SARDAR PATEL UNIVERSITY
Vallabhb Vidyanagar
Pre- Ph.D. (Course)

Paper-I

Research Methodology:

1. **Introduction:** Meaning, Objectives, Motivation, Types of Research, Approach and Significance, Characteristics of scientific research, Value of and value-free scientific research, definition and selecting a problem, Scientific methods in research, criteria for good research, sources for selecting research topics.

2. **Research Design:** Meaning, need, features, concepts, goals, characteristics, different phases in research design, Designs for different types of research, advantages of a research design, Basic principles and experimental design.

   (b) **Measurement and Scaling Techniques:** Measurement in research, measurement in Scales, source of error in measurement, tests for sound measurement, measurement tools. Observation-purpose, types, process, factors affecting observation, recording observation, observation schedule, Scaling-means, techniques.

   OR

2. **Thought Process Involved in Theoretical Studies:**
   Asking questions: How and Why?, analogies and similarities, relevance to rest of subject area, philosophy of subject, role of appropriate scientific background, choice of research area and research subject, celebrated research problems in theoretical studies, historical aspects of the development of subject.

3. **Mathematical and Statistical Methods:**
   Polynomials- transcendental and trigonometric functions
   Differentiation and integration
   Differential equations- ODE and Solutions, partial differential equations of Science
   Matrix algebra – Solution of matrix equation A [x] = B
   Measure- Means, median, mode and comparison
   Analysis of variance and covariance (ANOVA) - Definition, types, basic principle, techniques, methods, two way ANOVA, analysis of covariance, tests of significance
   Multivariate Analysis techniques: Growth, characteristics and applications, classification variables, multivariate techniques, factor analysis-rotation, R-type and Q-type factor analysis, path analysis.

4. **Interpretation and Report Writing:** Meaning, technique, precaution, significance, different steps in writing report, layout, and presentations, mechanism and precautions in writing research reports, writing papers in theoretical and experimental studies, writing project proposals and presentation.

5. **Computers:** Application in Scientific Research, Computer and computer technology. Computer system, characteristics
MS office: Tools and Application, Internet Web programming: Hardware and software requirement for internet, ISP and internet account, web home page, URL, Browser, Security on web, Searching on web, Searching tools and search engines.
Internet as Resource for Scientific Literature: The structure of chemical information, Important electronic based resources, and how to find information on compounds-synthetic routes, physical and chemical properties; abstracts and journals in Science, Electronic form of journals and their Resource, patents and the disclosure of inventions. Scientific word processing – LaTeX relevant scientific freeware,

6. **Quality of research:** Serious and meaningful research, research evaluation, citation indices, impact factors, quality of research, ethics in scientific research, plagiarism and manipulation.