Syllabi & Course Scheme

Pre-Ph.D (Mathematics)

Paper No.	**Nomenclature**	**Credits**
PPD– 101	Research Methodology	04 Credits
PPD-102	Review of Literature	
PPD-103	Option-I Advanced Solid Mechanics Option-II Algebraic Coding Theory	04 Credits

PPD– 101 Research Methodology

Marks for Major Test (External): 70 **4 Credits (4-0-0)**
Internal Assessment: 30 **Time: 3 Hours**
Total Marks: 100

Note: The question paper will contain eight questions in all. The candidates are required to attempt any five questions. All questions carry equal marks.

Introduction of Research Methodology: Meaning of research, objectives of research, types of research, significance of research, research and scientific method, research process.
Research Problem: Definition, necessity and techniques of defining research problem. Formulation of research problem. Objectives of research problem.
Scientific Communications: Publishing Research Papers: Selection of a journal; writing of paper's abstract, formulation of problem, discussion and references, submission and handling of reviewer's comment.
Writing of thesis: Format of a thesis; Review of literature, formulation; Writing methods, results; preparation of Tables, figures; writing discussion; writing conclusion; writing summary and synopsis; Reference citing and listing/Bibliography. Avoiding Plagiarism.
Computer Applications in Research: Practical aspects of Matlab, Introduction to latex.
MS Office 2007: Word Basics, Mail Merge, Macros, Math Type, Equation Editor
MS Excel 2007: Excel Basics, Data Sort, Functions.
Presentation: Poster and Oral. Presentation tools: Introduction to presentation tool, MS Power Point: features and functions, creating presentation, customizing presentation, showing presentation.
Web Search: Internet Basics, Internal Protocols, Pre-requisites, Search Engines, Searching Hints, Using advanced search techniques

Books Recommended:

1. Gurumani, N. (2010), Scientific Thesis Writing and Paper Presentation, MJP Publishers
2. Kothari, C.R. (2010), Research Methodology (Methods and Techniques), New Age International Publishers.
3. Gerald, C.F. and Wheatley, P.O. : Applied numerical analysis, 6th Ed. Addison Wesley (2002)
4. Smith G.D. : Numerical solution of partial differential equations, Oxford University Press (1982)
5. Schwartz H.R., Stiefel: E & Rustishausar : Numerical analysis of symmetric matrices, Prentice Hall (1976)

PPD– 102 Review of Literature

Marks for Major Test (External): 70 **Time: 3 Hours**
Internal Assessment: 30
Total Marks: 100

Note: The candidates are required to submit a copy of Review of Literature on the relevant research topic. The performance will be evaluated on the basis of submitted literature and the presentation given by the candidates before the evaluation committee.

PPD-103 (Option-I) Advanced Solid Mechanics

Marks for Major Test (External): 70 **4 Credits (4-0-0)**
Internal Assessment: 30 **Time: 3 Hours**
Total Marks: 100

Note: The question paper will contain eight questions in all. The candidates are required to attempt any five questions. All questions carry equal marks.

General solution of the equilibrium equations: Papkovitch-Neuber solution, Lame's strain potential, Galerkin Vector, Love's strain function, Applications to the solution of the Kelvin problem for an unbounded medium and the Boussinesq problem for a semi-infinite medium.
Generalized Hooks's law including the effect of thermal expansion, Naviers' equation, thermal stresses in a long circular cylinder
Seismic Waves: Field equations of linear elastodynamics, Plane waves in unbounded media, P, SV and SH waves of seismology, wave propagation in two dimensions, Surface waves-Love & Rayleigh waves, Reflection of P, SV, SH waves at a free boundary, Reflection and transmission of SH-waves at a solid-solid interface.
Viscoelasticity: Spring & Dashpot, Maxwell & Kelvin Models, Three parameter solid, Correspondence principle & its application to the Deformation of a viscoelastic Thick-walled tube in Plane strain.
Fluid Dynamics: Vector & tensor analysis in fluid dynamics, The idea and viscous fluid, Newtonian, generalized Newtonian and non- Newtonian fluids, Rheology of fluid, Constitutive laws, Conservation laws, Navier-Stokes, Couette flow, flow over a Flat Plate, Wedge flows, Hangen-Poiseuille flow. Boundary layer flow, similarity solution. Flow through porous media: Darcy, Brinkman and Forchheimer models. Heat transfer: Free convection through Vertical plate, horizontal plate, cylinders.

Books suggested:

1. Bath, M. : Mathematical Aspects of Seismology, Elsevier
2. Bullen, K.E. and A. Bolt: An Introduction to the Theory of Seismology, Cambridge University Press
3. Fung, Y.C. : Foundations of Solid Mechanics, Prentice Hall
4. Peter M. Shearer: Introduction to Seismology, Cambridge University Press
5. W. Flugge, Viscoelasticity, Springer Verlag.
6. Kundu, P.K. and Cohen I.M., Fluid Mechanics, 3rd Ed., academic Press, (2004).
7. Nield, A.D. and Bejan, A., Convection in Porous Media, Springer, Berlin, 1999
8. Schlichting H., Boundary-layer theory, McGraw Hill International, (1979)
9. Sherman F.S., Viscous Flow, McGraw Hill International, (1990)
10. White F.M., Viscous Fluid Flow, McGraw Hill International, (1991)

PPD-103 (Option-II) ALGEBRAIC CODING THEORY

Marks for Major Test (External): 70 **4 Credits (4-0-0)**
Internal Assessment: 30 **Time: 3 Hours**
Total Marks: 100

Note: The question paper will contain eight questions in all. The candidates are required to attempt any five questions. All questions carry equal marks.

Groups, Representation theory of finite groups, Peter-Weyl theorem, Rings and Modules, commutative rings, Noetherian and Artinian rings and modules, modules over PID, fields extensions, introduction to Galois theory.
The Communication channel. The Coding Problem. Types of Codes. Block Codes. Error Detecting and Error-Correcting Codes. Linear Codes. The Hamming Metric. Description of Linear Block Codes by Matrices. Dual Codes. Standard Array. Syndrome. Error-Correction Capabilities of Linear Codes.

Important Linear Block Codes. Hamming Codes. Golay Codes. Perfect Codes. Quasi - perfect Codes. Reed-Muller Codes. Codes derived from Hadmard Matrices.

Suggested Texts:

1. E.R. Berlekamp, Algebraic Coding Theory, McGraw Hill Inc., 1968.
2. F.J. MacWilliams and N.J.A. Sloane, Theory of Error Correcting Codes, North Holland Publishing Company 1977.
3. M. Artin. *Algebra*.
4. I.N. Herstein. *Topics in Algebra*.