(For the candidates admitted from the academic year 2015 onwards)

CORE I : ALGEBRA

Semester: I **Subject Code:**
Hours :6 **Credits : 5**

Objectives:

- To give a detailed knowledge about the counting Principle, Euclidean Rings and dual spaces.
- To develop the concept of extension fields and algebra of linear transformations.

Unit I : Another Counting Principle - Sylow's Theorem - Finite Abelian Groups.

Unit II : Polynomial Rings - Polynomials over the Rational Field - Polynomial Rings over Commutative Rings.

Unit III : Dual Spaces - Inner Product Spaces - Modules.

Unit IV : Extension Fields - Roots of Polynomials - More About Roots.

Unit V : The Algebra of Linear Transformations - Characteristic Roots – Matrices - Canonical Forms : Triangular Form.

Text Book: "Topics in Algebra" by I.N.Herstein, Vikas Publishing Company, Edition 1996.

Unit I: Chapter 2 -Sections 2.11, 2.12, 2.14
Unit II: Chapter 3- Sections 3.9 to 3.11
Unit III: Chapter 4 - Sections 4.3 to 4.5
Unit IV: Chapter 5 - Sections 5.1, 5.3, 5.5
Unit V: Chapter 6 - Sections 6.1 to 6.4

Reference Books:

1. "Modern Algebra" by Surjeet Singh & Quasi Zameerudi
2. "A First Course in Abstract Algebra" by J.B.Fraleigh Addison-Wesley Publishing Company 1970

(For the candidates admitted from the academic year 2015 onwards)

CORE: II – REAL ANALYSIS

Semester: I **Subject code:**
Hours: 6 **Credits : 4**

Objectives: To enable the students to

1. Provide a comprehensive idea about the principles of real analysis.
2. Understand the concepts of Metric spaces, Differentiation and Riemann Steiltjes integrals.
3. Apply the above Concepts to new situations.
4. Develop the right approach towards research in analysis.

Unit I : **Basic Topology :** Metric Spaces - Compact Sets.

Unit II: **Continuity:**- Limits of functions-Continuous functions-Continuity and Compactness - Continuity and Connectedness.

Unit III: **Differentiation**:The derivative of a real function –Mean value theorems-The continuity of Derivatives - L'Hospital's Rule – Derivates of Higher Order – Taylor's theorem.

Unit IV: **The Riemann-Stieltjes integral**:Definition and Existence of the integral – The fundamental theorem of calculus.

Unit V: **Sequences and series of functions**: Definition –Uniform Convergence – Uniform Convergence and Continuity – Uniform Convergence and Integration.

Text Book: "Principles of Mathematical Analysis "- III Edition by Walter Rudin, McGraw Hill Company, Newyork.

Unit I : Chapter 2 Sections 2.15 to 2.42
Unit II : Chapter 4 Sections 4.1 to 4.10, 4.13 to 4.19, 4.22, 4.23
Unit III : Chapter 5 Sections 5.1 to 5.15
Unit IV : Chapter 6 Sections 6.1 to 6.17, 6.21,6.22
Unit V : Chapter 7 Sections 7.1 to 7.13, 7.16, 7.17

Reference Books:

1. "Mathematical Analysis" by Tom M.Apostol ,Addison-Wesley Publishing company.
2. "Methods of Real Analysis" by Goldberg, Oxford and IBH Publishing company.

(For the candidates admitted from the academic year 2015 onwards)
CORE III : ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Semester: I | Subject Code:
Hours : 6 | Credits : 4

Objectives:

1.Learn various concepts in ordinary and partial differential equations.
2.Acquire and develope knowledge in applied mathematics.
3.Increase their capability to perform better in UGC,CSIR and SLET examinations.

UNIT I : The general solution of the homogeneous equation – The use of a known solution to find another – The method of variation of parameters – Power series solutions.

UNIT II: Second order linear equations. Ordinary points - Regular singular points – Gauss Hyper geometric equation – The point at infinity.

UNIT III : Special Functions – Legendre Polynomials – Bessel Functions and their properties – Linear system of first order homogeneous equations with constant coefficients.

UNIT IV : First order Partial Differential Equations – Integral surfaces passing through a given curve – Compatible systems – Charpit's method – Jacobi method.

UNIT V : Second order Partial Differential Equations – Linear partial differential equations with constant coefficients – Equations with variable coefficients.

Text Books:

1. "Differential Equations with applications and Historical Notes" by G.F.Simmons (First Edition), TATA McGRAW-HILL, 2003.

   Unit I : Chapter III - sec 15,16,19 and Chapter V – Sections 26 & 27
   Unit II : Chapter V - sec 28,29,30,31
   Unit III: Chapter VI - sec 32,33,34,35,38.

2. "Elements of Partial differential equations" by Ian Sneddon
   Unit IV : Chapter 2 – sec 5,9,10 and 13
   Unit V : Chapter 3 - sec 4 and 5

(For the candidates admitted from the academic year 2015 onwards)

Core IV: CLASSICAL DYNAMICS

SEMESTER: I — Subject Code:
Hours: 6 — Credits: 4

Objectives: To enable the students to

- Learn various concepts in classical dynamics.
- Understand the Lagrange's function of classical dynamics and its applications.
- Acquire and develop knowledge in applied mathematics.
- Increase their capability to perform better in UGC, CSIR, and SLET.

UNIT I : **Introductory Concepts:** The Mechanical System – Generalised co-ordinates – Constraints – Virtual Work – Energy and Momentum.

UNIT II : **Lagrange's Equations:** Derivation of Lagrange's Equations – Examples – Integrals of the Motion.

UNIT III : **Hamilton's Equations:** Hamilton's Principle – Hamilton's Equations – Other Variational Principles.

UNIT IV " **Hamilton-Jacobi Theory:** Hamilton's Principal Function – The Hamilton - Jacobi Equation.

UNIT V : **Canonical Transformations:** Differential Forms and Generating Functions – Special Transformations.

TEXT BOOK: Content and treatment as in **"Classical Dynamics" by Donald T.Greenwood**, Dover Publications, Inc. New York, Edition 1997.

UNIT – I - Chapter 1 – Sections 1.1 to 1.5

UNIT – II - Chapter 2 – Sections 2.1 to 2.3

UNIT – III - Chapter 4 – Sections 4.1 to 4.3

UNIT – IV - Chapter 5 – Sections 5.1 & 5.2

UNIT – V - Chapter 6 – Sections 6.1 & 6.2

(For the candidates admitted from the academic year 2015 onwards)

CORE - V : NUMBER THEORY

Semester: I Subject Code

Hours: 6 Credits: 4

Objectives: To enable the students to

1. Know about Congruences, Quadratic residues and partition generating function.
2. Enjoy the technique of the proof of some beautiful results like Mobius inversion formula, Euler's partition theorem etc.,
3. Motivate the students towards research in number theory

Unit I : Fundamentals of congruences: Basic properties of congruences – Residue Systems – Riffling. Solving Congruences: Linear congruences – The theorems of Fermat and Wilson revisited – The Chinese Remainder theorem – Polynomial Congruences.

Unit II : Arithmetic functions: Combinatorial study of $\phi(n)$ – Formulae for d(n) and $\sigma(n)$ – Multiplicative Arithmetic functions – The Mobius Inversion formula. Primitive Roots: Properties of reduced Residue Systems – Primitive roots Modulo P.

Unit III: Quadratic Residues: Euler's Criterion – The Legendre symbol – The Quadratic reciprocity law – Applications of the Quadratic reciprocity law. Distributions of Quadratic residues: consecutive Residues and non-residues – Consecutive Triples of Quadratic Residues.

Unit IV:Sum of squares: Sums of two squares – Sums of Four Squares. Elementary partition theory: Introduction – Graphical representation – Euler's partition theorem – Searching for partition Identities.

Unit V: Partition generating functions: Infinite Products as Generating functions – Identities between Infinite series and products. Partition Identities: History and Introduction – Euler's Pentagonal Number Theorem – The Roger's Ramanujan Identities.

Text Book: " NUMBER THEORY " By E. ANDREWS, Edition 1984, Hindustan Publishing Corporation,NewDelhi..

Unit I	:	Chapters 4 & 5.
Unit II	:	Chapters 6 & 7.
Unit III	:	Chapters 9 & 10.
Unit V	:	Chapters 11 & 12.
Unit III	:	Chapters 13 & 14. (Omit 14.4 & 14.5)

(For the candidates admitted from the academic year 2015 onwards)

CORE VI - COMPLEX ANALYSIS

Semester: II | Subject Code:
Hours : 6 | Credits : 5

Objectives:

1. *To Understand analytic functions, Cauchy's theorems and Residue theory and solve problems in these areas.*
2. *To Know about Power series expansions and Elliptic Functions.*

Unit I: Arcs and Closed Curves - Analytic Functions in Regions – Conformal mapping - Line Integrals - Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchys' theorem for a Rectangle , Cauchys' theorem in a Disk

Unit II : Index of a point with respect to a closed curve –Integral Formula – Higher Derivatives - Removable Singularities – Zeros and Poles – The Maximum Principle.

Unit III: Residue Theorem – Argument Principle – Evaluation of Definite Integrals – Harmonic Functions – Definition and Basic Properties – Mean Value Property – Poisson's Formula.

Unit IV: Weierstras's theorem – Taylors Series – Laurent's Series - Partial Fractions - Infinite Products – Canonical Products .

Unit V: Period Module – Unimodular Transformations – General Properties of Elliptic Functions –Weierstrass P Function –Functions $\zeta(z)$ and $\sigma(z)$ - Differential Equation

.**Text Book: "Complex Analysis" – III Edition by L.V.Ahlfors, ISE McGraw – Hill Publishing Company.**

Unit I: Chapter 3 Sections 2.1 to 2.3 and Chapter 4 Sections 1.1 to 1.5
Unit II: Chapter 4 Sections 2.1 to 2.3 and 3.1,3.2,3.4
Unit III: Chapter 4 Sections 5.1 to 5.3 and 6.1 to 6.3
Unit IV: Chapter 5 Sections 1.1 to 1.3 and 2.1 to 2.3
Unit V: Chapter 7 Sections 2.1, 2.2, 2.4 & 3.1 to 3.3

Reference Books:

1. **"Analysis of Functions" Vol. I & II by E.Hille.**
2. **"Functions of One Complex Variable" by J.B.Conway.**
3. **"Complex Analysis" by Nevellina & Parto**

(For the candidates admitted from the academic year 2015 onwards)

CORE VII: GRAPH THEORY

Semester :II Subject Code:
Hours:6 Credits :5

Objectives :

1.To introduce to the students, topics of further research.
2.To understand the different types of digraphs.
3.To enable the students to formulate real life problems into graph theoretic models.

UNIT I: **Matrix representation of graphs:** Incidence Matrix – Submatrices of A(G) – Circuit matrix – Fundamental Circuit Matrix and Rank of B.

Coloring, Covering and Partitioning : Matchings – Coverings – The Four Color problem.

UNIT II: **Directed graphs:** Definitions - Some types of digraphs – Euler digraphs – Trees with directed edges – Fundamental circuits in digraphs.

UNIT III**: Enumeration of graphs :** Types of enumeration - Counting labeled trees - Counting unlabeled trees.

UNIT IV: Polya's counting theorem - Graph enumeration with Polya's theorem.

UNIT V: **Graph Theory in Operations Research :** Transport networks – Minimal Cost Flows - Activity networks in project planning – Analysis of an activity network.

Text Book: "Graph theory with applications to Engineering and Computer Science" by Narsingh Deo, PHI, 2012.

UNIT I: Chapter 7 – Sections 1 to 4,Chapter 8 – Sections 4 to 6.
UNIT II: Chapter 9 – Sections 1,2,5 to 7.
UNIT III: Chapter 10 – Sections 1 to 3.
UNIT IV: Chapter 10 – Sections 4 & 5.
UNIT V: Chapter 14 – Sections 1,3,7 & 8.

(For the candidates admitted from the academic year 2015 onwards)

CORE VIII – Mathematical Probability and Statistics

Semester: II **Subject Code:**

Hours : 6 **Credits : 5**

Objectives:

To make students gain in- depth knowledge in probability and statistics

To learn about limiting distributions and central limit theorem.

Unit I: ***Distribution of Random Variables***

The Probability Set Function – Random Variables – The Probability Density Function – The Distribution Function – Mathematical Expectation – Some Special Mathematical Expectations – Chebyshev's Inequality.

Unit II:***Conditional Probability and Stochastic Independence***

Conditional Probability – Marginal and Conditional Distributions – The Correlation Coefficient – Stochastic Independence.

Unit III: ***Special Distribution***

The Binomial Distribution only – The Poisson Distribution – The Gamma and Chi-Square Distributions – The Normal Distribution.

Unit IV: ***Distributions of Functions of Random Variables***

Sampling Theory – Transformations of Variables of the Discrete type – Transformations of Variables of the Continuous type – The $'t'$ and $'F'$ Distributions – The Moment – Generating function Technique.

Unit V:***Limiting Distributions***

Limiting Distributions – Stochastic Convergence – Limiting Moment – Generating Functions – The Central Limit Theorem – Some Theorems on Limiting Distributions.

Text Books: "Introduction to Mathematical Statistics" by Robert V.Hogg and Allen T.Craig, **Fourth Edition, MacMillan Publishing Co.**

Unit I: Chapter 1 – Sections 1.4 to 1.7, 1.9 to 1.11

Unit II: Chapter 2 – Sections 2.1 to 2.4

Unit III: Chapter 3 – Sections 3.1 to 3.4

Unit IV: Chapter 4 – Sections 4.1 to 4.4 and 4.7

Unit V: Chapter 5 – Sections 5.1 to 5.5

References:

1. **"An Introduction to Probability Theory and Mathematical Statistics",** *V.K.Rohatgi,* **Wiley Eastern Limited.**
2. **"Probability and Statistics",** *KadarkkaraiThangam K. and Subas Chandra Bose,* **A. Jeyalakshmi Publishers, Tuticorin.**

(For the candidates admitted from the academic year 2015 onwards)

CORE IX : DISCRETE MATHEMATICS

Semester: II | Subject Code:
Hours : 6 | Credits : 5

Objectives: At the end of the course, students would

1. Have knowledge of the concepts needed to test the logic of a program
2. Have gained knowledge, which has application in expert systems, in database and a basic for the prolog language.

UNIT I : **Computability and Formal Languages :** Russell's Paradox and Non computability - Ordered Sets – Languages – Phrase Structure Grammars – Types of Grammars and Languages.

UNIT II: **Finite State Machines :** Finite State Machine as Models of Physical Systems – Equivalent Machines.

UNIT III: Finite State Machines as Language Recognizers – Finite State Languages and Type – 3 Languages.

UNIT IV : **Discrete Numeric Functions and Generating Functions :** Introduction Manipulation of Numeric Functions Asymptotic Behavior of Numeric Functions.

UNIT V : **Recurrence Relations and Recursive Algorithms :** Introduction – Recurrence Relations – Linear Recurrence Relations with Constant Coefficients – Homogeneous Solutions – Particular Solutions – Total Solutions – Solutions by the Method of Generating Functions.

Text Book:"Elements of Discrete Mathematics " by C.L.Liu (Second Edition)

Unit I : Chapter 2 - sec 2.2 to 2.6
Unit II : Chapter 7 - sec 7.2 to 7.4
Unit III: Chapter 7 - sec 7.5 to 7.6
Unit IV : Chapter 9 – sec 9.1 to 9.3
Unit V : Chapter 10 - sec 10.1 to 10.7

(For the candidates admitted from the academic year 2015 onwards)

CORE X – FUZZY SET THEORY

Semester: II **Subject Code:**

Hours: 4 **Credits: 4**

Objectives: To enable the students to

1. Learn the basic concepts of fuzzy set theory
2. Link the crisp sets with fuzzy set theory and know how and where these two theories concur as well as differ.

Unit I : Fuzzy Set Theory: Concept of a Fuzzy Set – Relations between Fuzzy Sets – Operations on Fuzzy Sets - Properties of the Standard Operations – Certain Numbers Associated with a Fuzzy Set – Certain Crisp Sets Associated with a Fuzzy Set – Certain Fuzzy Sets Associated with a Given Fuzzy Set – Extension Principle.

Unit II: More Concepts Of Fuzzy Sets: Index of Fuzziness – Remarks on Extension Principle – Fuzzy Sets of Type –K and Level-K – Non Standard Operations on Fuzzy Sets - Generation of Membership Functions.

Unit III: Fuzzy Relations: Fuzzy Relations – Operations on Fuzzy Relations – α –Cuts of a Fuzzy Relations - Compositions of Fuzzy Relations - Projections of Fuzzy Relations – Cylindric Extensions – Cylindric Closure - Fuzzy Relation on a Domain.

Unit IV: Fuzzy Logic: Three -valued Logics – N-valued Logics for N ≥ 4 – Infinite – valued Logics – Fuzzy Logics – Fuzzy Propositions and Their Interpretations in Terms of Fuzzy Sets – Fuzzy Rules and Their Interpretations in Terms of Fuzzy Relations – Fuzzy Inference or Approximate Reasoning – More on Fuzzy Inference - Generalizations of Fuzzy Logics.

Unit V: **Fuzzy Analysis:** Fuzzy Functions on Fuzzy Sets- Extrema of Fuzzy Functions – Integration of Fuzzy Functions – Integration of a Fuzzy Function over a Crisp Interval - Integration of Real-Valued Function over a Fuzzy Interval – Fuzzy Differentiation.

Text Book: 1. "Introduction to Fuzzy Sets And Fuzzy Logic" by M.Ganesh, PHI Learning Private Limited , New Delhi, 2012.

Unit I : Chapter 6: Sections 6.2 to 6.9
Unit II: Chapter 6: Annexure 6.1 to 6.5
Unit III: Chapter 7: Sections 7.2 to 7.9
Unit IV: Chapter 8: Sections 8.2 to 8.10

Text Book: 2. "Fuzzy Set Theory And Its Applications" H.J . Zimmermann, Fourth Edition , New Delhi.

Unit V: Chapter 7: Sections 7.1 to 7.4

Reference Books:

1. Kaufmann.A. Introduction to the theory of fuzzy subsets ,Vol.1,Academic Press,NewYork,1975.
2. Klir .G.J. and B. Yuan, Fuzzy sets and Fuzzy Logic: Theory and Applications,Prentice Hall , Upper Saddle River, N.J.,1995.

(For the candidates admitted from the academic year 2015 onwards)

CORE XI : TOPOLOGY

Semester: III **Subject Code:**

Hours: 6 **Credits: 5**

Objectives: To enable the students to

1. Understanding the meanings of various terms involved in Topology.
2. Introduce various spaces namely complete metric spaces, compact, connected, normal and regular spaces and their properties.
3. To solve problems in these areas.
4. Participate in various competitive examinations.

Unit I : **Topological Spaces And Continuous Functions :** Topological spaces – Basis for a topology – The order toplology – The product topology on XxY – The subspace topology – Closed sets and limit points – Continuous functions – The product topology.

Unit II: Metric Topology And Connectedness – The metric topology – The Metric topology (continued) – Connected spaces

Unit III:Compactness: Compact spaces – Compact subspaces of the real line – Limit point compactness.

Unit IV: Countability And Separation Axioms: The countability axioms – The Separation axioms – The Urysohn's Lemma.

Unit V: The Tychonoff Theorem and Complete Metrics Spaces – The Tychonoff Theorem — Complete metric spaces – Compactness in metric spaces.

Text Book: "Topology - A first Course" by James R. Munkres, PHI Private Ltd. New Delhi, II Edition, 2013.

Unit I : Chapter 2: Sections 12 to 19.
Unit II : Chapter 2: Sections 20,21
Chapter 3: Section 23
Unit III: Chapter 3: Sections 26 to 28
Unit IV: Chapter 4: Sections 30,31 & 33
Unit V : Chapter 5: Sections 37
Chapter 7: Sections 43,45

Reference Book:

1. "Introduction to Topology and Modern Analysis," G.F.Simmons, Tata McGraw Hill Edition 2009.

(For the candidates admitted from the academic year 2015 onwards)

CORE XII : FLUID DYNAMICS

Semester :.III Subject Code:

Hours : 6 Credits: 5

Objectives:

1. To introduce basic ideas of fluid velocity, streamlines, vortex motion, rotational and irrotational flows.
2. To understand the general analysis and treatment of fluids in motion. Special mathematical methods involving complex variables are treated.

Unit I: **Introduction:** Real fluids and Ideal fluids – Velocity of a fluid at a point – streamlines and Pathlines - The Velocity potential – The Vorticity vector – Local and particle rates of change – The equation of Continuity – Worked examples.

Unit II: **Equations of motion of a fluid:** Pressure at a point in a fluid at rest – Pressure at a point in a moving fluid – Conditions at a Boundary of Two invisicid Immisscible fluids – Euler's equations of motion – Bernoulli's equation – Worked examples – Discussion of the case of Steady Motion under Conservative Body forces.

Unit III: **Some three dimensional flows:** Some flows involving axial symmetry – Sources, sinks and doublets – Images in a rigid infinite plane – Images in Solid spheres.

Unit IV: **Some two dimensional flows:** Meaning of Two-Dimensional flow – Use of Cylindrical polar coordinates – The stream function – The complex potential for two dimensional, irrotational, incompressible flow – Complex velocity potentials for standard two dimensional flows – Some worked examples.

Unit V: **Viscous flow:** Two dimensional image systems – The Milne-Thomson circle theorem – The theorem of Blasius – Stress Components in a Real Fluid – Relations between Cartesian components of stress – Translational Motion of Fluid element – The Coefficient of Viscosity and Laminar Flow – The Navier-Stokes equations of Motion of a Viscous Fluid – Steady motion between parallel planes.

Text Book : "Text book of Fluid Dynamics" by Chorlton.F**,** CBS Publishers & Distributors, Delhi, 1985.

Unit I Chapter 2 § 2.1-2.8

Unit II Chapter 3 § 3.1-3.7

Unit III Chapter 3 § 3.9; Chapter 4 § 4.2-4.4

Unit IV Chapter 5 § 5.1-5.6

Unit V Chapter 5 § 5.7-5.9; Chapter 8 § 8.1-8.3, 8.8-8.9, 8.10.1

Reference:

1. H. Schlichting, Boundary Layer Theory, McGraw Hill Company, New York, 1979.

(For the candidates from the academic year 2015 onwards)

Core XIII Practical I - C++ Practicals / Fortran 77

Semester: III **Subject code:**

HOURS/WEEK: 6 **Credits: 5**

Objectives:

1.To develop a computer code for a any given mathematical problem

2.To develop independent programming skills.

3.To introduce programming language.

Programs:

1. Inversion of a non-singular square matrix.
2. Solution of a system of linear equations by Gauss Elimination method
3. Solution of a system of linear equations by Gauss-Seidel method
4. Integration by Trapezoidal rule
5. Integration by Simpson's 1/3 rule
6. Solution of Initial value problem by Euler's method
7. Solution of Initial value problem by Runge-kutta second order method
8. Solution of Boundary value problem by finite difference method
9. Solution of Boundary value problem by shooting method
10. Sorting given set of integers.

Internal : 25 Marks

Problem: 25 Marks

Viva: 25 Marks

Program: 25 Marks

Total : 100 Marks

(For the candidates admitted from the academic year 2015 onwards)

Core Based Elective I : STOCHASTIC PROCESSES

Semester : III Subject Code :

Hours : 6 Credits : 4

Objectives :

To study the renewal process and related results and their applications by introducing the concept of Marko chains and their properties.

Unit I: Stochastic Processes: Some Notions: Introduction - Specification of Stochastic Processes – Stationary Processes – Markov chains – Definitions and examples – Higher Transition Probabilities.

Unit II: Markov Chains: Classification of states and chains – Determination of Higher Transition Probabilities – Stability of Markov system – Graph Theoretic Approach.

Unit III: Markov Process with Discrete State Space: Poisson Process and related distributions – Pure birth Process – Birth immigration Process – Time dependent Poisson processes.

Unit IV: Birth – Death Process – Renewal Processes in continuous time – Renewal Equation.

Unit V: Stopping Time, Wald's Equation: Stopping time- Wald's Equation. – **Renewal Theorems** : Elementary Renewal Theorem – Applications – Renewal theorems (Blackwell's and Smiths').

Text Book: "**Stochastic Processes**" by *J.Medhi, II Edition*, 1984, New Age International Publishers.

Unit I	:	Chapter 2 Sections 2.1 to 2.3
		Chapter 3 Sections 3.1 & 3.2
Unit II	:	Chapter 3 Sections 3.4 to 3.7
Unit III	:	Chapter 4 Sections 4.1, 4.2, 4.3.3, 4.3.4 & 4.3.5
Unit IV	:	Chapter 4 Sections 4.4
		Chapter 6 Sections 6.2 & 6.3
Unit V	:	Chapter 6 Sections 6.4.1, 6.4.2, 6.5, 6.5.1, 6.5.2 & 6.5.4

(For the candidates from the academic year 2015 onwards)

Core Based Elective II: MEASURE THEORY AND INTEGRATION

Semester: III **Subject Code:**
HOURS/WEEK:6 **Credits:4**

Objectives:

1. To Provide a concrete knowledge in measure theory and an ability to apply them
2. To study measure theory for real line and generalize them for general measure spaces.

UNIT I: Lebesgue Measure: Introduction – Outer measure – Measurable sets and Lebesgue measure – A nonmeasurable set – Measurable functions – Littlewood's three principles.

UNIT II: The Lebesgue Integral: The Riemann integral – The Lebesgue integral of a bounded function over set of finite measure – The integral of nonnegative function – The general Lebesgue integral – Convergence in measure.

UNIT III: General Measure and Integration: Measure spaces – Measurable functions – Integration- General convergence theorems.

UNIT IV: Signed Measures: Signed measures – The Radon – Nikodym theorem – The L^p spaces.

UNIT V: Outer Measure: Outer measure and measurability – The extension theorem – The Lebesgue –Steiltjes integral – Product measures.

Text Book: "Real Analysis", by Royden H.L., Second Edition, Macmillan. 1968.

UNIT I: Chapter 3: Section 1 to 6
UNIT II: Chapter 4: Section 1 to 5
UNIT III: Chapter 11: Section 1 to 4
UNIT IV: Chapter 11: Section 5 to 7
UNIT V: Chapter 12: Section 1 to 4

Reference Books:

1.G.de. Barra, Measure Theory and Integraton, New Age International publishers, 2008.
2.Rudin.W., Principles of Mathematical Analysis,Third edition, McGraw–Hill,New York, 1976.

(For the candidates from the academic year 2015 onwards)

CORE XIV: INTEGRAL EQUATIONS AND TRANSFORMS

Semester : IV **Subject Code:**

HOURS : 6 **Credits:5**

Objectives:

1. To solve differential equations using variational methods.
2. To introduce Fredhlom & Volterra Integral equations and to study the methods of solving the above equations.
3. To introduce Fourier transform

UNIT I: **Integral equations:** Introduction - Relations between differential and integral Equations - The Green's function.

UNIT II: Fredholm equations with separable kernals - Illustrative example - Hilbert-Schmidt Theory - Iterative methods for solving equations of the second kind.

UNIT III: The Neumann series - Fredholm theory-Singular intergral equations - Special Devices - Iterative approximation to characteristic functions.

UNIT IV: **Fourier Transforms:** Fourier Integral formula - Complex Fourier Transform - Inversion Theorem for complex Fourier transform - Fourier sine transform - Inversion formula for Fourier sine transform - Fourier cosine transform - Inversion formula for Fourier cosine transform - Linearity property of Fourier transform-Change of scale property - Shifting property-Modulation theorem.

UNIT V: **Finite Fourier Transforms:** Finite Fourier sine transforms - Inversion formula for sine Transform - Finite Fourier cosine transform- Inversion formula for cosine transform.

Text Book1: "METHODS OF APPLIED MATHEMATICS" BY Francis B. Hildebrand, **S**econd edition, Prentice-Hall of India Privative Limited,New Delhi.

Text Book2: "INTEGRAL TRANSFORMS" BY VASISHTHA GUPTA KRISHNA Prakashan Media (P) Ltd., Meerut.1

UNIT I: Text Book1-Chapter3 Sections 3.1 to 3.3

UNIT II: Text Book 1-Chapter3 Sections 3.6 to 3.9

UNIT III: Text Book 1-Chapter3 Sections 3.10 to 3.14

UNIT IV: Text Book 2-ChapterVI Sections 6.3 to 6.13

UNIT V: Text Book 2-ChapterVII Sections 7.1 to 7.4

(For the candidates from the academic year 2015 onwards)

CORE XV: Practical II - MATLAB

Semester: IV | Subject Code:
Hours : 6 | Credits : 5

Objectives:

1.Apply computer theory and algorithmic aspects in various situations.
2.Design and debug the programs.
3.Develop program skills independently themselves.

LIST OF PRACTICALS

1. MATLAB program involving matrix manipulations.
2. MATLAB program to solve a system of linear equations using matrix inversion method.
3. MATLAB program to solve a system of linear equations using Gauss Jordan method.
4. MATLAB program to solve a quadratic equation.
5. MATLAB program to draw 2D graphs.
6. MATLAB program to draw 3D graphs.
7. MATLAB program to solve an algebraic equation using bisection method.
8. MATLAB program to solve an algebraic equation using Newton Raphson method.
9. MATLAB program to evaluate an integral using Trapezoidal rule.
10. MATLAB program to evaluate an integral using Simpson's 1/3 rule.

PG QUESTION PAPER PATTERN :

Internal Marks = 25
External Marks = 75

TOTAL=100

(For the candidates from the academic year 2015 onwards)

CORE BASED ELECTIVE III: DIFFERENTIAL GEOMETRY

Semester: IV **Subject Code:**

HOURS: 6 **Credits: 4**

Objectives:

1. To help the students to understand the use of differential calculus in the field of genetics.
2. To help the students to distinguish between plane curves and space curves using differentiations.

UNIT I: **Space curves:** Definitions – Arc length-Tangent,Normal and binormal – Osculating Plane – Curvature – Torsion – Serret – Frenet formulae.

UNIT II: Osculating circle – Osculating sphere – Tangent surface, involutes and evolutes – Intrinsic equations, fundamental existence theorem for space curves – Helices.

UNIT III: **Intrinsic properties of a surface:** Metric – Direction coefficients – Families of Curves – Isometric correspondence – Intrinsic properties.

UNIT IV: **Geodesics:** Geodesics – Canonical geodesic equations – Normal property of geodesics – Existence theorems – Geodesic parallels

UNIT V: **Non – Intrinsic properties of a surface:** The second fundamental form – Principal curvatures – Lines of curvature – Developables – Developables associated with space curves and with curves on Surfaces – Minimal surfaces.

Text Book: "An Introduction to Differential Geometry" by T.J.Willmore, Oxford University press(26th impression), New Delhi 2010 (Indian Print).

UNIT I: Chapter I: Sections 2 to 4

UNIT II: Chapter I: Sections 6 to 9

UNIT III: Chapter II: Sections 5 to 9

UNIT IV: Chapter II: Sections 10 to 14

UNIT V: Chapter III: Sections 1 to 7

Reference Books:

1. D.Somasundaram, Differential geometry A first course, Narso Publishing House 2005.
2. Dirk J.Struick, Lectures on Classical differential geometry, Addison – Wesley publishing company, 2nd Edition.

(For the candidates admitted from the academic year 2015 onwards)

Core Based Elective IV: FUNCTIONAL ANALYSIS

SEMESTER: IV Subject Code:
Hours: 6 Credits: 4

Objectives: To enable the students to

1. Understand the basic concepts and theorems in functional analysis.
2. Know the concepts of Banach Spaces, Hilbert Spaces and Bounded linear functional.
3. Acquire knowledge in operator theory and projections for the above spaces.
4. Develop right approach towards research in Functional Analysis.

UNIT I **Banach Spaces:** The definition and some examples – Continuous linear transformations – The Hahn-Banach Theorem.

UNIT II The natural imbedding of N in N** - The Open Mapping Theorem – The conjugate of an operator.

UNIT III **Hilbert Spaces:** The definition and some simple properties – Orthogonal complements – Orthonormal sets - The conjugate space H*.

UNIT IV The adjoint of an operator – Self-adjoint operators – Normal and Unitary Operators – Projections.

UNIT V **General Preliminaries on Banach Algebras:** The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius – The radical and semi-simplicity.

TEXT BOOK: "Introduction to Topology and Modern Analysis", G. F. Simmons, Tata McGraw-Hill Publishing Company Ltd., New Delhi, Edition 2004.

UNIT – I - Chapter 9 – Sections 46 to 48
UNIT – II - Chapter 9 – Sections 49 to 51
UNIT – III - Chapter 10 – Sections 52 to 55
UNIT – IV - Chapter 10 – Sections 56 to 59
UNIT – V - Chapter 12 – Sections 64 to 69