COURSE DETAILS

Name of the Programme	:	**Master of Science (Data Science)**
Semester	:	**I**
Course Name	:	**Statistical Computing**
Course Code	:	**T6688**
No. of Credit	:	**4**

Learning Objectives:

The Course aims at providing students with a good knowledge of computational methods in the field of statistics. Particular relevance is given to numerical methods as the course means to provide students with the ability to solve numerical problems using appropriate software tools.

Pre-requisites:

Algebra and Calculus

Course Outline:

Module No.	Topic
1	Random number generation, Requisites of a good random number generator, methods of random number generation such as linear congruential, mixed congruential and multiplicative congruential. Tests of randomness, digit frequency test and serial correlation, selection of a random number generator. Methods of generating random variables (model sampling)

2	Optimization methods, direct search, grid search, interpolatory search, gradient search. Newton-Raphson method, Muller's method, Aitken's extrapolation.
3	Numerical integration: quadrature formula, double integration, singularity, Gaussian integration. Monte Carlo Methods: Monte Carlo integration and Simple case studies, applications of Monte Carlo methods to compute expected values of functions of random variables.
4	Computation of probabilities and percentage points in selected probability distribution, verification of WLLN and CLT using random number generator, simulating sampling distribution of a test statistic.
5	Finding zeros of function: interpolation, Newton-Raphson method, Secant method etc
6	Problem solving with statistical software

Books Recommended:

1. Rizzo Maria L (2008). Statistical computing with R. London : Chapman & Hall/CRC, c2008.

2. Kennedy W. J. & Gentle J. E. (1980). Statistical Computing (Marcel Dekker)

3. Thisted R. A.(1988). Elements of Statistical Computing, (Chapman and Hall)

4. Krishnamurthy V. & Sen (1993). Numerical Algorithm Computation in Science and Engineering. (Affiliated East West Press), Second edition

5. Law, A.M. and Kelton, W.D. (2000). Simulation, Modeling and Analysis Third Edition. (Tata McGraw Hill)

6. Rajaraman V. (1993). Computer Oriented Numerical Methods, (Prentice-Hall). Fourth edition

7. Ripley B. D.(1987) Stochastic Simulation. (John Wiley)

8. Ross, S. (2000). Introduction to Probability Models. (Academic Press)

9. Schilling, R.J. and Harris, S.L.(2002). Applied Numerical Methods for Engineers Using MATLAB and C, (Thomson and Brooks/Cole, Singapore)