Course Code	Course Name	Hours per Week			Total	Total
		L	**T**	**P**	**Hrs.**	Credits
EN5RD01	**Research Methodology**	4	0	0	4	4

Unit-I **Introduction to Research Techniques**

Meaning of research, objectives of research, motivation in research, types of research- empirical and experimental research, algorithmic research, simulation research, mathematical modelling approach, characteristics and prerequisites of research, significance of research, research process, Sources of research problem, criteria of identifying the problem, necessity of defining the problem, formulation of a research problem, errors in selecting research problem, technique involved in defining the problem, Report and paper writing.

Unit II **Statistical analysis**

Statistical analysis, Measures of central tendency and dispersion, mean, median, mode, range, mean and standard deviations, computing correlation in variables, linear and non-linear regression.

Unit III **Probability and Probability distributions**

Probability: classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes'Theorem and independence. Probability distributions: binomial, poison, geometric, negative binomial uniform exponential, normal and log normal distribution.

Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quintiles, Markov inequality, correlation and regression, independence of random variables.

Unit IV **Sampling & Distributions**

The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, ChiSquare, t and F distributions, problems. Hypothesis Testing: Basic ideas of testing hypothesis, null and alternative hypotheses, the critical and acceptance regions, two types of error, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications. Software and Tools to be learnt: Statistical packages like SPSS and R.

Unit V **Simulation and Soft Computing Techniques**

Introduction to soft computing, Artificial neural network, Genetic algorithm, Fuzzy logic and their applications, Tools of soft computing, Need for simulation, types of simulation, simulation language, fitting the problem to simulation study, simulation models, verification of simulation models, calibration and validation of models, Output analysis.

Introduction to any one simulation tool e.g. MATLAB, NS2, ANSYS, Cadence etc. (Department Specific).

Text:

1. R. Panneerselvam, " Research Methodologies," PHI.
2. C.R. Kothari: Research methodology, Methods and Techniques, New Age Publication.
3. S.M. Ross, A First Course in Probability, 8 th Edition, Prentice Hall.

Reference Books:

1. Best John V. and James V Kahn: Research in Education, Wiley eastern.
2. S.P. Sukhia, P.V. Mehrotra, and R.N. Mehrotra: Elements of Educational Research, PHI publication.
3. K. Setia: Methodology of Research Education, IEEE publication.
4. Jerry Banks, John S. Carson, Barry.L. Nelson David. M. Nicol, “Discrete-Event System Simulation”, Prentice-Hall India.
5. V.K. Rohatgi, A.K. Md.E.Saleh,” An Introduction to Probability and Statistics”, Johm Willey.