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

(w.e.f Academic year2017-2018)

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.

Department of Mathematics
Mahatma Gandhi University
Pre-Ph.D (Mathematics)
Paper-I

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 over al structure, titles for documents, sectioning commands, packages, inputting files, pictures, making a Bibliography, making an index, slides.

Unit-IV

Matlab: Arthmetic operations, Built-in-math functions, Scalar variables, Creating arrays, built-in-functions for handling arrays, Mathematical operations with arrays, Script files, Two dimensional plots, Programming in Matlab, Polynomial, curve fitting and interpolation, Three dimensional plots.

Text Books:

1. C.R.Kothari, Research Methodology, New Age International Publishers.
2. Michael Davis: Ethics and the University. Rouledge(1999)
3. Harold Rabinowitz, Suzanne Vogel: The manual of scientific style, Academic press(2009).
4. Laslie Lamport: LATEX, Addison Wesley Publications Company (1994).
5. David F. Griffiths, Desmond J.Higham: Learning LATEX. Society for Industrial and Applied Mathematics, Philadelphia (1997).
6. Amos Gilat: MATLAB: An Introduction with applications , John Wiley & Sons, INC(2004).
7. WWW:en. Wikipedia. Org.

Department of Mathematics
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Pre-Ph.D(Mathematics)
Elective –Paper-II (a)

Advanced Analysis

Uint 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- Uniorm Approximation

Unit –IV

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

Text Books

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

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Elective- Paper-II (b)

Fluid Mechanics

UNIT-I

Kinematics- Lagrangian and Eulerian methods-Equation of continuity-Boundary surface-Stream Lines, path lines and Streak lines- Velocity potential – Irrotational and rotational motions – Vortex lines. Equation of motion-Lagrange's and Euler's equation of motion-Bernoulli's theorem- Stream functions-Irrotational motion in two-dimensions- Complex velocity potential sources –Sinks, doublets and their images – Milne –Thompson Circle theorem.

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 –Poiseuillie 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

Magneto hydro-dynamics: Basic equation of viscous magneto hydro –dynamic-Equation of incompressible MHD flow –One dimensional steady viscous flow –Hartman flow –Coutte flow-Temperature distribution MHD approximation –Equations under the MHD approximation –waves and theory of characteristics- Characteristic equation of MHD Alfven's wave and velocity.

Text books :

1. A treatise on Hydrodynamics, Part II CBS publishers, Delhi 1988- W.H BESAINT and A.S. Ramsay.
2. Theoretical Hydrodynamics by Milne Thompson.
3. Text book of Fluid Dynamics by F. Chorlton.
4. Magneto Hydrodynamics by Allan Jaffery.
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)