

**Mahatma Gandhi University, Kottayam**  
**Part III Subsidiary Statistics for Mathematics Main - Model I**

**Introduction:** As per the revised UGC model Curriculum, it is recognized that the purpose of undergraduate teaching is primarily to prepare the students for post-graduate instruction and also to prepare them to hold positions dealing with statistical analysis. Hence, these courses have to be in tune with the latest developments in the subject and also take cognizance of the newer techniques of statistical analysis, which are now totally based on computers. In the revised syllabus, it is expected that teaching of Statistics should be made more interesting, using real data sets and data analysis by making use of elementary software packages like Microsoft Excel, Minitab etc. In addition to these, some exposure on Indian Statistical System and Official Statistics, and general awareness on history and development of Statistics including biographies of eminent Statisticians, and applications of Statistics may be imparted to students using Internet and other information sources.

**Revised Syllabus (2006 Admission onwards)**

**Paper I**

1. **Descriptive Statistics – I.** Meaning and scope of Statistics, Population and sample, Primary and secondary data, Preparation of questionnaire and schedule, Census study and sample survey. Types of data - qualitative and quantitative data, cross - sectional and time - series data, Discrete and continuous data, and frequency and non-frequency data. Types of sampling – SRS; Stratified Sampling; Systematic Sampling (Method only), Classification and tabulation of data (up to 3 variables). Diagrammatic representation of grouped data– bar diagram; pie diagram. Frequency distribution and cumulative frequency distribution, Graphical representation of frequency distributions - histogram, frequency polygon, ogives, and stem and leaf chart. [20 hrs]
2. **Descriptive Statistics – II.** Measures of Central tendency– Mean; Median; Mode; Geometric mean; Harmonic Mean [properties without proof], Absolute and relative measures of dispersion–Range; Quartile deviation; Mean deviation; Standard deviation; and C.V. [properties without proof], Lorenz Curve, Box plot, Partition values - quartiles, deciles, percentiles, graphical determination of partition values. Raw moments and central moments, Skewness – Pearson, Bowley and Moment Measure, Kurtosis – moment measure and percentile coefficient measure. [25 hrs]
3. **Curve fitting, Correlation and Regression**
  - (a) Principle of Least squares, Curve fitting – Linear, quadratic and exponential curves.
  - (b) Correlation and Regression – Scatter diagram, Simple linear regression and correlation; rank correlation – repeated ranks. Definition and problems of partial and multiple correlation and multiple regression (3 variables case only) [properties without proof]. [20 hrs]
4. **Index Numbers** – Definition, simple 1N, weighted 1N, - Laspeyer's, Paasche's, Fisher's and their bias, Cost of Living Index Number- construction - Family budget method and weighted aggregate method. [10hrs]

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5. **Theory of Estimation**-Statistics and desirable properties, Crammer-Rao Inequality (without proof), Methods of estimation-M.L. method, method of moments.  
 (b) Interval estimation-Construction of confidence intervals for mean, proportion, difference of means, difference of proportions, variance, and ratio of variances (samples from normal population only). [30hrs]
6. **Testing of Hypothesis**  
 (a) General principles, two types of errors, critical region, significance level, power. Neymann Pearson Theorem for testing a simple hypothesis against a simple alternative (without proof) , simple applications.  
 (b) Normal and t-tests--Test for mean, proportion, equality for means, and equality of proportions (both large and small sample). Test for correlation coefficient  $\rho=0$ ,  $\rho=\rho_0$ ,  $\rho_1=\rho_2$   
 (c) Chi-square test--Test for significance of variance, goodness of fit, Independence of attributes.  
 (d) F-test for equality of variances. [40 hrs]

**Topic wise distribution of questions**

Time 3 hrs

Max. Marks: 50

Each question carries 5 marks

| Sl.No | Topic                    | No. of questions |
|-------|--------------------------|------------------|
| 1     | Bivariate distributions  | 1                |
| 2     | Mathematical Expectation | 3                |
| 3     | Standard distributions   | 3                |
| 4     | Sampling distributions   | 2                |
| 5     | Theory of Estimation     | 3                |
| 6     | Testing of Hypotheses    | 3                |
| Total |                          | 15               |

**Paper III- Practical**-(written Examination)

Time 3 hrs

Max. Marks:60

**Each question carries 10 Marks**  
**Use of calculator and tables allowed**

Topic wise distribution of questions

| Sl.No | Topic  | No. of questions |
|-------|--|------------------|
| 1     | Graphical representation of data   | 1                |
| 2     | Descriptive statistics II  | 1                |
| 3     | Correlation and Regression   | 1                |
| 4     | Curve fitting, testing of correlation coefficient                                | 1                |
| 5     | Fitting of distribution and testing<br>goodness of fit-Binomial, Poisson, Normal | 1                |
| 6     | Estimation and Confidence Intervals  | 1                |
| 7     | Test for mean, proportion and<br>their differences                               | 1                |

|   |   |               |
|---|---|---------------|
| 8 | Test for variance, equality<br>of variances, Independence of attributes | 1             |
| 9 | Index Number  | $\frac{1}{9}$ |
|   | Total   | $\frac{1}{9}$ |

### Topic wise distribution of Record Work

| Sl.No | Topic  | No. of questions<br>to be answered |
|-------|--|------------------------------------|
| 1     | (a) Questionnaire                                    | 2                                  |
|       | (b) Sampling techniques                              | 3                                  |
|       | (c) Diagrams and Graphs                              | 5                                  |
| 2     | Measures of central tendency<br>and dispersion       | 6                                  |
| 3     | Moments – Skewness and Kurtosis                      | 5                                  |
| 4     | Curve fitting  | 5                                  |
| 5     | Correlation and Regression                           | 4                                  |
| 6     | Partial and Multiple correlation                     | 2                                  |
| 7     | Probability  | 10                                 |
| 8     | Random variables and probability<br>density function | 6                                  |
| 9     | Index Number   | 4                                  |
| 10    | Bivariate distribution                               | 4                                  |
| 11    | Mathematical Expectation                             | 7                                  |
| 12    | Standard distributions                               | 10                                 |
| 13    | Sampling distributions                               | 5                                  |
| 14    | Estimation of parameters                             | 6                                  |
| 15    | Testing of Hypothesis-Basis concepts                 | 5                                  |
| 16    | Large and small sample tests                         | 11                                 |
|       |  | <hr/> 100                          |

### References

1. Spiegel M.R. and Stephens L.J. (2000) STATISTICS, 3<sup>rd</sup> edition, Schaum's Outline Series.
2. Hogg R.V. and Craig A. T. (1995) Introduction to Mathematical Statistics, 5<sup>th</sup> edition, Pearson Education, In c.
3. Goon A.M., Gupta M.K. & Dasgupta B. (1993) Fundamentals of Statistics Vol. I & II (1993) The World Press Pvt. Ltd. Kolkotha.
4. Croxton F.E., Cowden D.J. and Klein S. (1973) Applied General Statistics, 3<sup>rd</sup> edition, Prentice – Hall International, Inc, Englewood Cliffs.
5. Gupta S.C. and Kapoor V.K. (2002) Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
6. Hogg and Tanis (2003) Probability & Statistical Inference, 6<sup>th</sup> edition, Low price edition, Pearson Education Asia.
7. Medhi J.(1995).Statistical Methods.New age International(P) Ltd.

5. **Theory of Estimation**-Statistics and desirable properties, Crammer-Rao Inequality (without proof), Methods of estimation-M.L. method, method of moments.  
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