Objective: - Students should be aware with the basics of advanced mathematical statistics.

1. **Discrete Probability Distributions -1:** [25%]
   Definition of probability distributions and distribution function, Probability mass function of Poisson distribution, It’s properties and applications, Numerical examples, Probability mass function of Hyper-geometric distribution, properties and simple applications based on it (without any mathematical proofs).

2. **Discrete Probability Distributions -2:** [25%]
   Probability mass function of Negative Binomial distribution Its properties and applications, Numerical examples and Geometric distribution, simple applications and their properties and simple examples based on it.

3. **Process Control Technique:** [25%]
   Meaning of quality control and its uses in industry, Variations in quality, Theory of control chart, revised control chart, Theory of run, Control charts for variables ( and R) and its examples, Control charts for attributes (np for fixed sample size, p and c) (No derivation of control limits), Examples related to the charts.

4. **Product Control Technique:** [25%]
   Meaning of product control and its advantages, Definition of Single sampling plan, Explanation of the terms AQL, LTPD, Producer’s risk, Consumer’s risk, O.C function, ASN, ATI, AOQ, Simple examples based on Binomial, Hyper-geometric and Poisson distributions

**References Books:**

Objective: - Students should be competent to apply the statistical techniques in various fields.

1. Decision Theory: [25%]
   Meaning of decision theory and its basic terminologies, Methods of solving decision problem
   (i) Decision under uncertainty- Maxi-max, Maxi-min, Hurwich, Laplace. (ii) Decision under
   certainty when events probabilities are known – EMV, EVPI simple examples and their
   interpretations.

2. Time Series: [25%]
   Meaning and uses of time series, Various components of time series, determination of trend
   by using graphical, moving average and least square method, To separate seasonal
   component by using moving average method, with examples.

3. Index Numbers: [25%]
   Definition, limitations, characteristics, and uses of index numbers, Construction of whole sale
   price index number and cost of living index number, Construction of index number by using
   aggregate expenditure method and family budget method using Laspeyre’s, Paasche’s,
   Fisher’s, Time Reversal Test (TRT) and Factor Reversal Test (FRT) and to test various
   formulas for TRT & FRT, Simple examples.

4. Testing of Hypothesis: [25%]
   Meaning of statistical hypothesis, Definitions of Null hypothesis, Alternate hypothesis,
   Simple and Composite hypothesis, Critical region, Type-I and Type-II errors, Level of
   significance, Power of tests, One tailed and Two tailed tests, Examples of finding $\alpha$, $\beta$ and
   power of tests by using Binomial and Poisson distributions.

Reference Books: