Kadi Sarva Vishwa Vidyalaya Gandhinagar

Ph. D. Course Work

For

Faculty of Mathematics

Year: 2010-11

Course structure

Paper	Title	University Examination (Marks)	
		Section A (general)	Section B (specialization)
I	Research Methodology	60	40
II	Scientific Communication	60	40
III	Specialization Paper	100	

Paper-I   Research Methodology

Syllabus
SECTION-A   (Common to all faculty)   60 marks

1) Introduction to Research Methodology : Meaning of Research, Objectives of Research, Motivations in Research, Types of Research, Research Approaches, Significance of Research, Research Methods v/s Methodology, Research and Scientific Methods, Research Process, Criteria of Good Research
2) Defining the Research Problem : What is Research Problem?, Selecting the Problem, Necessity of and Techniques in defining the problem
3) Research Design: Meaning, Need, Features of Good Design, Concepts, Types. Basic Principles of Experimental Design, Developing a Research Plan
4) Sample Design : Implication, Steps. Criteria for selecting a sample procedure, Characteristics of Good sampling Procedure, Types of Sample Design, Selecting Random Samples, Complex random sampling Design.
5) Measurement and Scaling Techniques: Measurement in Research, Measurement Scales, Sources of Errors in measurement, Tests of Second measurement, Technique of developing Measurement Tools, Meaning of Scaling, Scale Classification Bases,
   Important Scaling Techniques, Scale Construction Techniques. 6
6) Methods of Data Collection: Collection of Primary Data, Observation Method, Interview method, Collection of Data through questionnaire and Schedules, Other methods. Collection of Secondary Data, Selection of appropriate method for data collection, Case Study Method, Guidelines for developing

questionnaire, successful interviewing. Survey v/s experiment.

7) Processing and Analysis of Data : Processing Operations (Meaning, Problems), Data Analysis (Elements), Statistics in Research, Measures of Central Tendency, Dispersion, Asymmetry, Relationship. Regression Analysis, Multiple correlation and Regression, Partial Correlation, Association in case of Attributes

8) Sampling Fundamentals : Definition, Need, Important sampling Distribution, Central limit theorem Sampling Theory, Sandler's A-test, Concept of Standard Error, Estimation, Estimating population mean, proportion. Sample size and its determination, Determination of sample size Based on i) Precision Rate and Confidence level ii) Bayesian Statistics.

9) Testing of Hypothesis: Meaning, Basic concepts, Flow diagram, Power of a hypothesis test, Important parametric tests, Hypothesis Testing of Means, Differences between Means, Comparing Two related samples, Testing of Proportion, Difference between proportions, Comparing variance to hypothesized population variance, Equality of variances of two normal populations, hypothesis testing of Correlation coefficients, Limitations of Tests of hypothesis.

10) Chi- square test : Applications, Steps, characteristics, limitations

11) Analysis of Variance and Covariance : Basic Principles, techniques, applications, Assumptions, limitations.

12) Analysis of Non-parametric or distribution-free Tests : Sign Test, Fisher-Irwin Test, McNemer Test, Wilcoxon Matched pair Test (Signed Rank Test), Rank

13) Sum Tests : a) Wilcoxon-Mann-Whitney Test b)Kruskal-Wallis Test, One sample Runs Test, Spearman's Rank Correlation, Kendall's Coefficient of Concordance, Multivariate Analysis Techniques: Characteristics, Application, Classification, Variables, Techniques, Factor Analysis (Methods, Rotation), Path Analysis.

Section – B (Faculty of Mathematics)   40 Marks

- Select the area of research
- Study of research papers in the relevant area
- Analysis of studied research papers
- Formulate Model/problem

- Components of the model
- Critical parameters of each component
- Solution methodology of proposed model
- Evaluation
- Future scope and limitation of model

Paper-II   Scientific Communication

SECTION-A   (Common for all faculty)   60 marks
Syllabus

1. Basics of Communication skill.
   a) English Grammar: Word Choice, Sentence Structure, paragraph structure,
      Comprehension
2. Types of Scientific Communications.
3. Importance of publishing research papers
4. Publishing Reearch paper :
   a) Preliminaries, Format, Choosing Journal
   b) Title, Running Title
   c) Authors: Single and Multi authorship
   d) Writing Abstract
   e) Introduction section
   f) Materials and Methods Section
   g) Result Section
   h) Figures : Design Principles, Legends, Table components, Graphs: Types, Style,
        Tables v/s Graph
   i) Discussion Section: Format, Grammar Style, Content.
   j) Acknowledgements
   k) References : Different Styles
   l) Selecting Keywords
   m) Communication with the Editor, Handling Referees' Comments, Galey Proofs
5.   Writing Review Articles
6.   Preparing and Delivering of Oral and Poster Presentations
7.   Avoiding Plagiarism
8.   Preparing documents for MoUs, Confidentiality Agreements.

9. IUPAC symbols and Terminology for physicochemical quantities and Units, SI prefixes, Fundamental Constants, Standard Abbreviations and Symbols

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Section – B (Faculty of Mathematics)   40 Marks

Exposure on
• Study of general guidelines for authors in journals
• Compilation of manuscript
• Preparation of Hardcopy and Softcopy version of manuscript
• Selection of Journal
• Submission of manuscript
• Final Submission of paper after review comments
• Select an area from emerging methodologies
• Plan for an innovative project
• Plan for project proposal
• Compilation of proposal with data
• Selection of funding agency (UGC, AICTE, GUJCOST, DST, IT Ministry, CSIR, etc.
• Submission proposal to the agency.
• Use of MS-OFFICE, MATLAB, MAPLE, MATHEMATICA for scientific visualization of data.

Paper – III (Faculty of Mathematics)   100 Marks

1. **Basic Concepts of Real and Complex Analysis:**

   Limits, Continuity, Uniform Continuity, Differentiability, Riemann Integral, Metric space, Sequence and series, Algebra of complex numbers, Analytic functions, Power series, Taylor's and Laurent's series, Conformal mapping.

2. **Basic Concepts of Linear Algebra:**

   Vector space, Subspace, Linear dependence, Basis, Linear transformation, Algebra of matrices, Rank of matrix, Determinants, Linear equations, eigen values and eigen vectors, Quadratic forms.

3. **Discrete Mathematics:**

Partially ordered sets, Lattices, Complete Lattices, Distributive lattices, Complements, Boolean algebra, Elements of Graph Theory, Eulerian and Hamiltonian graphs, Planar Graphs, Directed graphs, Trees, Spanning trees, Fuzzy set theory

4. **Differential Equations:**

First order ODE, singular solutions, initial value problem of first order ODE, general theory of homogeneous and non homogeneous linear ODE, variation of parameters.

5. **Basic concepts of probability:**

Sample space, discrete probability, simple theorems on probability, independence of events, Bayes Theorem. Discrete and continuous random variables, Binomial, Poisson, Uniform, Exponential, Weibull and Normal distributions ; Expectation and moments, independence of random variables.

6. **Linear/Non-Linear Programming Basic Concepts:**

Convex sets. Linear Programming Problem (LPP). Examples of LPP, Hyperplane, open and closed half – spaces. Feasible, basic feasible and optimal solutions, Extreme point and graphical method, K-T conditions.

7. **Operational Research Modeling:**

Definition and scope of Operational Research, Different types of models, Replacement models and sequencing theory, inventory problems and their analytical structure. Simple deterministic and stochastic models of inventory control, Basic characteristics of queueing system, different performance measures. Steady state solution of Markovian queueing models : M/M/1, WW1 with limited waiting space MWC, M/M/C with limited waiting space