RK University (Pre-registration Coursework for PhD program)

Program – PhD (Applied Mathematics)

Concerned Dean – Dr. Ajit Kumar Shukla (email – ajit.shukla@rku.ac.in)

Sr. No.	Subject	Contents	Method of evaluation	Credits
1.	Research Methodology	As per syllabus mentioned below	Written examination(3 hrs)	4
2.	Subject of specialization:* 1. Fluid Mechanics 2. Graph Theory 3. Fourier Analysis	Research topic specific	Written examination (3 hrs)	4
3.	Review of literature	Review of literature for the PhD research topic	Presentation + Detailed report in hard copy	3
Total				11

(*Shall be decided by the Dean of Faculty, individually, for each PhD scholar)

Notes –

1. The admission process of PhD program will comprise of 2 stages viz. (a) admission to PhD program (b) final registration in PhD program.
2. A successful PhD candidate (RAT examination) will be admitted to PhD program after paying admission fees (Rs. 60000/-) and upon allocation of a PhD guide by RK University.
3. An admitted PhD candidate will have to submit synopsis and presentation of his/her actual research project (in consultation with the PhD guide approved and allocated by RK university) before Doctoral Research Committee (DRC) within 6 months from date of admission (date will be declared by university).
4. An admitted PhD candidate will be registered after earning minimum of 11 credits as per above mentioned course-work structure.
5. The candidate will acquire credit of a subject on passing the examination that will be conducted at the end of 6 months (date will be declared by university).
6. On acquiring required credits, an admitted candidate will be issued a certificate of registration (along with project title) by RK University.

Course Title	Research Methodology

Detailed syllabus

Research:

Meaning, purpose, Types, (Educational, Clinical, Experimental, historical descriptive, Basic applied and Patent oriented Research) and objectives of research, phases of research.

Research Design:

Review of Research Literature: Purpose and use of literature review, locating relevant information, use of library & electronic databases, preparation & presentation of literature review, research article reviews, theoretical models and frame work. Identification of gaps in research, formulation of research problem, definition of research objectives.

Documentation:

a. "How" of documentation

b. Techniques of documentation c. Importance of documentation

d. Use of computer packages in documentation

Research Publication:

Thesis, Research paper, Review Article & Technical Reports: Organization of thesis and reports, formatting issues, citation methods, references, effective oral presentation of research. Quality indices of research publication: impact factor, immediacy factor, H- index and other citation indices

Presentation (especially for oral presentation):

Importance and types of different skills, contained, format of model, introduction, Poster, Gestures, eye contact, facial, expressions, stage fright, volume of pitch, speed, pause & language, Visual aids & seating, Questionnaire etc.

Cost analysis of the project:

cost incurred on raw materials, Procedure, instrumentations and clinical trials.

Sources for procurement of research grants:

International agencies, government and private bodies.

Industrial-institution interaction:

Industrial projects, their feasibility reports, interaction with industries.

Research Ethics and Morals:

Issues related to plagiarism, collaborative models and ethics, acknowledgements. Intellectual Property Rights: copy rights, copy left: patents, Industrial designs, Trademarks.

Reference Books:

1. Research Methodology, Methods & Techniques, C. R. Kothari, Vishwa Prakashan
2. Research Methods- A Process of Inquiry, Graziano, A.M., Raulin, M.L, Pearson Publications.
3. How to Write a Thesis:, Murray, R. Tata McGraw Hill
4. Writing For Academic Journals, Murray, R., McGraw Hill International.
5. Writing for Publication, Henson, K.T., Allyn &Bacon.
6. Research Methodology by Bhattacharyya Excel Books 2nd Edition.
7. What is this thing called Science, Chalmers, A.F.,Queensland University Press.
8. Methods &Techniques of Social Research, Bhandarkar & Wilkinson, Himalaya publications.
9. Doing your Research project, Bell J., Open University Press, Berkshire.
10. A Handbook of Academic Writing, Murray, R. and Moore, S., Tata McGraw Hill International.
11. Business Research Methods Donald R. Cooper and Pamela S.Schindler Business Research Methods Tata McGraw Hill Publishing Company Ltd
12. Research Methodology: A Guide for Researchers in Management and Social Sciences Taylor, Sinha & Ghoshal

Course Title	Fluid Mechanics

Detailed syllabus

1. Basics of general fluid mechanics:
   -Definitions: real fluid, ideal fluid, velocity of fluid, velocity of potential, vorticity vector, local and particle rates of change.
   - Equation of Continuity
   - Equation of motion
   -Bernoulli's equation
2. Stress and Strain, Navier- Stokes equation.
3. Derivation of Reynolds equation from the Navier- Stokes equation.
4. Concepts of the magnetic fluid
5. Concepts of the porous media –porosities, permeability, Darcy's law, etc.

Reference Books:

1. Fluid Mechanics : Fundamentals and Applications, Cengel Yunus, A. Cimbala John, M. , Tata Mc Graw-Hill Publishing Company Limited New Delhi
2. Fluid Power with Applications, Esposito, Anthony, Pearson Education Delhi
3. Textbook of Fluid Mechanics and Hydraulic Machines, Rajput R. K. , S. Chand & Company Ltd New Delhi
4. Textbook of Fluid Mechanics and Hydraulic Machines, Bansal R. K., Laxmi Publications (P) Ltd New Delhi

Course Title	Graph Theory

Detailed syllabus

Section – I

Part I: Basic concept and Knowledge based Topic in graph theory

1 Basic preliminaries, definition and important result in graph theory
2 Directed graph
3 Connectendancess of directed and undirected graph(Strongly connected, Unilaterally connected, weakly connected graphs)
4 Operation on graph: Union, Intersection, Join, Cartesian Product, One point union, Corona
5 Euler graph and related result
6 Hamiltonian graph ant related results
7 Matching, Covering and colouring in graph
8 Cut verities, cut-set of a graph
9 Trees, types of trees, important result on graph theory
10 Matrix representation of graph
11 Graph models
12 Application on graph theory in different field of engineering and science

Section – II

Part II: Researched based advanced topics graph theory

1. Graph Labeling: introduction
2. Graceful labeling: Definition, examples
3. Skolem graceful labeling: definition, examples
4. Cordial labeling: definition, examples
5. 3-equitable labeling: definition, examples
6. Product cordial labeling: definition, examples
7. Prim cordial labeling: definition, examples

Reference Books:

1. Graph Theory with Applications, J.A. Bondy and U.S.R. Murty, Elsevier North-Holland
2. Graph Theory and Its Applications. J.L. Gross and J. Yellen, CRC Press
3. Graphical Enumeration, F. Harary and E. Palmer, Academic Pres
4. Graph Theory With Applications To Engineering And Computer Science, Narsingh Deo, Phi Learning
5. Graph Theory, F. Harary, Narosa Publishing House

Course Title	Fourier Analysis

Detail Syllabus

Section I

1. Functional Analysis:

Normed linear spaces
Banach spaces
Bounded linear operators.
Convergence of Sequences of Functions.
Dual of a normed linear space.
Inner product space
Hilbert space, operators.

2. Fourier Series:

Trigonometric series
Convergence of Fourier series
Orthogonality
Generalized Fourier series
Completeness.
Harmonic Analysis

Section II

3. Sturm Liouville Problem

Regular S-L Problem
Singular S-L Problem
Properties of S-L Problem
Fourier-Bessel Series
Fourier Legendre Series
Perceval's theorem on Fourier Constant
Complex form of Fourier Series

4. Fourier Transform:

Introduction of Fourier transform
Existence of Fourier transform
Basic properties of the Fourier transform
Fourier Inversion
Convolution
Plancherel's Formula
The Fourier Transform of L2- Function
smoothness versus Decay
Dilation and Translation
Bandlimited Functions and sampling formula

Discrete Fourier Transform.

Reference Book:

1. "An Introduction to Wavelet Analysis", David F. Walnut, Birkhauser.
2. "Introductory Functional Analysis with Applications", Erwin Kreyszig, John Wiley & Sons.