# PROBABILITY AND STATISTICS

**II Semester: CSE/IT   III Semester: AERO /MECH**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| AHSB12 | **Foundation** | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes:  60** | | |

## COURSE OBJECTIVES:
**The course should enable the students to:**

I.   Enrich the knowledge of probability on single random variables and probability distributions.
II.  Apply the concept of correlation and regression to find covariance.
III. Analyze the given data for appropriate test of hypothesis.
IV.  Understand the foundations for classical inference involving confidence intervals and hypothesis testing.

## COURSE OUTCOMES (COs):

CO 1:  Describe the concept of probability, conditional probability, Baye's theorem and analyze the concepts of discrete, continuous random variables

CO 2:  Determine the binomial, poisson and normal distribution to find mean, variance.

CO 3:  Understand multiple random variables and enumerate correlation and regression to the given data.

CO 4:  Explore the concept of sampling distribution and apply testing of hypothesis for sample means and proportions.

CO 5:  Use t-test for means, F-test for variances and chi-square test for independence to determine whether there is a significant relationship between two categorical variables.

## COURSE LEARNING OUTCOMES (CLOs):

1.  Describe the basic concepts of probability.
2.  Summarize the concept of conditional probability and estimate the probability of event using Baye's theorem.
3.  Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.
4.  Use the concept of random variables in real-world problem like graph theory; machine learning, Natural language processing.
5.  Determine the binomial distribution to find mean and variance.
6.  Understand binomial distribution to the phenomena of real-world problem like sick versus healthy.
7.  Determine the poisson distribution to find mean and variance.
8.  Use poisson distribution in real-world problem to predict soccer scores.
9.  Illustrate the inferential methods relating to the means of normal distributions.
10. Describe the mapping of normal distribution in real-world problem to analyze the stock market.
11. Explain multiple random variables and the covariance of two random variables.
12. Understand the concept of multiple random variables in real-world problems aspects of wireless communication system.
13. Calculate the correlation coefficient to the given data.
14. Contrast the correlation and regression to the real-world such as stock price and interest rates.
15. Calculate the regression to the given data.

16. Discuss the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean.
17. Understand the foundation for hypothesis testing.
18. Summarize the concept of hypothesis testing in real-world problem to selecting the best means to stop smoking.
19. Apply testing of hypothesis to predict the significance difference in the sample means.
20. Apply testing of hypothesis to predict the significance difference in the sample proportions.
21. Use Student t-test to predict the difference in sample means.
22. Apply F-test to predict the difference in sample variances.
23. Understand the characteristics between the samples using Chi-square test.

| MODULE-I | PROBABILITY AND RANDOM VARIABLES | Classes: 09 |
|---|---|---|

Probability, Conditional Probability, Baye's Theorem; Random variables: Basic definitions, discrete and continuous random variables; Probability distribution: Probability mass function and probability density functions; Mathematical expectation.

| MODULE -II | PROBABILITY DISTRIBUTION | Classes: 09 |
|---|---|---|

Binomial distribution; Mean and variances of Binomial distribution, Recurrence formula for the Binomial distribution; Poisson distribution: Poisson distribution as a limiting case of Binomial distribution, mean and variance of Poisson distribution, Recurrence formula for the Poisson distribution; Normal distribution; Mean, Variance, Mode, Median, Characteristics of normal distribution.

| MODULE-III | CORRELATIONS AND REGRESSION | Classes: 09 |
|---|---|---|

Correlation: Karle Pearson's Coefficient of correlation, Computation of correlation coefficient, Rank correlation, Repeated Ranks; Properties of correlation.

Regression: Lines of regression, Regression coefficient, Properties of Regression coefficient, Angle between two lines of regression; Multiple correlation and Regression.

| MODULE-IV | TEST OF HYPOTHESIS - I | Classes: 09 |
|---|---|---|

Sampling: Definitions of population, Sampling, Parameter of statistics, standard error; Test of significance: Null hypothesis, alternate hypothesis, type I and type II errors, critical region, confidence interval, level of significance. One sided test, two sided test.

Large sample test: Test of significance for single mean, Test of significance for difference between two sample means, Tests of significance single proportion and Test of difference between proportions.

| MODULE-V | TEST OF HYPOTHESIS - II | Classes: 09 |
|---|---|---|

Small sample tests: Student t-distribution, its properties: Test of significance difference between sample mean and population mean; difference between means of two small samples. Snedecor's F-distribution and its properties; Test of equality of two population variances Chi-square distribution and it's properties; Test of equality of two population variances Chi-square distribution, it's properties, Chi-square test of goodness of fit.

**Text Books:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

**Reference Books:**

1. S. C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand & Co., 10<sup>th</sup> Edition, 2000.
2. N. P. Bali, "Engineering Mathematics", Laxmi Publications, 9<sup>th</sup> Edition, 2016.
3. Richard Arnold Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Prentice Hall, 8<sup>th</sup> Edition, 2013.

**Web References:**

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resourcs/#Mathematics
3. http://www.sosmath.com
4. http://www.mathworld.wolfram.com

**E-Text Books:**

1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks