RME001 - RESEARCH METHODOLOGY (Science & Technology)

**Unit-I: Research Preparation and Planning**  
10 hours  

**Unit-II: Research Resources**  
10 hours  

**Unit-III: Academic Writing & Presentation**  
13 hours  
Proposal submission for funding agencies, Elements of Style. Organization of proposals, Basic knowledge of funding agencies, Research report writing, Communication skills, Tailoring the presentation to the target audience – Oral presentations, Poster preparations. Submission of research articles for Publication to Reputed journals, Thesis writing, and Research report writing. Elements of excellent presentation: Preparation, Visual and Delivery. Oral Communication skills and Oral defence.

**Unit-IV: Data Collection, Analysis and Inference**  
15 hours  
Basic Statistical Distributions and their applications: Binomial, Poisson, Normal, Exponential, Weibull and Geometric Distributions.  
Sample size determination & sampling techniques: Random sampling, stratified sampling, systematic sampling and cluster sampling.  
Large Sample Tests and Small Sample Tests: Student–t-test, F-test and $\chi^2$ test and their applications in research studies.  
Correlation and Regression Analysis-Time series analysis: Forecasting methods.  
Factor analysis, Cluster Analysis and Discriminant Analysis (Basic ideas only).  
Principles of Experimentation, Basic Experimental Designs: Completely Randomized Design Randomized Block Design and Latin Square Design. Factorial Designs: $2^2$, $2^3$ and $2^4$ – Accuracy, Precision and error analysis.

**Unit-V: Mathematical Modelling**  
12 hours  
Basic concepts of modeling of Engineering systems – static and dynamic model – Model for prediction and its limitations.  
System simulation -- validation.  
Use of optimization techniques – Genetic Algorithm, Simulated Annealing, Particle Swarm Optimization.
References