

## School of Mathematical Sciences

### Syllabus for Ph.D. Pre-registration Qualifying Entrance Examination

#### **PART-I** **RESEARCH METHODOLOGY**

##### **UNIT-I**

**Meaning of Research-** Objectives of Research - Motivation in Research - Types of Research- Research Approaches - Significance of Research - Research Methods versus Methodology - Research and Scientific Method - Importance of Knowing How Research is Done- Research Process - Criteria of Good Research.

**Research Problem-** Selecting the Problem- Necessity of Defining the Problem - Technique Involved in Defining a Problem - Meaning of Research Design - Need for Research Design - Features of a Good Design - Important Concepts Relating to Research Design - Different Research Designs - Basic Principles of Experimental Designs.

##### **UNIT-II**

**Basics of MATLAB-** MATLAB windows- online help- Input output- File types - Platform dependence- General commands- Interactive Computation: Matrices and vectors- matrix and array operation-character strings-Special note on array operation-Command line Functions- using built-in functions and online- help.

**Scripts and Functions-** Script Files - Function Files - Language-specific Features - Loops , branches, and control-flow - Recursion - Advanced Data Objects - Multidimensional matrices - Applications - Linear Algebra - Curve Fitting and Interpolation - Data Analysis and Statistics - Numerical Integration - Ordinary Differential Equations.

##### **UNIT-III**

**Plotting Simple Graphs-** Basic 2-D plots - Subplot for multiple graphs-3D plots - Handle graphics - Fun with 3-D Surface graphs - Saving and Printing Graphs - Saving graphs to reusable files - Animation - Errors.

**Computer Algebra and The Symbolic Math Toolbox -** The Symbolic Math Toolbox - Two useful tools in the Symbolic Math Toolbox - Numeric Versus Symbolic Computation - Variable precision arithmetic - Getting help with the Symbolic Math Toolbox - Using the Symbolic Math Toolbox - Generating MATLAB code for an inline or anonymous function - Using MuPAD Notebook - Some Symbolic Math Toolbox Commands.

## **UNIT-IV**

**LATEX Commands and Environments-** Command names and arguments-Environments-Declaration- Lengths- Special characters- Spaces and carriage returns-Document Layout and Organization: Document class- Page style- Parts of the document-Changing font- Centering and indenting- Lists- Theorem-like declarations - Tabulator stops - Boxes - Tables - Printing literal text - Footnotes and marginal notes - Comments within text

**Graphics Inclusion and Color** - The graphics packages - Adding color.

## **UNIT-V**

**Mathematical Formulae** - Mathematical environments- Main elements of math mode-Mathematical symbols- Additional elements- Fine-tuning mathematics-Horizontal spacing-selecting font size in formulas- processing parts of a document- In-text references-Bibliographies.

**Floating tables and figures** - Float placement - Postponing floats - Style parameters for floats - Float captions - Float examples - References to figures and tables in text - Some float packages - User Customizations - Counters - Lengths - User-defined commands - User-defined environments - Some comments on user-defined structures.

### **Reference Books:**

1. C.R.KOTHARI, RESEARCH METHODOLOGY, Methods and techniques (second revised edition).
2. RUDRA PRATAP, Getting Started with Matlab, A Quick Introduction for Scientist and Engineers.
3. HELMUT KOPKA, Patrick W. Daly, A Guide to Latex and Electronic Publishing(Fourth Edition).