

**Course Title: Probability and Statistics for Engineers**

**Course Code: MATH 208**

**Credit Hours: 3**

**Course Description:**

The course is to provide students with a clear understanding of the basic statistical concepts and tools and to enable them to use these tools as Necessary Avenue for engineering professions and scientific knowledge.

**Course Contents:**

**Unit 1: Introduction to Statistics and Data Description**

Graphical Presentation of Data: Dot Plots and Scatter Plots, The frequency Distribution and Histogram, The Stem-and-leaf Plot, The Box Plot, The Pareto Chart; Numerical Description of Data: Measures of Central Tendency: Mean, Median, Mode, Mean of combined groups, Comparison of mean, median and mode, Measures of Dispersion: Range, Quartile deviation, Standard deviation & Variance, Coefficient of Variation, Skewness and Kurtosis

**Unit 2: Probability**

Introduction, A Review of Sets, Random experiment, Sample space and Events (simple and composites), Mutually exclusive and Collectively exhaustive events, Independent events, Probabilities definition and Assignment, Finite Sample Space and Enumeration, Conditional probability, Partitions, Total probability, and Bayes' theorem and its applications

**Unit 3: One Dimensional Random Variables**

Introduction, The Distribution Function, Discrete and Continuous Random variable, Some Characteristics of Distributions (mean, variance)

**Unit 4: Functions of One Random Variable and Mathematical Expectation**

Introduction, Equivalent Events, Function of Discrete and Continuous Random variable, Mathematical Expectation

**Unit 5: Some Important Discrete Distributions**

Introduction, Bernoulli Trials and the Bernoulli Distribution, The Binomial Distribution, Mean and variance of Binomial Distribution, The cumulative Binomial Distribution, An application of Binomial Distribution, The Poisson Distribution, Mean and variance of Poisson Distribution, The Poisson Approximation to Binomial Distribution

**Unit 6: The Normal Distribution**

Introduction, Properties of the Normal Distribution, The Mean and Variance of the Normal Distribution, The Normal Cumulative Distribution, The Standard Normal Distribution, Problem-Solving Procedure, The Central Limit Theorem, The Normal Approximation to Binomial Distribution

### **Unit 7: Random Samples and Sampling Distributions**

Population and sample, Census and sampling, Estimate and estimator, Parameter and statistic, Random Samples, Statistics and Sampling Distributions, The Chi-Square Distribution, The  $t$ -Distribution, The  $F$ -Distribution

### **Unit 8: Estimation**

Point Estimation, Interval estimation, Properties of Estimators, Single-Sample Confidence Interval Estimation (mean and variance), Two-Sample Confidence Interval Estimation (mean and variance)

### **Unit 9: Tests of Hypotheses**

Introduction, Tests of Hypotheses on a Single-Sample (mean and variance), Tests of Hypotheses on two Samples (mean and variance)

### **Unit 10: Simple Linear Regression and Correlation**

Simple Linear Regression and interpretation, Correlation and interpretation, Coefficient of determination

### **Unit 11: Statistical Quality Control**

Introduction, Statistical Process Control, Control Charts for Measurements, Control Charts for Individual Measurements, Control Charts for Attributes

### **References:**

1. William W. Hines, Douglas C. Montgomery, David M. Goldsman, and Connie M. Borror, *Probability and Statistics in Engineering*, 4th Edition, John Wiley and Sons, Inc, 2003
2. Richard A Johnson, Miller & Freund's, *Probability and Statistics for Engineers*, Pearson
3. Nabendu Pal and Sahadeb Sarkar, *Statistics Concepts and Application*, Prentice Hall of India Private Limited, 2005
4. Purna Chandra Biswal, *Probability and Statistics*, Prentice Hall of India Private Limited, 2005
5. John E. Freund, *Modern Elementary Statistics*, 6th edition, Prentice Hall Int.
6. R. I. Levin and D. S. Rubin, *Statistics for Management*, 6th edition, Pearson