Department of Mathematics
Mahatma Gandhi University
Scheme of Ph. D Course Work

(w.e.f Academic year 2017-2018)

**Paper I:**  Research Methodology and Technical Writing (Compulsory)

**Paper II:**  Elective (Each student has to choose one from the following)

a. Advanced Analysis

b. Fluid Mechanics

Note: Each paper is 3 hrs duration and carries 100 marks. Minimum pass mark is 50.
Research Methodology and Technical Writing

Unit-I
Introduction to research methodology, Meaning, Objectives, Types, Significance of research, Identification, Selection of research problem, Formulation of research objectives, Research design, Quantitative and qualitative methodology, H-index, impact factor, Immediacy index, acknowledgement and its index, copy rights, Research ethics, plagiarism,

Unit-II
Effective word selection in science writing, Common mathematical functions and their abbreviations, symbols, operators commonly used in mathematics, Greek, roman letters used in mathematics, mathematics journals (science citation index, engineering indexed and Scopus indexed) and their abbreviations, mathematics subject classifications, mathematical review, Math SciNet, other E-resources,

Unit-III
Latex: Sample Document, Type style, Environments, Lists, Centering, Tables, Verbatim, Vertical and Horizontal spacing, Equation environments, Fonts, Hats and underlining, Braces, Arrays and matrices, customized commands, Maths styles, document classes and overall structure, titles for documents, sectioning commands, packages, inputting files, pictures, making a Bibliography, making an index, slides.

Unit-IV

Text Books:
Department of Mathematics  
Mahatma Gandhi University  
Pre-Ph.D(Mathematics)  
Elective –Paper-II (a)

**Advanced Analysis**

**Unit I**

Abstract Integration, simple functions, integration of positive functions, sets of measure zero, Lebesgue measure.

**Unit- II**

Banach fixed point theorem, Application of Banach theorem to Integral equations, Application of Banach theorem to linear equations, Application of Banach theorem to differential equations

**Unit- III**

Approximations in Normed Spaces- Examples- Uniqueness- Strict Convexity- Uniform Approximation

**Unit –IV**

Algebra, Banach Algebra-Definition and examples, regular singular elements, Topological divisors of zero

**Text Books**

1. Real and Complex Analysis by W.Rudin  
2. Introductory Functional Analysis by E. Kreyszing  
2. Introduction to Topology and Modern Analysis by G.F.Simmons
Fluid Mechanics

UNIT-I

UNIT-II
Navier –stokes equations of motion of a viscous fluid-The energy equation-Conservation of energy-Dissipation of energy –Determination of energy dissipation due to viscosity-vorticity equation-Couette flow –Poiseuille flow-Unsteady flow over a flat plates and parallel plates.

UNIT-III
Dimensional analysis-Dimensionless constants and similarity of flow-Technique of dimensional analysis-Rayleigh’s technique-Buckingum, π theorem, Reynolds number-and its significance, Prandtl’s boundary layer theory –Boundary layer thickness Displacement and momentum thickness-Energy thickness -Energy thickness-Drag and lift. The boundary layer equation in two-dimension- Boundary layer flow over a flat plates –The Blasius solution.

UNIT-IV

Text books :
2. Theoretical Hydrodynamics by Milne Thompson.
5. Fluid Dynamics by M.D.Raisingania
Model paper  
Faculty of Science  
Per-PhD(Mathematics) Examinations  

Time: 3 Hours  
Max.Marks: 100  

Note: Answer all the questions in Section A and Section B  

Section-A  
(Short Answer Type)  
4x10=40 Marks  

1.  
2.  
3.  
4.  

Section-B  
(Essay Answer Type)  
4x15=60 Marks  

1. (a)  
   or  
   (b)  
2. (a)  
   or  
   (b)  
3. (a)  
   or  
   (b)  
4. (a)  
   or  
   (b)