INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE								
I Semester: CSE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BCSD01	**Core**	3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

This course will discuss fundamental concepts in mathematics with emphasis on their applications to computer science. Topics include probability, distribution, multivariant statistical models, computer applications, trees and graphs. This course is appropriate for communications and networking, storage and retrieval of information.

II. COURSE OBJECTIVES:

The students will try to learn:

I.   The mathematical fundamentals that are prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
II. The mathematical and logical basis to many modern techniques in information technology.
III. Gain knowledge about various sampling and classification problems.

III. COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1	Make use of distribution theory for depicting the expected outcome of products based on data related to supply and demand.	Understand
CO2	Apply Central Limit Theorem and Probability inequalities for estimating population parameters in the data generating process/experiment.	Apply
CO3	Build statistical models based on random sampling data for getting unbiased estimates in performing data analysis.	Understand
CO4	Examine regression and multivariate statistical models for solving classification and curve fitting problems in data analysis.	Apply
CO5	Identify appropriate techniques of graphs and combinatorial theory for finding solutions to shortest path and enumeration problems.	Apply
CO6	Choose appropriate mathematical and statistical techniques for solving applications in emerging areas of Information Technology.	Apply

IV. COURSE CONTENT:

MODULE-I: INTRODUCTION (10)

Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains.

MODULE-II: RANDOM SAMPLES (10)

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood.

MODULE-III: STATISTICAL INTERFACE (8)

Statistical inference, Introduction to multivariate statistical models: regression and classificationproblems, Principal components analysis, The problem of over fitting model assessment.

MODULE-IV: GRAPH THEORY (09)

Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems.

MODULE-V: COMPUTER SCIENCE AND ENGINEERING APPLICATIONS (08)

Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.

V. TEXT BOOKS:

1. John Vince, "Foundation Mathematics for Computer Science", Springer 2015.
2. K. Trivedi. "Probability and Statistics with Reliability, Queuing, and Computer Science Applications". Wiley, 2016.
3. M. Mitzenmacher and E. Upfal." Probability and Computing: Randomized Algorithms and Probabilistic Analysis". Wiley, 2005.

VI. REFERENCE BOOKS:

1. Alan Tucker, "Applied Combinatorics", Wiley, 2012.

VII. WEB REFERENCES:

1. http://www.tutorialspoint.com/r/
2. https://en.wikipedia.org/wiki/R_programming_language.
3. http://www.r-bloggers.com/how-to-learn-r-2/#h.obx6jyuc9j7t.

VIII. E-TEXTBOOKS:

1. https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf
2. https://www.cs.bris.ac.uk/~flach/mlbook/.
3. http://mylovelibrabry.com/emylibraryus/free.php?asin=1466583282.