

SOLAPUR UNIVERSITY, SOLAPUR



SYLLABUS
FOR
M. Phil.
IN
MATHEMATICS

To be effective from the academic year 2010-11(June-2010)

SOLAPUR UNIVERSITY, SOLAPUR

M. Phil. in Mathematics

SYLLABUS

To be effective from the academic year 2010-11 (June – 2010).

The following table gives the scheme of Theory Examination at M. Phil. in the subject Mathematics.

Paper No.	Title of the Paper	Marks
I	Research Methodology and Computer Applications	100
II	Topics in Mathematics	100
III	Topic of Dissertation	100

Nature of Question Paper for Theory Examination at M. Phil. in Mathematics.

1) Each paper contains six questions (one question from one unit) each of 25 Marks. The candidate has to attempt any four questions.

2) Paper – III is based on the Topic of Dissertation. The syllabus of Paper – III will be prepared by concerned Research Guide and it shall be submitted immediately after the registration of the Candidate.

Paper I

Research Methodology and Computer Applications

Section I : Research Methodology

Unit I : An Introduction

Meaning of Research, Objectives of Research, Motivation, Types of Research , Research approaches, Significance of research, Research process, Criteria of Good research, Research methods versus methodology, Research and Scientific method, research problem, Selecting the research problem.

Unit II : Interpretation and Report Writing

Meaning of interpretation, Technique of interpretation, precaution in interpretation, Significance of Report writing, different steps in writing report, types of reports, oral presentation, mechanics of writing a research report, precautions for writing reports.

Unit III : Outer issues : Utility of mathematics to science, technology and Mathematics, pure versus applied mathematics, mathematics by fiat, from Hardyism to Maoism, standard dogmas Platonism, formalism and Constructivism, Non – Eudidean geometry, Non – cantorian Set theory.

Section II : Computer Applications

Unit I: - Role of Computer in Research.

Introduction, The computer and Computer technology, the computer system, important characteristics, the binary number system, computer applications, computers and researchers.

Unit II :- Language

C Essentials – scalar data types, control flow, operators and Expressions, Arrays and pointers, Functions

Unit III : - MATLAB and LATEX

Introduction to MATLAB, Matrices; programming in MATLAB(Scripts and functions) ,What is LATEX, Simple typesetting, fonts, type size, Document class, page style, page numbering, formatting lengths, parts of a document, dividing the document.

References:-

- 1.C.R. Kothari, Research Methodology, Methods and Techniques,(2nd revised ed.) New Age TECHNO PRESS.
2. LATEX Tutorials, A primer,by Donald knuth(www.tug.org.in/tutorials.html)
3. First steps in Latex – George Gratzer
- 4.Getting started with MATLAB 7 , Rudra Pratap, OXFORD PRESS.
- 5.Davis and Hersh : The Mathematical Experiences, penguin 1983.
- 6.Let us C, 8th Edition by Yashavant Kanetkar – Jones & Bartlett publishers.

Paper II

Topics in Mathematics

Unit I : Algebra .

Rings with chain conditions, Noetherian and Artian rings, Hilbert basis theorem, Levilsky theorem, weddeburn theorem, semisimple Artinian and Noetherian rings, primary decomposition of ideals in Noetherian rings, Cohen's theorem, Nakayama rings, Local rings and krull intersection theorem.

Unit II : Analysis .

Continuity of functions on \mathbb{R}^2 , Differentiability of $F: \mathbb{R}^m \rightarrow \mathbb{R}^n$, properties of differential, partial and directional derivatives continuously differentiable functions, Inverse function theorem, Implicit function theorem, Integral functions, line and surface integrals, Green's theorem, stoke's theorem.

Unit III : Topology

Para compact spaces, the fundamental groups, Homotopic paths, contractible and simply connected spaces, the covering Homotopy property for S^1 , the degree of a loop, equivalence of loops, the isomorphism between the fundamental group and the group of integers \mathbb{Z} .

Unit IV : Partial Differential Equations

Weak solutions of Elliptic boundary value problems, variational problems, Weak formulation of Elliptic PDE, regularity, Galerkin Method, Maximum principles, Eigenvalue problems, Introduction to finite element method.

Unit V : Intergral Equations

Evolution equations – unbounded linear operators, Co- Semigroups, Hille – Yosida theorem, Contraction semigroups on Hillbert spaces, Heat equation, wave equation, Schrödinger equation, Inhomogenous equations.

Unit VI : Functional Analysis.

Definition and examples of topological vector spaces, Nonvariational methods, monotonicity Methods, Fixed point theorems, sub and super solutions, Geometric properties of solutions (Radial symmetry) , Nonexistence of solutions, Gradient flows.

References:-

- 1.S. Kesavan; Topics in functional Analysis and applications, wiley – Eastern, New Age international 1989.
- 2.L.C. Evans : partial differential equations, Graduate studies in Mathematics, volume 17, AMS 1998.
- 3.David M. Burton. : First course in rings and ideals, Addison Wesley pub. Comp. 1970 .
- 4.W. J. Pervin : Fundamentals of General Topology, Academic press, New York, 1972.
- 5.Atiyah M.A. and T. G. Machonald : Introduction to commutative algebra, Addison Wesley .
- 6.John Horwath, Topological vector spaces and distributions Adison Wesley, 1966.
- 7.“Differential Equations in Abstract spaces”, Lakshmikantham and G.E.Ladas. Academic press, INC. 1972.
- 8.Fred H. Croom : Basic Concepts of Algebraic Topology, Springer – Verlag.

Paper III

Topic of Dissertation

Paper – III is based on the Topic of Dissertation. The syllabus of Paper – III will be prepared by concerned Research Guide and it shall be submitted immediately after the registration of the Candidate.