f. and moments. Distribution of $Ax+By+c$ , where a, b, c are real no.s. Cauchy distribution as the distribution of $Z=X/Y$ where $(x, y) \sim BN(0, 0, 1, 1, \rho)$ , Examples and Problems.  | 12                 | 01        | 15                 |

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**Teaching Plan 2023-24**


**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- S. S. Patil

| Class/<br>Month | <b>B.Sc. III STATISTICS - XII (R programming and quality management)</b>  |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/ Subunit   | No.<br>Lects | Practical | No.<br>Lects |
| Jul             | History, Features of R, Character sets, Variable, Constants, Symbolic constant, key words, Data Types and Data Structure, Arithmetic, relational, logical, assignment, increasing, decreasing, special operators, Character vectors, Input and output functions, Data Import and Export function, Basic built-in function.  | 9            | 02        | 20           |
| Aug             | Algorithm, flow chart, Structure of programme, Conditional Statements: If, if else, Loops: for, while, Unconditional Statements, Writing of your own functions, Diagrams and Graphs, Simple programmes Simple programmes in R, Meaning and dimensions of quality, quality philosophy, and Magnificent tools of quality: Histogram, Check sheet, Pareto diagram, cause and | 12           | 02        | 20           |
| Sep             | effect diagram, scatter diagram, control chart, flow chart. Deming's PDCA cycle. CUSUM chart, tabular form, use of these charts for monitoring process mean. Moving average and exponentially weighted, moving average charts. Introduction to six-sigma methodology, DMAIC cycle and case studies  | 12           | 02        | 20           |
| Oct             | Sampling Inspection plans for attribute: Concept of AQL, LTPD, Consumer's risk, and producer's risk, AOQ, AOQL, OC, ASN and ATI. Description of Single and double sampling plans with determination of above constants.   | 12           | 02        | 15           |

  
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**Teaching Plan 2023-24**

**B.Sc. III (Semester VI)**

Sub: - Statistics

Name of Teacher: - S. M. Zarekar

| Class/<br>Month | B.Sc. III STATISTICS-XV<br>(DSE-F15:Sampling Theory.)   |                    |           |                 |
|-----------------|---|--------------------|-----------|-----------------|
|                 | Unit/Subunit  | No.<br>of<br>Lect. | Practical | No. of<br>Lect. |
| Dec             | <p><b>Unit- 1: Simple and Stratified Random Sampling: 1.1: Simple Random Sampling:</b> i) Revision of Simple random sampling, Procedure of drawing SRSWOR and SRSWR using (a) random number table (b) software. ii) Sample mean (<math>\bar{y}</math>) as an estimator of population mean, derivation of its expectation, standard error and estimator of standard error under SRSWOR and SRSWR iii) <math>N\bar{y}</math> as an estimator of population total, derivation of its expectation, standard error and estimator of standard error under SRSWOR and SRSWR iv) Sampling of dichotomous attributes. Estimation of population proportion, Sample proportion (<math>p</math>) as an estimator of population proportion (<math>P</math>), derivation of its expectation, standard error using (SRSWOR). <math>Np</math> as an estimator of total number of units in the population possessing the attribute of interest, derivation of its expectation, standard error and estimator of standard error. 1.2: Determination of the sample size: Determination of the sample size (<math>n</math>) under SRSWOR for variables and attributes given i) Margin of error and confidence coefficient. ii) Coefficient of variation of the estimator and confidence coefficient.</p> | 12                 | 02        | 15              |
| Jan             | <p><b>1.3: Stratified Sampling:</b> i) Real life situations where stratification is appropriate. ii) Procedure of drawing stratified sample using (a) random number table (b) software given the sampling frame. iii) Description of stratified sampling method where sample is drawn from individual stratum using SRSWOR method. (a) <math>\bar{y}_{st}</math> as an estimator of population mean <math>Y</math>, derivation of its expectation, standard error and estimator of standard error. (b) <math>N\bar{y}_{st}</math> as an estimator of population total, derivation of its expectation, standard error and estimator of standard error. iv) Problem of allocation: Proportional allocation, Neyman's allocation and optimum allocation, derivation of the expressions for the standard errors of the above estimators when these allocations are used. v) Comparison amongst SRSWOR, stratification with proportional allocation and stratification with optimum allocation. Gain in precision due to stratification. 20 vi) Cost and variance analysis in stratified random sampling, minimization of variance for fixed cost, minimization of cost for fixed variance, optimum allocation as a particular case of</p>   | 12                 | 02        | 20              |

**P. V. P. Mahavidyalaya Kavathe Mahankal**

**Teaching Plan 2023-24**

**B.Sc. III (Semester VI)**

Sub: - Statistics

Name of Teacher: - S. S. Patil

| Class/<br>Month | <b>B.Sc. III STATISTICS - XVI (Operation Research)</b>  |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/Subunit  | No.<br>Lects | Practical | No.<br>Lects |
| Dec             | Basic concepts, Statement of the Linear Programming Problem (LPP), formulation of problem as L.P. problem. Definition of (i) a slack variable, (ii) a surplus variable, L.P. problem in (i) canonical form, (ii) standard form. Definition of (i) a solution, (ii) a feasible solution, (iii) basic variable and non-basic variable, (iv) a basic feasible solution, (v) a degenerate and a non-degenerate solution, (vi) an optimal solution, Solution of L.P.P.: i. Graphical Method ii. Simplex Method introduction of artificial variable, Big-M method, modified objective function, modifications and applications of simplex method to L.P.P., criterion for no solution, Duality Theory | 12           | 02        | 15           |
| Jan             | Transportation problem, balanced and unbalanced T. P., Methods of obtaining initial basic feasible solution of T.P. (a) North West corner rule (b) Method of matrix minima (least cost method), (c) Vogel's approximation (VAM), MODI method of obtaining Optimal solution of T. P, uniqueness and non-uniqueness of optimal solutions, degenerate solution, examples and problems. Assignment Problem, Sequencing Problem, examples and problems.  | 12           | 02        | 20           |
| Feb             | Queuing Theory essential features of queuing system, input source, queue configuration, queue discipline, service mechanism, Operating characteristics of queuing system, transient-state and steady state, queue length, general relationship among system characteristics. Probability distribution in queuing system   | 12           | 02        | 20           |
| Mar             | Simulation Techniques: Meaning of simulation, Monte Carlo simulation, advantages and disadvantages of simulation, definition and properties of random numbers, generation of pseudo random numbers, Techniques of generating random numbers from uniform distribution, Tests for randomness and uniformity distribution, random variate generation using inverse cdf method, random variate generation from   | 09           | 01        | 20           |

  
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**Teaching Plan 2023-24**

**B.Sc. III (Semester V)**

Sub:- Statistics

Name of Teacher :- G. D. Satpute

| Class/<br>Month | B.Sc. III ( Statistical inference-I)  |            |             |
|-----------------|---|------------|-------------|
|                 | Unit//Subunit   | No. Lects. | Practicals. |
| Jul             | Introduction, Statistical inference meaning, Notion of a parameter, parameter space, general problem of estimation,<br>Introduction to estimating parameter using point and interval estimation,  | 9          |             |
| Aug             | Def <sup>n</sup> of Point estimation, estimator, estimates, distinction between estimator and estimate. Properties of estimator:<br>i) Unbiased estimator, Biased estimator, Positive and Negative Bias, examples of unbiased and biased estimator, Proof of the results of unbiased, examples.<br>ii) Efficiency, relative efficiency, examples, MVUE, UMVUE, results on it. Examples. | 12         |             |
| Sep             | iii) Consistency: Definition, result of Consistency, Likelihood function. Def <sup>n</sup> , Examples.<br>iv) Sufficiency: Concept of sufficiency, Definition of sufficient statistic, Neyman factorization criterion, Pitman- Koopman criterion, Properties of sufficient statistic, Fisher Information function.  | 12         |             |
| Oct             | Definition of Information function, Statement and proof of Cramer Rao Inequality. Definition of Minimum Variance Bound Unbiased Estimator, Methods of Estimation, Method of Maximum Likelihood (MLE), Definition, Derivation of MLE, Method of Moments. Derivation of moment estimators for standard distributions.   | 12         | 04          |

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Teaching Plan 2023-24

B.Sc. III (Semester VI)

Sub:- Statistics

Name of Teacher :- G. D. Satpute

| Class/<br>Month | B.Sc. III STATISTICS - XIV ( Statistical inference-II)  |              |           |              |
|-----------------|---|--------------|-----------|--------------|
|                 | Unit/Subunit  | No.<br>Lects | Practical | No.<br>Lects |
| Dec             | Introduction, Interval Estimation & It's Notions, Definition. Length and confidence bounds of confidence interval, pivotal quantity and its use to obtaining confidence Intervals and bounds. Interval estimation for: Mean and Variance of normal distribution, difference between means of normal distribution and mean of exponential distribution. Interval estimation for : Ratio of variances for samples from two independent normal populations, Population proportion and difference of two population proportions,  | 12           | 02        | 15           |
| Jan             | Statistical hypothesis, problems of testing of hypothesis, def. simple and composite hypothesis, C. R., Type I and Type II error and probabilities of two errors. Power of a test, p-value, size of a test, level of significance, problem of controlling probabilities of type I and Type II errors. Definition of MP test. Statement and proof of Neyman- Pearson lemma for MP test.  | 12           | 03        | 20           |
| Feb             | . Examples on MP test. Power function of a test, power curve, definition of Uniformly Most Powerful test, Use of NP lemma for constructing UMP test of level $\alpha$ for one-sided alternative. Computation of powers for standard probability distributions. Likelihood Ratio Test Procedure statement & its properties, LR test involving mean and variance of normal population for this alternative hypothesis $H_0: \mu = \mu_0$ v/s $H_1: \mu \neq \mu_0$ and $H_0: \sigma^2 = \sigma_0^2$ v/s $H_1: \sigma^2 \neq \sigma_0^2$ General theory of sequential analysis and procedure. Test for binomial, Poisson, exponential and normal Distributions & Graphical and tabular procedure for test. | 12           | 03        | 20           |
| Mar             | Non-parametric tests: Notion, comparison with parametric statistical, Concept of distribution free statistic. And test i) Run test for randomness and run test for equality of distributions. ii) Sign test for one sample and two sample paired observations iii) Wilcoxon's signed rank test for one sample and two samples paired observations iv) Mann-Whitney U-test (Two independent samples) v) Median test vi) Kolmogorov Smirnov test for one and two independent samples.   | 9            | 03        | 20           |

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