

# DETAIL OF COURSES

## STAT- 101:      **Introductory Statistics**

**3(3+0)**

### **Learning Objectives:**

- To have introduction of statistics as a field of knowledge and its scope and relevance to other disciplines of natural and social sciences.
- To equipped and prepare students for advance courses in the field of statistics.
- To achieve the capability of critical thinking about data and its sources; have idea about variables and their types and scale measures.
- Be able to calculate and interpret descriptive statistics (able to classify, tabulate, describe and display data using software).

### **Learning Outcomes:**

- Acquire the basic knowledge of the discipline of Statistics.
- Understand and differentiate between the types of data and variables.
- Evaluate and Interpret basic descriptive statistics. Display and Interpret data graphs.

### **Course Contents:**

The nature and scope of the Statistics, Variables and their types, Data and its sources, Scales of measurements, Tabulation and classification of data, Graphs and Charts: Stem-and leaf diagram, Box and Whisker plots and their interpretation. Measures of Central Tendency, Quantiles, Measures of Dispersion: Their properties, usage, limitations and comparison. Moments, Measures of Skewness and Kurtosis and Distribution shapes. Rates and ratios, Standardized scores.

Index numbers: construction and uses of index numbers, un-weighted index numbers (simple aggregative index, average of relative price index numbers), weighted index numbers (Laspayer's, Paasche's and Fisher's ideal index numbers), Consumer price index (CPI) and Sensitive Price Indicators

### **Recommended Books:**

1. Clarke, G. M., & Cooke, D. (1978). *A basic course in statistics* (No. 519.5 C53).
2. Chaudhry, S.M. and Kamal, S. (2008), "*Introduction to Statistical Theory*" Parts I & II, 8<sup>th</sup> ed, Ilmi Kitab Khana, Lahore, Pakistan.
3. Mann, P. S. (2010) *Introductory Statistics*. Wiley.
4. Spiegel, M.R., Schiller, J.L. and Sirinivasan, R.L. (2000) "*Probability and Statistics*", 2<sup>nd</sup> ed. Schaums Outlines Series. McGraw Hill. NY.



4. Walpole, R.E., Myers, R.H and Myers, S.L. (2007), "*Probability and Statistics for Engineers and Scientist*" 7<sup>th</sup> edition, Prentice Hall, NY.

## **STAT- 202:       Basic Statistical Inference**

### **Learning Objectives:**

- To understanding of basic techniques of sampling and estimation, their properties and application
- To select a sample from a given population and use it to make inferences about the population and its parameter
- To test, deduce and infer the validity of different types of hypotheses and models built on the basis of the raw data collected in diverse problem-situations.

### **Learning Outcomes:**

- Acquire the knowledge of the sampling distributions and their properties.
- Derive the appropriate estimators for parameters using best estimation procedure.
- Use appropriate sampling distributions for interval estimation and hypotheses testing.
- Apply appropriate inferential procedures to handle the practical situations.

### **Course Contents:**

Sampling and sampling distribution of sample mean, proportion, difference between means and difference between proportions; Point and interval estimate properties of good point estimator; Testing of hypothesis for population mean, difference between population means and population proportion and difference between two population proportions, difference between means for paired data; Single population variance, ratio of two variances; Non-parametric methods: The sign test, Wilcoxon's signed rank test, Mann-Whitney U test, Median test, Run test, Kolmogorov-Smirnov test, Kruskal-Wallis test, Median test for k-samples, Friedman test.

### **Pre-Requisite- STAT-102**

### **Recommended Books:**

1. Ross, S. (2017). *A first course in Probability*. 9<sup>th</sup> edition. Pearson Education Limited.
2. DeGroot, M. Schervish, M. (2017). *Probability and Statistics*. 4<sup>th</sup> edition. Pearson Education Limited.
3. Srivastava, M.K., Khan, A.H. and Srivastava, N. (2014). *Statistical Inference: Theory of Estimation*. Prentice-Hall of India Pvt. Ltd
4. Clark, G.M. and Cooke, D. (1998). *A Basic Course in Statistics*. 4<sup>th</sup> ed, Arnold, London.
5. Mclave, J.T., Benson P.G. and Sincich, T. (2014). *Statistics for Business and Economics*. 12<sup>th</sup> Edition. Pearson Education Ltd, U.K.
6. Spiegel, M.R., Schiller, J.L. and Sirinivasan, R.L. (2015). *Probability and Statistics*. 3<sup>rd</sup> edition. Schaums Outlines Series. McGraw-Hill. NY.

## **STAT-204          Linear Algebra**

### **Course Objectives:**

- To develop the ability to solve problems using the techniques of linear algebra
- To Understand Euclidean vector spaces, their inherent arithmetic and algebraic structure, and the accompanying geometry that arise
- Acquire facility working with general vector spaces, linear transformations, coordinate vectors, and the changing of bases.
- To analyze the structure of real-world problems and plan solution strategies. Solve the problems using appropriate tools.

### **Learning Outcomes:**

- Interpret the Use of vector equations and linear transformations and its application in image processing and Control theory, etc
- Apply mathematical concepts in problem-solving through integration of new material and modeling
- Analyze/interpret quantitative data verbally, graphically, symbolically and numerically.

### **Course Contents:**

Linear Equations: Introduction, Gaussian elimination and matrices, Gauss-Jordan method, Making Gaussian elimination work, Ill-conditioned systems. Echelon Forms: Row echelon form and rank, The reduced row echelon form, Consistency of linear systems, Homogeneous systems, Nonhomogeneous systems. Matrix Algebra: Addition, scalar multiplication and transposition, linearity, matrix multiplication, properties of matrix multiplication, matrix inversion, inverses of sums and sensitivity, elementary matrices and equivalence, The LU factorization. Vector spaces: spaces and subspaces, four fundamental subspaces, linear independence, basis and dimension, more about rank, classical least squares, linear transformations, change of basis and