MT103 Probability and Statistics

Prerequisites: Standard XII Mathematics or equivalent.

Course Contents:

Probability

Experiments and sample spaces, events, algebra of events, probability axioms, conditional probability, independence of events, mutually exclusive events. Baye's rule (10%)

One dimensional random variable:: discrete and continuous random variable, characteristics of distributions, cumulative distribution function, functions of one random variable. (10%)

Two dimensional random variable: marginal and conditional distributions, conditional expectation independence, covariance and correlation, distribution function. (10%)

Special discrete distributions: Bernoulli, Binomial, Poisson (10%)

Special continuous distributions: uniform, exponential, normal **(10%)**

Statistics

Sampling distributions, Parameter Estimation of mean and proportion. (10%)

Hypothesis tests about mean and proportion, Chi-square tests, analysis of variance ,least squares curve fitting, the coefficient of Determination. (15%)

Confidence Intervals in linear Regression, correlation analysis, simple nonlinear regression, Higher dimensional least-squares fit. (15%)

Non parametric tests: sign test, Rank test, Median test (10%)

Main Reading

1. William W. Hines and Douglas C. Montgomery, Probability and Statistics in Engineering and Management Science, Wiley India Pvt. Ltd.
2. T.Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill Pub. Co. Ltd.
3. P.S.Mann, Introductory Statistics, Wiley Student edition

MT104 Discrete Mathematical Structures

Prerequisites: Standard XII Mathematics or equivalent.

Course Contents:

Logic, Propositional equivalences, predicates and quantifiers, nested quantifiers, methods of proof, functions. (10%)

Mathematical induction, recursive definitions and structural induction, recursive algorithms, programme correctness, Pigeonhole principle, permutations and combinations. (10%)

Recurrence relations, solving recurrence relations, divide and conquer algorithms and recurrence relations, generating functions, inclusion and exclusion, applications of inclusion and exclusion. (20%)

Relations and their properties, n-ary relations and their applications, representing relations, closures of relations, equivalence relations, partial orderings. (20%)

Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamiltonian paths, shortest path problems, planar graphs. (20%)

Introduction to trees, applications of trees, tree traversal, spanning trees, minimum spanning trees (10%)

Boolean functions, representing Boolean functions, logic gates, minimization of circuits (10%)

Main Reading

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Tata McGraw-Hill Pub. Co. Ltd.
2. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, PHI Learning Pvt. Ltd.

PL105 Programming and Problem Solving Lab

Prerequisites: None

List of Sample Lab Assignments

Programs using Conditional/Selection constructs

1. Program to convert polar co-ordinates to Cartesian coordinates and vice-versa.
2. Program to find out the maximum and minimum of three integers read as input.
3. Program to convert lowercase characters to uppercase characters.
4. Program to read an integer 'n' and print whether 'n' is a prime number or not.
5. Program to compute real or imaginary roots of a quadratic equation.

Programs using Arrays, Iterative Constructs and Conditional/Selection constructs

6. Program to read an array of 'n' numbers and to sort it using selection sort algorithm.
7. Program to read an array of 'n' numbers and to sort it using insertion sort algorithm.
8. Program to read an array of 'n' numbers and to sort it using bubble sort algorithm.
9. Consider a matrix of 0's and 1's. A sequence of successive 1's along a row, or a column, or a diagonal is defined to be a line. The number of 1's in a line is called its length. Write a program to find out the line with the maximum length in such a matrix.
10. Program to implement Newton Raphson Method
11. Program to implement Runga Kutta Method

Programs using Recursion

12. Program to compute the greatest common divisor of two positive integers.
13. Program to solve Tower of Hanoi problem.
14. Program to sort an array of integers using Merge Sort.

Programs using Structures and Unions

15. Define a structure for a student having name, roll number and marks obtained in six subjects. Assume that "all students" is an array of students. Write 'C' function to:
    1. Print the name and roll number of the students who have secured the highest marks in each subject;
    2. Print the name and roll number of the student who has secured highest total marks
16. Program to read details of 'n' students and call the above functions.
17. Program to store information of the performance of all cricket players of Indian Team in a dynamic array. For the batsman the following information should be stored - Name, Number of games played, Average runs scored, Number of centuries and fifties scored. For a bowler the information should be: Name, Number of games played, Number of overs bowled, Number of times the bowler has taken five and ten wickets in a match and Average runs given per wicket.