

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NEEC595	Research Methodology and Statistics for Electrical Engineering	3	0	0	3

Course Objective
<ul style="list-style-type: none"> <li>The objective of the course is to prepare the researchers so that they can handle their future research goals. The course is prepared so that the students can readily identify the methods, materials, scientific tools and techniques relevant to the solution of the problem at hand. The course also provides a brief overview of statistical tools that the students might require during their doctoral research work</li> </ul>
Learning Outcomes
<p>Upon successful completion of this course, students will:</p> <ul style="list-style-type: none"> <li>develop the ethics that are necessary for carrying out doctoral-level research.</li> <li>be able to present their research finding in a technically relevant yet lucid manner.</li> <li>be able to readily identify the methods, scientific tools and techniques relevant to the solution of the problem at hand.</li> <li>have a basic understanding of statistical tools that are frequently used in research relevant to Electrical Engineering.</li> </ul>

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to research, Objective of research, Importance of Research, Difference between research methods and research methodology with examples, various stages of research, various components of thesis research, Preparation and presentation of thesis research.	5L	Understanding the basic steps of carrying out a doctoral-level research work.
2	Research Process, Types of Research, Problem identification & Hypotheses formulation, Elements of Research Article, Ethics of Scientific Research, Introduction to IPR, Patent, Copyright, Trade Mark, National and International Status, Current Trends & Future Prospect.	5L	This module will help students in developing the ethics that are necessary for carrying out doctoral-level research. Further, the students will be informed about the different outcomes of doctoral study (including IPR, Patent, Copyright, Trade Mark etc.) and their importance.
3	Various mathematical tools for scientific research, Correlation. Auto-correlation and cross-correlation, Data analysis.	8L	This unit will help students in understanding the relationship that exists between various types of experimental data.
4	Time Series Analysis for Electrical Load Forecasting, Curve Fitting Technique for Electrical Data Analysis, Application of Interpolation Technique in the context of Electrical Engineering.	7L	The students will gain knowledge about time series data and its analysis. This is crucial for analyzing signals like sensor outputs. The students will also learn about different available interpolation techniques.
5	Frequency Distribution, Presentation of Data, Measures of Dispersion, Skewness, Kurtosis and Moments, Various Types of Charts and Diagram for Electrical Engineering.	8L	This module is designed to help students process the experimental data in a meaningful, scientific way so that it helps achieve the research goals.
6	Probability Distributions for Electrical Engineering - Binomial, Poisson, Normal, Sampling and Estimation, Hypotheses testing – t test, z test, Chi-square test, Analysis of Variance.	9L	This module will familiarize students with essential statistical tools that are frequently used in Electrical Engineering.
Total Contact Hours		42L	

#### Text Books

1. Ranjit Kumar, "Research Methodology: A Step-by-Step Guide for Beginners", SAGE Publications Ltd; 4th edition

#### Reference Books

1. Trevor Hastie, Jerome H. Friedman, Robert Tibshirani, "The Elements of Statistical Learning", Springer-Verlag New York Inc.