

**Dr. Babasaheb Ambedkar Marathwada  
University, Aurangabad**

**Syllabus  
B.Sc. / B.A. S.Y.  
Statistics  
(Semester Pattern)**

With effect from the academic  
year 2010-2011

**SYLLABUS OF B.Sc. / B.A . SECOND YEAR STATISTICS.**

| <b>Class</b>       | <b>Semester</b> | <b>Paper No.</b> | <b>Title Of The Paper</b> | <b>No.Of Lectures per week</b> | <b>Total No. of Lectures</b> | <b>Marks Univ.</b> | <b>Internal</b> |
|--------------------|-----------------|------------------|---------------------------|--------------------------------|------------------------------|--------------------|-----------------|
| <b>Second Year</b> | III Theory      | 201              | Statistical Methods-I     | 03                             | 45                           | 30                 | 20              |
|                    |                 | 202              | Sampling Techniques       | 03                             | 45                           | 30                 | 20              |
|                    | III Practicals  | 203              | Practicals based on 201   | 03                             | -                            | 50                 | -               |
|                    |                 | 204              | Practicals based on 202   | 03                             | -                            | 50                 | -               |
|                    | IV Theory       | 205              | Statistical Methods-II    | 03                             | 45                           | 30                 | 20              |
|                    |                 | 206              | Applied Statistics        | 03                             | 45                           | 30                 | 20              |
|                    | IV Practicals   | 207              | Practicals based on 205   | 03                             | -                            | 50                 | -               |
|                    |                 | 208              | Practicals based on 206   | 03                             | -                            | 50                 | -               |

**SEMESTER – III****PAPER 201, STATISTICAL METHODS- I****Unit I: Some Standard Continuous Distributions. 15 Lectures**

- 1.1 P.D.F. of normal distribution as a limiting case of binomial distribution.
- 1.2 Mode and Median of normal distribution.
- 1.3 M.G.F. of normal distribution.
- 1.4 Additive property of the distribution.
- 1.5 Exponential distribution : Definition, p.d.f., mean and variance of the distribution.
- 1.6 Lack of memory property of the distribution.
- 1.7 Gamma distribution : Definition, p.d.f., mean and variance of the distribution.
- 1.8 Beta Distribution of First and Second type : Definition, p.d.f., mean and variance of the distribution.

**Unit II: Point Estimation. 15 Lectures**

- 2.1 Characteristics of a good estimator. viz. Consistency, Unbiasedness, Efficiency, and Sufficiency. Standard results on the above Characteristics.
- 2.2 Problems on the above Characteristics.
- 2.3 Methods of Estimation : Method of Maximum Likelihood and Method of Moments.
- 2.4 Large Sample Tests: Tests for Single Proportion and Difference between Proportions.
- 2.5 Large Sample Tests: Tests for Single Mean, Difference between Means and Difference between Standard Deviations

**Unit- III, Testing of Hypothesis and Interval Estimation. 15 Lectures**

- 3.1 Definitions of Parameters, Statistic, Critical Region, Level of Significance.
- 3.2 Type I and Type II errors, Power of a test.
- 3.3 Types of Hypothesis : Simple, Composite, Null, Alternative Hypothesis.
- 3.4 One Sided and Two Sided Tests.
- 3.5 Confidence Interval : Concept and C.I. for Single mean and Single proportion for large 'n'.
- 3.6 Weak Law of Large Numbers ( WLLN)
- 3.7 Central Limit Theorem (CLT) and Cramer- Rao inequality ( Statement only). Application of Cramer- Rao inequality in Confidence Interval for large samples.



**SEMESTER – III**

**PAPER 203, PRACTICALS BASED ON PAPER 201**

- 1) Fitting of normal distribution.
- 2) Large sample test for single proportion and confidence interval for single proportion.
- 3) Large sample test for single mean and confidence interval for single mean.
- 4) Large sample test for difference between means and difference between standard deviations.
- 5) Model sampling from Poisson Distribution.
- 6) Model sampling from Continuous Uniform Distribution
- 7) Model sampling from Normal Distribution
- 8) Model sampling from Exponential Distribution.
- 9) Estimation of parameters of binomial, Poisson and Normal distributions by Method of Maximum Likelihood.
- 10) Estimation of parameters of distributions with Specified probability functions by Method of Moments.

**SEMESTER – III****PAPER 204****PRACTICALS BASED ON PAPER 202**

- 1) SRSWOR : Drawing samples of size 'n' from a population of size 'N' and verification of results (a)  $E(\bar{y}) = Y$ , (b)  $E(s^2) = S^2$  and (c)  $V(\bar{y}) = S^2/n[(1-f)]$ .
- 2) SRSWR : Drawing samples of size 'n' from a population of size 'N' and verification of
- 3) results (a)  $E(\bar{y}) = Y$ , (b)  $E(s^2) = \sigma^2$  and (c)  $V(\bar{y}) = S^2/n[(N-1)/N]$ .
- 4) Sampling proportions: Verification of results (a)  $E(p) = P$ , (b)  $V(p) = PQ/n$ (\*\*\*\*).
- 5) Using stratum data, estimation of  $V(\bar{y}_{st})$  and quantify gain due to stratification.
- 6) Determination of stratum sample sizes under Proportional and Optimum allocations and comparison of precision with SRSWOR.
- 7) Systematic Sampling : Drawing systematic samples of size 'n' and comparison of precision with SRS and Stratified Random Sampling.
- 8) Ratio estimator and computation of its variance.
- 9) Linear Regression estimator and computation of its variance.
- 10) Estimation of Sample size.

**SEMESTER – IV****PAPER 205,****STATISTICAL METHODS – II****Unit I- Chi-Square Distribution****15 Lectures**

- 1.1. Definition and p.d.f. of Chi-Square distribution.
- 1.2. M.g.f. and c.g.f. mean variance and other moments of Chi-Square distribution.
- 1.3. Additive property of Chi-Square distribution.
- 1.4. Theorems on independent Chi-Square variates.
- 1.5. Limiting form of Chi-Square distribution.
- 1.6. Applications of Chi-Square distribution.
- 1.7. (a) Testing independence of attributes ( 2X2 and rXs contingency tables)
- 1.8. (b) Chi-Square test for population variance and its confidence interval.

**Unit –II , Student’s ‘t’ distribution****15 lectures**

- 2.1 Definition and p.d.f. of ‘t’ distribution.
- 2.2 M.g.f.of ‘t’ distribution.
- 2.3 Mean ,variance and other moments of ‘t’ distribution.
- 2.4 Limiting form of ‘t’ distribution.
- 2.5 ‘t’ test for single men and confidence interval for mean.
- 2.6 ‘t’ test for difference between means ( independent samples)
- 2.7 Paired ‘t’ test ( dependent samples).

**Unit –III , F,Z and Non-parametric tests****15 Lectures**

- 3.1 Definition of F- statistic, its p.d.f., mean and variance.
- 3.2 Distribution of 1/F.
- 3.3 F- test for testing difference between population variances.
- 3.4 Fisher’s Z transformations.
- 3.5 Applications of Fisher’s Z.
- 3.6 Concept of Non-parametric tests.
- 3.7 Run test.
- 3.8 Sign test.

**SEMESTER – IV****PAPER 206,****APPLIED STATISTICS****Unit I- Multiple & partial correlation & Multiple regression****15 Lectures**

- 1.1. Def<sup>n</sup> of multiple correlation coefficient & its properties.
- 1.2. Notions of multiple linear regression (trivariate case)
- 1.3. Fitting of plane of regression.
- 1.4. Residuals : Def<sup>n</sup> and properties.
- 1.5. Def<sup>n</sup> of partial correlation coefficient (trivariate case)
- 1.6. Properties of partial correlation (trivariate case)
- 1.7. Coefficient of multiple and partial determination.

**Unit –II , Time series****15 lectures**

- 2.1 Curve fitting by principle of least squares straight line, second degree, parabola.
- 2.2 Power curves, exponential curves.
- 2.3 Time series: meaning and utility.
- 2.4 Components of time series.
- 2.5 Estimation of trend by least square method.
- 2.6 Estimation of trend by exponential smoothing, computation of growth rates.
- 2.7 Measurement of seasonal variation by simple average method..

**Unit –III, Index number****15 Lectures**

- 3.1 Def<sup>n</sup> and utility index numbers.
- 3.2 Problems involved in construction of index numbers.
- 3.3 Unweighted and weighted indices.
- 3.4 Defn of various weighted indices.
- 3.5 Tests of adequacy.
- 3.6 Chain base index number.
- 3.7 Cost of living index number.
- 3.8 Cost of inflation index number.

**SEMESTER – IV****PAPER 207****PRACTICALS BASED ON PAPER 205**

- 1). Chi-Square test for testing goodness of fit for Known Standard Distributions .
- 2). Chi-Square test for testing goodness of fit for given mathematical models.
- 3). Chi-Square test for testing Independence of attributes for 2X2 contingency tables.
- 4). Chi-Square test for testing Independence of attributes for rXs contingency tables.
- 5). 't' test for single mean and Chi-Square test for population variance.
- 6). 't' test for difference between means and F- test for difference between population Variances.
- 7). Paired 't' test for difference between means.
- 8). Run test.
- 9). Sign test.

**PAPER 208****PRACTICALS BASED ON PAPER 206**

- 1). Computation of partial and multiple correlation coefficients. (Tri-variate case only).
- 2). Obtaining plane of regression.
- 3). Measurement of trend by Method of 3-yearly and 4- yearly moving averages.
- 4). Measurement of trend by Least Squares Method- ( St.line, Power curve and Exponential curve).
- 5). Measurement of Seasonal variations by Simple averages method.
- 6). Computation of unweighted indices by Simple Aggregative method and Average of Link relatives method.
- 7). Computation of weighted indices by Laspeyre's, Paasche's and Fisher's formulae.
- 8). Verification of tests of adequacy for index numbers for Laspeyre's, Paasche's, Fisher's formulae and Marshall-Edgeworth's formulae.
- 9). Construction of Cost of living index number.
- 10). Construction of Chain Base index numbers. Conversion between C.B.I. and F.B.I..