

MASTER OF SCIENCE MATHEMATICS

SYLLABUS

**Choice Based Credit System (CBCS)
2018-2021**



**FAKIR MOHAN AUTONOMOUS COLLEGE,
BALASORE**

DISTRIBUTION OF MARK
Mid Semester Examination
Full Marks-20

1.	One Long Answer questions (LAQ) with One Alternative	12 marks
2.	Two Short Answer Question (SAQ) out of four options	2 x 4 =08 marks
		<hr/>
		Total= 20 marks

Example

Q. No-1	LAQ Or LAQ	12 marks
Q. No-2	SAQ (Answer any two) a. b. c. d.	2 x 4= 08 marks
		<hr/>
		Total = 80 marks

End Semester Examination
Full Marks-80

Section-A

10 Short Answer Questions (SAQ)
out of 12 Questions covering the entire Syllabus

12 marks

Section-B

3 Long Answer Questions (LAQ) each
Question with one alternative set unit wise

3 x 20= 60 marks

Total= 80 marks

Example

Section-A

Q. No-1 SAQ (Answer any ten)

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.
- i.
- j.
- k.
- l.

2 x 10= 20 marks

Section-B

Q. No-2 Unit-I LAQ
Or

20 marks

LAQ

Q. No-2 Unit-II LAQ
Or

20 marks

LAQ

Q. No-2 Unit-III LAQ
Or

20 marks

LAQ

Total= 80 marks

CBCS Course Structure

Fakir Mohan Autonomous College, Balasore

2018-2020

Semester	Paper	Paper Name	Credit	Marks in Each Semester		Total
				Mid Sem	End Sem	
1ST SEMESTER	I	Real Analysis	06	20	80	100
	II	Complex Analysis	06	20	80	100
	III	Linear Algebra	06	20	80	100
	IV	Numerical Analysis-I	06	20	80	100
	V	Discrete Mathematics	06	20	80	100
2ND SEMESTER	VI	Numerical Analysis-II	06	20	80	100
	VII	Topology	06	20	80	100
	VIII	Abstract Algebra	06	20	80	100
	IX	Object Oriented Programming with C++	06	20	80	100
	X	C++ (Practical)	06	-	100	100
3RD SEMESTER	XI	Differential Equation	06	20	80	100
	XII	Graph Theory	06	20	80	100
	XIII	Functional Analysis	06	20	80	100
	XIV	Optimization Theory & Application-I OR Algorithmic Analysis & Design-I OR Fluid Dynamics-I OR Functional Analysis & Applications	06	20	80	100
	XV	Number Theory & Cryptography-I OR Wavelet Analysis-I OR Fuzzy Theory OR Algebraic Topology-I	06	20	80	100
	XVI	Mathematical Statistics	06	20	80	100
4TH SEMESTER	XVII	Optimization Theory & Application-II OR Algorithmic Analysis & Design-II OR Fluid Dynamics-II OR Advanced Complex Analysis	06	20	80	100
	XVIII	Number Theory & Cryptography-II OR Wavelet Analysis-II OR Calculus of Variation & Integral Equation OR Algebraic Topology-II	06	20	80	100
	XIX	MATLAB Practical	06	-	100	100
	XX	Project	06	-	100	100

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**FIRST YEAR
Semester- I**

Credit-6

F.M: 20+80=100

**PAPER-I
REAL ANALYSIS**

Unit- I

- Elements of Metric Spaces
- Compact Sets, Perfect Sets, Connected Sets
- Uniform Convergence
- Uniform Convergence and Continuity
- Uniform Convergence and Integration

Unit- II

- Uniform Convergence and Differentiation
- Stone Wierstrass Theorem
- Lindeloff Theorem, Cantorlike Sets
- Lebesgue outer Measure, Measurable Sets
- Regularity, Measurable Function
- Borel and Lebesgue Measurability
- Integration of Non-Negative Functions
- General Integral
- Integration of Series

Unit- III

- Riemann & Lebesgue Integration
- Differentiation, The four derivatives
- Function of Bounded Variation
- Lebesgue Differentiation Theorem

- Differentiation and Integration
- The Convex Functions
- The Jensen's Inequality
- The L^p Spaces
- The Inequalities of Holder and Minkowski
- Completeness of L^p Spaces

Books Recommended:

1. Principles of Mathematical Analysis- W. Rudin, McGraw Hill, 3rd Edition.
Article- 2.15- 2.47, 7.1-7.17, 7.26
2. Measure Theory and Integration- G. De. Barra, Wiley Eastern Publication, 1st Edition.
Article- (1.6, 1.7), (2.1-2.5), (3.1-3.4), (4.1-4.5), (6.1-6.5)

Books of Reference

1. Mathematical Analysis- T. M. Apostol, Narosa Publication.
2. Real Analysis- H. L. Royden
3. Measures Theory and Inegration- I. K. Rana
4. Real & Complex Analysis- W. Rudin
5. Real Analysis- N. L. Carothers, Cambridge University Press

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Semester- I

Credit-6

F.M: 20+80=100

PAPER-II

COMPLEX ANALYSIS

Unit- I:

Complex Numbers, Functions, Limit & Continuity

Unit- II:

Analytic Functions & Power Series

Complex Integration, Classification of Singularities

Unit- III:

Calculus of residues & evaluation of certain integrals

Conformal mapping & mobious transformation

Books Recommended:

1. Foundation of Complex Analysis- S. Ponnusamy, Narosa Publishing House.
(Ch. 1.1 to 2.5) (Ch 3.1 to 3.7), (Ch 4.1 to 4.13 (excluding 4.5 & 4.6), (Ch 7.1 to 7.5), (Ch 8.1 to 8.6), (Ch 9.1 to 9.4), (Ch 5.1 to 5.8)

Books of Reference

1. Complex Analysis- R. V. Churchill
2. Function of One Complex Variable- J. B. Conway
3. Complex Analysis- S. Ponnuswami
4. Complex Analysis- L. V. Ahlfors
5. Engineering Mathematics- Erwin Kreyszig

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Semester- I

Credit-6

F.M: 20+80=100

PAPER-III
LINEAR ALGEBRA

Unit- I:

Matrices, Systems of Linear Equations, Vector Spaces

Unit- II:

Linear maps & Matrices & Linear Operators

Canonical forms

Unit- III:

Bilinear forms

Inner Product Spaces

Books Recommended:

1. Linear Algebra- Promod Kumar Saikia, Pearson Publication
(Ch 1,2,3,4,5 (excluding 5.5 & 5.6), 6,7,8

Books of Reference

1. Linear Algebra- M. Artin
2. Finite Dimensional Vector Spaces- P. R. Halmos
3. Algebra- Vimshanker Rao
4. Algebra- I. N. Herstein

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Semester- I

Credit-6

F.M: 20+80=100

PAPER-IV

NUMERICAL ANALYSIS-I

Unit- I:

Round-off errors and Computer Arithmetic, Algorithms and Convergence, Error Analysis for Iterative methods, Accelerating Convergence, Zeroes of Polynomials and Muller's Method. Data Approximation and Neville's Method, Divided Differences.

Unit- II:

Hermite Interpolation, Cubic spline Interpolation, Parametric Curves.

Numerical Differentiation, Richardson's Extrapolation, Elements of Numerical Integration, Composite Numerical Integration, Romberg Integration, Adaptive Quadrature Methods, Gaussian Quadrature, Multiple Integrals.

Unit- III:

The Elementary Theory of IVP, Euler's method, Higher-Order Taylor Methods, Runge-Kutta Methods, Multistep Method, Extrapolation Method.

Boundary Value Problems for ODE, Shooting method for Linear and Non Linear Problems, Finite Difference method for Linear and Non Linear Problems, The Rayleigh- Ritz method.

Books Recommended:

1. Numerical Analysis (9th Edition)- Richard L Burden and J. Douglas Faires (CENGAGE Learning)
Ch-1 (1.2, 1.3), Ch-2 (2.4, 2.6), Ch-3 (3.2- 3.6), Ch-4 (4.1-4.8), Ch-5 (5.1- 5.8), Ch-11 (11.1- 11.5)

Books of Reference

1. An Introduction to Numerical Analysis- K. E. Atkinson, Wiley Students Edition.
2. Numerical Analysis- Conte De Boor
3. Numerical Analysis- B. P. Acharya and R. N. Das, Kalyani Publisher

Semester- I

Credit-6

F.M: 20+80=100

PAPER-V
DISCRETE MATHEMATICS

Unit- I:

- Partially ordered sets and Lattices
- Characteristics functions of a set

Unit- II:

- Hashing function, Lattices and Boolean Algebra
- Recursion

Unit- III:

- Grammer and Languages
- Application of residue arithmetic to computers group codes
- Computability Theory

Books Recommended:

1. Discrete Mathematics for Computer Science and Engineering- J. P. Trembly & R. Monohar.
Ch-2 (2.3.8, 2.3.9, 2.4.5, 2.4.6, 2.6), Ch-3 (3.3, 3.6, 3.7), Ch-4, Ch-6

Books of Reference

1. Discrete Mathematics- L. Mott
2. Discrete Mathematics and its Applications- K. Rosen (TMH)
3. Elements of Discrete Mathematics- C Liu (TMH)

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Semester- II

Credit-6

F.M: 20+80=100

PAPER-VI

NUMERICAL ANALYSIS-II

Unit- I:

Methods of solving Linear Systems of Equations, Pivoting Strategies; Linear Algebra and Matrix inversion, Matrix Factorization, Special types of matrices. Norms of vectors and matrices, Eigen Values and Eigen Vectors, Jacobi and Gauss- Siedel Iterative Techniques.

Unit- II:

Error Bounds and Iterative Refinement, The Conjugate Gradient Method. Discrete Least Squares Approximation, Chebyshev Polynomials and Economization of Power Series, Rational Function Approximation, Trigonometric Polynomial Approximation.

Unit- III:

Linear Algebra and Eigen values, Orthogonal Matrices and similarity Transformations, Power method, Householder's method, QR Algorithm.

Numerical Solutions of Nonlinear Systems of Equation, Newton's method, Numerical Solution of Partial Differential Equations- Elliptic, Parabolic and Hyperbolic.

Books Recommended:

1. Numerical Analysis (9th Edition)- Richard L Burden and J. Douglas Faires (CENGAGE Learning)
Ch-6 (6.1-6.6), Ch-7 (7.1-7.3, 7.5, 7.6), Ch-8 (8.1-8.5), Ch-9 (9.1-9.5), Ch-10 (10.1, 10.2), Ch-12 (12.1-12.3)

Books of Reference

1. An Introduction to Numerical Analysis- K. E. Atkinson, Wiley Students Edition.
2. Numerical Analysis- Conte De Boor
3. Numerical Analysis- B. P. Acharya and R. N. Das, Kalyani Publisher

Semester- II

Credit-6

F.M: 20+80=100

**PAPER-VII
TOPOLOGY**

Unit- I

Topological Spaces & Continuous Function

- Topological Spaces
- Basis for a Topology
- The Order Topology
- The Product Topology on $X \times Y$
- The Subspace Topology
- Closed Sets and Limit Points

Unit- II

- Continuous Function
- The Product Topology
- **Connectedness**
- Connected Spaces
- Connected Sets in the Real Line

Unit- III

Compactness

- Compact Spaces
- Compact Sets in the Real line
- Limit point compactness

Countability and Separation Axioms

- The Countability Axioms

- The Separation Axioms
- The Uryshons Metrization Theorem

Books Recommended:

1. Topology- James R. Munkress
(2.1-2.8), 3 (3.1,3.2, 3.5, 3.6, 3.9), 4 (4.1-4.3)

Books of Reference

1. Topology- M. Dugunchi
2. Topology- Nanda & Nanda
3. Topology- Willard

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Semester- II

Credit-6

F.M: 20+80=100

PAPER-VIII ABSTRACT ALGEBRA

Unit- I

- Homomorphism, Automorphism
- Cayley's Theorem, Sylow's Theorem

Unit- II

- Euclidean Ring, Polynomial Rings
- Polynomials over the rational field
- Extension fields, transcendence of e
- Roots of polynomials

Unit- III

- Construction with straight edge and compass
- More about roots
- The elements of Galois Theorem

Books Recommended:

1. Topics in Algebra- I. N. Herstein, Vikas Publication
Ch-2 (2.7-2.9), Ch-3 (3.8-3.10), Ch-5 (5.1-5.6)

Books of Reference

1. Algebra- M. Artin, PHI (EEE)
2. Algebra- N. Jackabson
3. Contemporary Abstract Algebra- J. A. Gallian, Narosa

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Semester-II

Credit-6

F.M: 20+80=100

PAPER-IX

OBJECT ORIENTED PROGRAMMING WITH C++

Unit- I

- Principles of Object Oriented Programming
- Beginning with C++
- Tokens, Expressions and Control Structure
- **Functions in C++:** The main function, Inline function, Function Overloading, Friend and Virtual function.

Unit- II

- **Classes and Objects:** Specifying a class, Arrays within a class, Arrays of Objects, Pointers to members, Local Classes.
- **Constructors and Destructors:** Parameterized constructors, Copy constructors, Dynamic Constructors, Destructors.
- **Operator Overloading and Type Conversion:** Overloading Unary and Binary operator, Type conversion.

Unit- III

- Inheritance: Extending Class, Single Inheritance, Multiple inheritance, Virtual Base class, Abstract class, Member classes, Nesting classes.
- **Pointers Virtual Functions and Polymorphism**
- **Working with Files:** Opening and Closing a file, Detecting end of file, Updating a File, Random Access.

Books Recommended:

1. Object Oriented Programming with C++: E Balagurusamy, 4th Edition, TMH. Ch-1 (1.4, 1.5), Ch-2 (2.1-2.3), Ch-3 (3.1-3.14), Ch-4, Ch-5, Ch-6, Ch-7, Ch-8 Ch-9, Ch-11 (11.1-11.8).

Books of Reference

1. Programming in ANSI C (TMH): E. Balagurusamy.
2. C++ How to Program, Prentice Hall- Paul Deitel, Harvey Deitel.
3. Problem Solving with C++, Pearson Education: Walter Savitch.

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Semester-II

Credit-6

F.M: (15+25+60)= 100

PAPER-X C++ PRACTICAL

Record-15, Viva-Voce-25, Experiment-60

1. Introduction to C++.
2. C++ Program for sum of series, absolute value of integer, sorting of integers using array, factorial of natural number, testing of prime, roots of quadratic equation, reverse of a number, generating Fibonacci numbers, addition of complex numbers by using Operator overloading, inheritance, virtual function, files etc.
3. C++ Program for Numerical methods: Bisection method, Newton Raphson's method, Lagrange's Interpolation method, Simpson's Rule, Gauss- Jacobi method, Gauss- Siedel method, Runge Kutta method, Fitting of curves using Least Square method etc.
4. C++ Program for Addition of Matrix, Multiplication of Matrix using arrays, LU decomposition etc.

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SECOND YEAR

Semester-III

Credit-6

F.M: 20+80=100

PAPER-XI

DIFFERENTIAL EQUATION

Unit- I

- Boundary- Value Problems
- Sturm Liouville System
- Eigen- values and Eigen functions
- Orthogonality of Eigen functions
- Green's function

Unit- II

- Power Series Solution near ordinary and regular singular point.
- Application to Legendre, Bessel and Hermite differential equations with their Principal properties.
- System of Linear Differential Equations.
- Fourier Series & Fourier Transform
- Application to Boundary value problem.

Unit- III

- Laplace Equation
- Elementary Solution
- Green's function for Laplace's Equation
- Wave Equation
- Diffusion Equation

Books Recommended:

1. A Course on Ordinary and Partial Differential Equation- J. Sinha Roy & S. Padhy.
Chapter- 7, 8, 10, 14, 15, 16 & 17

Books of Reference

1. Elements of Partial Differential Equation- Ian Sneddon.
2. Differential Equation: S. G. Deo & V. Raghavendra & Laxmikantham.

Semester- III

Credit-6

F.M: 20+80=100

PAPER-XII GRAPH THEORY

Unit- I

- Graph, its applications
- Finite and infinite graphs
- Incidence and Degree
- Isolated and pendant vertex and Null Graph
- Paths and circuits
- Isomorphism, Sub graphs
- Walks and paths, circuits, connected and disconnected graph components.
- Regular graphs, Operation on graphs, Hamilton paths and circuits
- Travelling Salesman problems

Trees and Fundamental Circuits

- Trees, Pendant vertices
- Distance and centre in a tree, Rooted and Binary tree
- On counting and spanning tree

Unit- II

- Fundamental circuit, cutsets and cut vertices, Sut-Sets, some properties of fundamental circuits.
- Connectivity and separability
- Network flows, 1- Isomorphisms, 2- Isomorphism

Planar and Dual Graphs

- Combinatorial vs Geometric graphs
- Planar graphs, Kuratowski's Two Graphs
- Direction of planarity, Geometrical Dual, Gombinatorial Dual

- Directed graphs, Types of diagraphs
- Diagram and binary relations
- Directed path and connectedness

Unit- III

- Euler diagraph
- Tree's with directed edges
- Diagraphs
- Matrix Representation of Graphs
- Colorihng, Covering and Partioning Fundamental Circuits in Diagraph
- Tournament and Acyclic

Books Recommended:

1. Graph Thepy- Narasingh Deo
Articles: Chapter: 1, 2, 3, 4, 5, (5.1, 5.7), 7, 8, (8.1, 8.6), 9 (excluding 9.8, 9.9)

Books of Reference

1. Graph Theory: F. Harary

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Semester- III

Credit-6

F.M: 20+80=100

PAPER-XIII

FUNCTIONAL ANALYSIS

Unit- I:

Normed spaces (Ch- 2.2 to 2.5)

Linear Operations (Ch- 2.6 to 2.10)

Unit- II:

Fundamentals Theorem for Normed & Banach Spaces (Ch- 4.1 to 4.13 excluding 4.10 & 4.11)

Unit- III:

Hilbert Spaces (Ch- 3.1 to 3.10)

Spectral Theory (Ch- 7.1 to 7.4)

Books Recommended:

1. Introductory Functional Analysis with Application: Kreyszig, Wiley Students Edition.

Books of Reference

1. Elements of Functional Analysis: B. K. Lahiri, World Press.
2. Functional Analysis: B. V. Limaye
3. Functional Analysis: S. Nanda & Choudhury

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Every student has to opt one paper from the following Electives for Paper-XIV

Semester- III

Credit-6

F.M: 20+80=100

PAPER-XIV

OPTIMIZATION THEORY AND APPLICATION-I

(Elective-I)

Unit- I:

- Simplex method, Duality in linear programming

Unit- II:

- Post optimal analysis, Integer Programming
- Goal programming, Revised simplex method

Unit- III:

- Transportation problem
- Assignment Problem

Books Recommended:

1. Operation Research- Kantiswaroop, P. K. Gupta and Manmohan, 9th Revised Edition, Sutan Chand Publications.
Ch- 4, 5, 6, 7, 8, 9, (9.2 only), 10, 11

Books of Reference

1. Operation Research- H. Taha
2. Operation Research- G. J. Liberman
3. Linear Programming- Hardley

NB: Emphasis will be lead on methods of solutions of problems rather than proving basic theorem theory.

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Semester- III

Credit-6

F.M: 20+80=100

PAPER-XIV

ALGORITHMIC ANALYSIS AND DESIGN-I
(Elective-II)

Unit- I:

- Foundation of ADA and Sorting- I- 1, 2, 3, 4, II- 6, 7, 8, 9 (9.1 only)

Unit- II:

- Data Structures, Greedy Algorithm- III- 10, 11, 12 (excluding 12.4), 16.1, 16.2

Unit- III:

- Graph Algorithms VI-22 (22.1, 22.5), 23.1, 23.2, 24.1-24.5, 25.1, 25.2

Books Recommended:

1. Introduction to Algorithms- Cormen, Leiserson Rivest & Stein

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Semester- III

Credit-6

F.M: 20+80=100

PAPER-XIV
FLUID DYNAMICS-I
(Elective-III)

Unit- I:

- Basic Concept

Unit- II:

- Fundamental equations of the flow of viscous fluids.

Unit- III:

- Dynamical similarity and inspection and dimensional analysis flow between parallel plates.
- Circular cyliners Tubes of uniform corssetics and concentric rotating cyliners.

Books Recommended:

1. Viscous Fluid Dynamics- J. L. Bansal (Oxford and IBH Publishing Co.)
2. Problem Solved- Meredith, F. W. and Grifith
3. Problem Solved- Lew H. G.

Books of Reference

1. Boundary Layer Theory- H Schillichting
2. Foundation of Fluid Mechanics- S. W. Yuan (PHI)

ooo

Semester- III

Credit-6

F.M: 20+80=100

PAPER-XIV

FUNCTIONAL ANALYSIS & APPLICATINS
(Elective-IV)

Unit- I:

- Distribution (Ch- 1.1 to 1.10)

Unit- II:

- Soboleve spaces (Ch- 2.1 to 2.4)

Unit- III:

- Some abstract variational problems (Ch- 2.5 to 3.2)

Books Recommended:

1. Functional Analysis & Applicatons- S. Kesavan, New Age Internationals Publishers.

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Every student has to opt one paper from the following Elective for Paper-XV

Semester- III

Credit-6

F.M: 20+80=100

PAPER-XV

NUMBER THEORY AND CRYPTOGRAPHY-I

(Elective-I)

Unit- I:

- Unique factorization theorem, g.c.d, Farey sequences, Infinitude of primes.

Unit- II:

- Congruence, modular equations, Lagrange's theorem.
- Rational approximation of irrationals and Hurwitz's theorem
- Quadratic residues, Eulers criterion, Wilsons' Theorem.

Unit- III:

- Sum of two squares, sum of four squares theorem
- The law of quadratic reciprocity theorem & problems
- Arithmetical functions and Lattice points

Books Recommended:

1. Introduction to Analytical Number Theory- K. Chandrasekharan
Ch- 1, 2, 3, 4, 5, 6

Books of Reference

1. Number Theory- I. Niven, H. s. Zukerman
2. Number Theory- David Burton
3. Analytical Number Theory- Tom Apostol
4. Number Theory- Hardy & Wright

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Semester- III

Credit-6

F.M: 20+80=100

PAPER-XV
WAVELET ANALYSIS-I
(Elective-II)

Unit- I:

- A Brief Introduction to Fourier Series and Fourier Transforms.

Unit- II:

- Wavelet Transforms and Time- Frequency Analysis

Unit- III:

- Cardinal Spline Analysis

Books Recommended:

1. An Introduction to Wavelets- C. K. Chul, Academic Press
Chapter- (2.1-2.5), 3 (3.1-3.6), 4 (4.1-4.6)

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Semester- III

Credit-6

F.M: 20+80=100

PAPER-XV
FUZZY THEORY
(Elective-III)

Unit- I:

- Crisp Sets and Fuzzy Sets

Unit- II:

- Operation on Fuzzy Sets
- Fuzzy Relations and Fuzzy Measures

Unit- III:

- Uncertainty and Information
- Applications

Books Recommended:

1. Fuzzy Sets, Uncertainty and Information- George J. Klir, Tina A. Farger (PHI), 6th Edition-2001.

Article: (1.1, 1.2,1.3, 1.4, 1.5,1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6)

(3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 4.1, 4.2, 4.3, 4.4, 4.5)

(5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 6.1, 6.2, 6.3, 6.6)

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Semester- III

Credit-6

F.M: 20+80=100

PAPER-XV
ALGEBRAIC TOPOLOGY-I
(Elective-IV)

Unit- I:

- Calculus in the Plane (Ch 1 to 2)

Unit- II:

- Winding Numbers (Ch 3 & 4)

Unit- III:

- Cohomology & Homology (Ch 5, Ch-6)

Books Recommended:

1. Algebraic Topology- William Fulton, Springer
2. Topology- James Mumkress, PHI

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Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVI

MATHEMATICAL STATISTICS

Unit- I:

- Binomial, Trinomial, Multinomial, Poission

Unit- II:

- Gamma, Chi-Square, Normal, Bivariate Normal
- Distributions of Functions of random variable

Unit- III:

- Limiting Distributions
- Estimation (point estimation....)

Books Recommended:

1. Introduction to Mathematical Statistics- R. V. Hogg, A. T. Craig, McMillan Publication.
Chapter- 3.4, (excluding 4.6), 5 (excluding 5.5), 6

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Every student has to opt one paper from the following Elective for Paper-XVII

Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVII

OPTIMIZATION THEORY AND APPLICATION-II

(Elective-I)

Unit- I:

- Sequencing Problem, Games & Strategies

Unit- II:

- Dynamic Programming
- Networking Scheduling by PERT & CPM

Unit- III:

- Non- Linear Programming, Methods of NLP, Kuhn- Tucker conditions with non-negative constraints.
- Quadratic Programming, Wolfes' method, Beales' Method.

Books Recommended:

1. Operation Research- Kantiswaroop, P. K. Gupta and Manmohan, 9th Revised Edition, Sutan Chand Publications.
Ch- 12, 13, 17, 21, 24 (24.1-24.5), 25 (25.1-25.6)

Books of Reference

1. Operation Research- H. Taha
2. Operation Research- G. J. Liberman
3. Linear Programming- Hardley

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Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVII

ALGORITHMIC ANALYSIS & DESIGN-II
(Elective-II)

Unit- I:

- Matrix Operations, Polynomial

Unit- II:

- Number Theoretic Algorithm

Unit- III:

- Striking Matching and N. P. Completeness

Books Recommended:

1. Introduction to Algorithms- I. H. Covmen, C. E. Leiserson, R. L. Riverst & C. Stein (PHI) Publication.

Chapters

28 (1, 2, 3, 4, 5,), 30 (1, 2, 3)

31 (1, 2, 3, 4, 5, 6, 7, 8, 9)

32 (1, 2, 3), 34 (1, 2, 3, 4, 5)

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Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVII
FLUID DYNAMICS-II
(Elective-III)

Unit- I:

- Stagnation point flows, flow due to rotating disks, Suddenly accelerated plates.

Unit- II:

- Oscillating plane wall, Starting flow in a plane and pipe, Plane Couette flow with transpiration cooling.

Unit- III:

- Flow past porous flat plate, Flow past a porous circular cylinder, Theory of laminar boundary layers, Integral methods for the approximate solution of laminar boundary layer equations.

Books Recommended:

1. Viscous Fluid Dynamics- J. L. Bansal (Oxford and IBH Publishing Co.)
2. A. A.: Problem Solved- Meredith, F. W. and Griffith.
A. A. R. C. 2315, 1955, R. A. E. Report No.
3. Problem Solved- Lew H. G.

Books of Reference

1. Boundary Layer Theory- H. Schlichting.
2. Foundation of Fluid Mechanics- S. W. Yuan, Printice Hall.

ooo

Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVII

ADVANCED COMPLEX ANALYSIS
(Elective-IV)

Unit- I:

- Maximum Principle (Ch- 6.1 to 6.8)

Unit- II:

- Analytic Continuation (Ch- 10.1 to 10.5)

Unit- III:

- Mapping Theorems (Ch-12.1 to 12.8)

Books Recommended:

1. Foundation of Complex Analysis- S. Ponnuswamy, Narosa.

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Every student has to opt one paper from the following Elective for Paper-XVIII

Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVIII

NUMBER THEORY AND CRYPTOGRAPHY-II

(Elective-I)

Unit- I:

- Chebyshev's theorem on the distribution of prime numbers.

Unit- II:

- Minkowski's theorem on Lattice points in convex sets.
- Cryptography and Public Key.

Unit- III:

- Elliptic curves
- Primality and Factoring

Books Recommended:

1. Introduction to Analytical Number Theory- K. Chandrasekharan
Chapter- 7, 9 by Springer Verlag
2. A Course in Number Theory and Cryptography- Neal Koblitz, UTM, Springer Verlag.
Chapter-3 (Art 1,2), Ch-4 (Art 1,2) Ch-5 (Art 1,2, 3) Ch-6

Books of Reference

1. Number Theory- I. Niven, H. S. Zuckerman, Montgomery
2. Number Theory- David Burton
3. Analytic Number Theory- Torn Apostol
4. Analytic Number Theory- Hardy & Wright

ooo

Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVIII

WAVELET ANALYSIS-II
(Elective-II)

Unit- I:

- Scalling Functions and Wavelets

Unit- II:

- Cardinal Spline- Wavelets

Unit- III:

- Orthogonal Wavelets and Wavelets packets

Books Recommended:

1. An Introduction to Wavelets- C. K. Chui, Academic Press
Chapter- 5 (5.1 to 5.6), 6 (6.1 to 6.6), 7 (7.1 to 7.5)

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Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVIII

**CLCLULUS OF VARIATION & INGEGRAL EQUATION
(Elective-III)**

Unit- I:

- Variational Problems with Fixed Boundaries (1.1-1.6).

Unit- II:

- Variational Problems with moving boundaries (2.1-2.3)
- Sufficient condition for an extremum (3.1-3.4)

Unit- III:

- Classification of Integral Equation and Equation of Convolution type (1.1, 1.3, 1.4, 3.1 to 3.3)
- Method of successive approximation (3.4, 3.5, 4.1, 4.2)

Books Recommended:

1. Calculus of Variation with Application- A. S. Gupta.
2. Integral Equation- B. L. Moiseiwitsch, Dover Publication.

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Semester- IV

Credit-6

F.M: 20+80=100

PAPER-XVIII

ALGEBRAIC TOPOLOGY-II
(Elective-IV)

Unit- I:

- Covering Spaces & Fundamentals Groups (Ch-11, 12)

Unit- II:

- Van Kampen Theorem (Ch-14).

Unit- III:

- Topology of Surfaces (Ch-17)

Books Recommended:

1. Algebraic Topology- William Fulton, Springer.

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Semester- IV

Credit-6

**F.M: 100
Time- 6 hours**

**PAPER-XIX
MATLAB PRACTICAL**

Record-15, Viva-Voce-25, Experiment-60

1. Introduction to MATLAB.
2. Plotting of graphs of Polynomials, Exponential, Logarithmic and Trigonometric Functions, Tracing of Curves using MATLAB.
3. Solution and plotting of Ordinary Differential Equation using MATLAB.
4. Solution and plotting of Partial Differential Equation using MATLAB (Heat equation and Wave equation are to be included.)

Semester- IV

Credit-6

F.M: 50+50=100

**PAPER-XX
PROJECT/ DISSERTATION**

Topic Include

The topic of the project is to be chosen within the scope of the syllabus with approval and guidance of the subject teacher. The project comprises three parts:

- a) Project Work & Dissertation- 50 marks
- b) Project Presentation- 30 marks
- c) Viva-Voce- 20 marks

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