# PG COURSE OUTCOMES

## SEMESTER-I

## COURSETITLE: ALGEBRA PAPER-I

**After completion of this course, students will be able**

- To classify numbers into numbersets.
- To combine polynomial by addition orsubtraction.
- To solve problems of simpleInequalities
- Interpret basic absolute valueexpression
- To simplify algebraic expressions, using the commutative, associative and Distributiveproperties.

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## SEMESTER- I

## COURSETITLE: MATHEMATICAL ANALYSISPAPER-II

**After completion of this course, students will be able to**

- Describe fundamental properties of the real numbers that lead to the formal development of realanalysis.
- Comprehend regions arguments developing the theory underpinning realanalysis
- Demonstrate an understanding of limits ad how that are used in sequences, series anddifferentiation.
- Construct rigorous mathematical proofs of basic results in realanalysis.
- Appreciate how abstract ideas and regions methods in mathematical analysis can be applied to important practicalproblems.

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## SEMESTER- I

## COURSETITLE: ORDINARY DIFFERENTIAL & PARTIAL DIFFERENTIAL EQUATIONS PAPER-III

**After studying this course, you should be able to**

- Demonstrate familiarity with emerging mathematical techniques appropriate in banks and other financialinstitutions.
- Demonstrate an ability to select and apply numerical methods appropriate for the solution of financialproblems.

- The principles of mathematical reasoning and their use in understanding analyzing and developing formalarguments.
- The connections between the mathematical series and other scientific and humoristicdisciplines.
- Undertake a piece of directed in mathematicalfinance.

## SEMESTER- I

## COURSE TITLE: ELEMENTARY NUMBER THEORY PAPER- IV

**Objective:** Elementary Number Theory is the study of the basic structure and properties of integers. Learning Number Theory helps improving one's ability of mathematical thinking. **Successful completion of this course will enable you to:**

- Prove results involving divisibility and greatest commondivisors;
- Solve systems of linearcongruences;
- Find integral solutions to specified linear DiophantineEquations;
- Apply Euler-Fermat's Theorem to prove relations involving primenumbers;
- Apply the Wilson'stheorem.

## SEMESTER- I

## COURSE TITLE:DISCRETEMATHEMATICS PAPER-V

**Upon successful completion of this course, the student will be able to:**

- Understand the basic principles of sets and operations insets
- Apply counting principles to determineprobabilities
- Demonstrate different traversal methods for trees andgraphs
- Write model problems in computer science using trees andgraphs
- Write an argument using logical notation and determine if the argument is or is not valid
- Determine when a function is one- one andonto.
- Prove basic setequalities.
- Demonstrate the ability to write and evaluate aproof.

## SEMESTER- II

## COURSETITLE: GALIOS THEORY

### PAPER-I

- On satisfying the requirements of this course, students will have the knowledge and skillsto:
- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and appliedcontexts.
- Explain Demonstrate accurate and efficient use of advanced algebraictechniques.
- Demonstrate capacity for mathematical reasoning through analyzing, Proving and explaining concepts from advancedalgebra.
- Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and othermathematical

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## SEMESTER- II

## COURSETITLE: LEBESEGUE MEASURE & INTEGRATION

### PAPER-II

**After completion of this course, students will be able to**

Read analyze and write logical arguments to prove mathematical concepts

- Communicate mathematical ideas with clarity and coherence both written and verbally
- Fundamental objects ,techniques and theorems in the mathematical sciences including the fields ofanalysis
- Master the object material in the four required core course that form the academic pillars of theprogram
- Demonstrate a competence in formulating ,analysing and solving problems in several core areas of mathematics at a detailed level , includinganalysis

## SEMESTER- III

## COURSETITLE: C O M P L E X ANALYSIS PAPER-III

**Upon successful completion of this course, the student will be able to:**

- Justify the need for a Complex Number System and explain how is related to other existing numbersystems
- Define a function of complex variable and carry out basic mathematicaloperations with complexnumbers.
- know the condition(s) for a complex variable function to be analytic and/or harmonic
- State and prove the Cauchy Riemann Equation and use it to show that a function is analytic.
- define singularities of a function, know the different types of singularities, and be able to determine the points of singularities of afunction
- Explain the concept of transformation in a complex space (linear and non-linear) and sketch associateddiagrams.
- Understand the concept of sequences and series with respect to the complex numbers system and establish whether a given series/ sequences is convergent/ divergent at a specified point orinterval.

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## SEMESTER- II

## COURSETITLE:TOPOLOGY PAPER-IV

**After completion of this course, students will be able to:**

- Topolgy uses to analyze complex network Ex: Social networks, Biological networks, Internet etc.
- It applies Differential Topology to probability to identity multivariate interactions. This was used in neuro science recently to deduce how neurons areinteracting.
- This paper discusses using cell phones to actually map out the topology of indoor spaces.
- Another cool application is in the world of chemistry where one can discuss the shape of molecules by an analysis of the topology of a

relatedgraph.

- There is also an application for medical imaging software andtechnology.

## SEMESTER- II

**TITLE: THEORY OF ORDINARYDIFFERENTIALEQUATIONS**

**PAPER-V**

**After completion of this course, students will be able to:**

- The study of Differential focuses on the existence and uniqueness of solutions and also emphansizes the rigorous justification of methods for approximating solutions in pure and appliedmathematics.
- It plays an important role in modelling virtually every physically technical or biological process from celestial motion to bridge design to interactions between neurons.
- Theory of differential equations is widely used in formulating many fundamental laws of physics andchemistry.
- Theory of differential equation is used in economics and biology to model the behaviour of complexsystems.
- Differential equations have a remarkable ability to predicts the world around us. They can describe exponential growth and decay population growth of species or change in investment return overtime.

## SEMESTER- III

**COURSETITLE: F U N C T I O N A L ANALYSIS PAPER-I**

**Upon successful completion of this course, the student will be able to:**

- Explain the fundamental concepts of functional analysis and their role in modern mathematics and appliedcontexts
- Demonstrate accurate and efficient use of functional analysistechniques.
- Demonstrate capacity for mathematical reasoning through analyzing proving and

explaining concepts from functionalanalysis.

- Apply problem-solving using functional analysis technique applied to diverse situations in physics, engineering and other mathematical context.

## SEMESTER- III

## COURSE TITLE: GENERALMEASURETHEORY PAPER-II

**Upon successful completion of this course, the student will be able to:**

- Students will understand the fundamentals of measure theory and be acquainted withtheproofsofthefundamentaltheoremsunderlyingthetheoryofintegration.
- They will also have an understanding of how these underpin the use of mathematical concepts such as volume, area, and integrationand
- They will develop a perspective on the broader impact of measure theory in ergodic theory and have the ability to pursue further studies in this and related area.
- The students will learn about measure theory random variables, independence, expectations and conditional expectations, product measures and discrete parametermatingalus.
- Explain the concept of length, area, volume using lebesgue'stheory.
- Apply the general principles of measure theory and integration in such concrete subjects as the theory of probability or financialmathematics.

## SEMESTER- III

## COURSE TITLE: LINEAR ALGEBRA PAPER-III

- **Upon successful completion of this course, the student will be able to**

- Construct, or give examples of, mathematical expressions that involve vectors, matrices, and linear systems of linear equations
- Finding eigenvalues and eigenvectors of a matrix or a linear transformation, and using them to diagonalize a matrix
- Demonstrate understanding of linear independence, span, and basis
- Apply principles of Matrix Algebra to linear transformations
- Characterize homogeneous linear systems using the concepts of free variables, span, pivots, linear combinations, and echelon forms

- Characterize linear transforms using the concepts of existence and uniqueness

## SEMESTER- III

### COURSE TITLE:OPERATIONRESEARCH PAPER-IV

**Upon successful completion of this course, the student will be able to:**

- Operation Research is used for defence capability acquisition decision making.
- It is used to find optimal or near optimal solutions to complex decision making problems.
- It is used in finding maximum (of profit or yield) in real-world objective.
- It is used in finding minimum (of loss or cost) in real-world objective.
- It is used in dataenvelopment.
- It has strong ties to computer science andanalytics.

## SEMESTER- III

### COURSE TITLE:NUMERICAL ANALYSIS PAPER-V

**Upon successful completion of this course, the student will be able to:**

- Apply numerical methods to obtain approximate solutions to mathematical problems.
- To learn how to interpolate the given set of values
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

- Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.
- Work numerically on the ordinary differential equations using different methods through the theory of finite differences.
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

## SEMESTER- IV

**TITLE: INTEGRAL EQUATIONS AND CALCULUSOFVARIATION**
**PAPER-I**

**Upon successful completion of this course, the student will be able to:**

- Learn variationprinciples
- Develop the knowledge in the path of the rocket trajectory, optimal economic growth
- Gain the vast knowledge by using the applications of calculus of variations in biological and medicalfield.
    - Ex: Spread of a contagious disease, pest control cancer chemotherapy and immune system, etc.
- Learn easier & systematic way to ordinary and differential equations and partial differentialequations
- Develop the skills while doing/solving the various problems by using integral equations in all engineering sciences andetc.

## SEMESTER- IV

**TITLE: ELEMENTARY OPERATOR THEORYPAPER-II**

- Relate the behavior of different kinds of operators acting on finite dimensional and infinite dimensional spaces
- Apply the theory of unbounded operator to differential equations and Difference equations
- Apply the concept of unbounded linear operators in Hilbert spaces

- Understand the concept of different kinds of bounded linear operators on Hilbert spaces such as, self-adjoint operator, unitary operator, normal operator etc.
- Understand the idea of spectral representation of compact self-adjoint operators and bounded self-adjoint operators
- Understand the difference between the eigenvalue of an operator and spectrum of an operator

## SEMESTER- IV

**TITLE: ANALYTICAL NUMBER THEORY** **PAPER-III**

**Upon successful completion of this course, the student will be able to:**

- Understand better distribution of prime numbers
- Know the basic theory of zeta& L-functions
- Understand the proof of dirichlet's theorem
- Understand Dirichlet characters and analytic properties of Dirichlet L-functions
- Define fundamental objects like gamma functions,thetafunction,the Riemann zeta function,Dirichlet L-function and Dirichlet characters
- Understand the basic methods of analytical numbers including abel's summation and mobius inversion

## SEMESTER- IV

**TITLE: CRYPTOGRAPHY** **PAPER-IV**

**Upon successful completion of this course, the student will be able to:**

- Understand the fundamental principles of access control models and techniques, authentication and secure system design
- Understand the Public-Key Infrastructure
- Understand various encryption techniques

- Understand the concept of Public key cryptography
- Use symmetric and asymmetric key algorithms for cryptography
- To be able to secure a message over insecure channel by various means

## SEMESTER- IV

**COURSE TITLE: ADVANCEDOPERATIONRESEARCH**

**PAPER-V**

**After studying this course, you should be able to:**

- Give an appreciation of strategic importance of operations ans supply chain management in a global businessenvironment.
- Understand how an operation relates to other businessfunction.
- Develop a working knowledge of concepts and methods related to designing and managing operations and supplychains.
- Develop a skill set for quality and processimprovement.
- Develops how to manage and control the resourceallocation.