S.S. JAIN SUBODH P.G. AUTONOMOUS COLLEGE

RAM BAGH CIRCLE, JAIPUR-302004

DETAILED COURSE STRUCTURE & SCHEME OF EXAMINATION

AS PER

UGC CURRICULUM AND CREDIT FRAMEWORK FOR UNDERGRADUATE PROGRAMMES UNDER NEP 2020

FOR

BACHELOR OF SCIENCE (HONOURS)

SUBJECT–MATHEMATICS

(2023-2024 & ONWARDS)

Medium of Instruction: Hindi/ English

B.Sc. (Honours) Mathematics

The Bachelor's Degree in B.Sc. (Honours) Mathematics is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements sought to be acquired by learners at the end of this program. Hence, the learning outcomes of mathematics for this course are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge of mathematics. Mathematics is the study of quantity, structure, space and change. It has very broad scope in science, engineering and social sciences. The key areas of study in mathematics bare Calculus, Algebra, Geometry, Analysis, Differential Equations and Mechanics.

Programme Specific Outcome

- Think in a critical manner.
- Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in mathematics and related sciences.
- Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of mathematics and statistics.
- Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas on multiple disciplines concerned with mathematics.
- Encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

Program Outcome

PO-1: Ability to acquire in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science and physical science. Thus, this Program helps learners in building a solid foundation for higher studies in mathematics.

PO-2: The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilized in modeling and solving real life problems.

PO-3: To recognize patterns and to distinguish between essential and irrelevant aspects of problems.

PO-4: Utilize mathematics to solve theoretical and applied problems by critical understanding, analysis and synthesis.

PO-5: Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society.

PO-6: Ability to communicate mathematics effectively by written, computational and graphic means.

PO-7: Create mathematical ideas from basic axioms.

PO-8: Ability to apply multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

PO-9: Able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians

PO-10: This Program will also help students to enhance their employability for jobs in banking, insurance and investment sectors, data analyst and in various other public and private enterprises.

Scheme for Choice Based Credit System in B.Sc. (Hons) Mathematics

NHEQF Level	Subject Code	Course Title	Course Category	Credit	Contact Hours per week			ESE Duration (Hrs.)	
					L	T	P	T	P
Semester-I									
5	MH 101	Differential Calculus	DSC	3	3	-	-	3	-
	MH 102	Analytic Geometry	DSC	3	3	-	-	3	-
	MH 103	Discrete Mathematics	DSC	3	3	-	-	3	-
	MHP 101	Mathematics Practical	DSCP	6	-	-	12	-	4
Semester-II									
5	MH 201	Integral Calculus	DSC	3	3	-	-	3	-
	MH 202	Abstract Algebra	DSC	3	3	-	-	3	-
	MH 203	Graph Theory	DSC	3	3	-	-	3	-
	MHP 201	Mathematics Practical	DSCP	6	-	-	12	-	4
Semester-III									
6	MH 301	Numerical Analysis	DSC	3	3	-	-	3	-
	MH 302	Real Analysis-I	DSC	3	3	-	-	3	-
	MH 303	Differential Equations-I	DSC	3	3	-	-	3	-
	MHP 301	Mathematics Practical	DSCP	6	-	-	12	-	4
Semester-IV									
6	MH 401	Complex Analysis	DSC	3	3	-	-	3	-
	MH 402	Real Analysis-II	DSC	3	3	-	-	3	-
	MH 403	Differential Equations-II	DSC	3	3	-	-	3	-
	MHP 401	Mathematics Practical	DSCP	6	-	-	12	-	4
Semester-V									
7	MH 501A/MH 501B	DSE A	DSE	3	3	-	-	3	-
	MH 502A/MH 502B	DSE B	DSE	3	3	-	-	3	-
	MH 503A/MH 503B	DSE C	DSE	3	3	-	-	3	-
	MHP 501	Mathematics Practical	DSCP	6	-	-	12	-	4
Semester-VI									
7	MH 601A/MH 601B	DSE D	DSE	3	3	-	-	3	-
	MH 602A/MH 602B	DSE E	DSE	3	3	-	-	3	-
	MH 603A/MH 603B	DSE F	DSE	3	3	-	-	3	-
	MHP 601	Mathematics Practical	DSCP	6	-	-	12	-	4

Discipline Subject Elective (DSE) for Semester V

DSE A (Choose any one)	DSE B (Choose any one)	DSE C (Choose any one)
1. MH 501A: Advanced Abstract Algebra	1. MH 502A: Advanced Complex Analysis	1. MH 503A: Dynamics
2. MH 501B: Operation Research-I	2. MH 502B: Matrices	2. MH 503B: Statistics

Discipline Subject Elective (DSE) for Semester VI

DSE D (Choose any one)	DSE E (Choose any one)	DSE F (Choose any one)
1. MH 601A: Linear Algebra	1. MH 602A: Number Theory	1. MH 603A: Mechanics
2. MH 601B: Operation Research-II	2. MH 602B: Theory of Equations	2. MH 603B: Vector Calculus

Note: If Candidate select the DSE paper MH501A in the Semester-V then candidate will select the corresponding DSE paper MH601A in the Semester-VI. Same selection procedure for other elective papers also.

Examination Scheme for Theory Paper

Part A- Question1 is compulsory comprises eight very short questions (Two from each Unit). Candidate has to attempt any seven questions. Each question carries 2 marks.
7×2 mark each = 14 Marks

Part B Comprises 4 questions (one question from each unit with internal choice) and all questions are compulsory. Each Question Carries 10 Marks.
4×10 mark each = 40 Marks

Total of End semester exam (duration of exam 3 hours) = 54 Marks
Internal Assessment = 21 Marks

Examination Scheme for Practical Paper

Max. Practical Marks = 150 Marks
Internal Practical Examination = 60 Marks
Marks External Practical Exam. (Duration: 4 hrs.) = 90 Marks
Distribution of Marks:
Four Practical one from each group 15 Marks each = 60 Marks
Practical Record: 15 Marks
Viva-voice: 15 Marks

Note: 1. Each Candidate has to prepare his/ her practical record.
2. Each Candidate has to pass in Practical and Theory examination separately.

Semester	Subject1/Discipline1 (DSC/DSCP /DSE/ DSEP) (credits)	Subject2 / Discipline 2 (DSC/DSCP/ DSE/DSEP) (credits)	Subject3/ Discipline3 (DSC/ DSE) (credits)	GenericElective (GE) (credits)	Ability Enhancement Course (AECC) (credits)	Skill Enhancement Course (SEC) (credits)	Internship/ Apprentice-ship/Project/ Community outreach (4)	Value addition course (VAC) (credits)	Total Credits
I	DSC-1 Differential Calculus (3)	DSC-13 (2)			English (2)			Choose one from a pool of courses (0)	23 credits
	DSC-2 Analytic Geometry (3)	DSC -14 (2)							
	DSC-3 Discrete Mathematics (3)								
	DSCP Mathematics Practical (6)	DSCP (2)							
II	DSC-4 Integral Calculus (3)	DSC -15 (2)			Hindi (2)			Choose one from a pool ofcourses (0)	23 credits
	DSC-5 Abstract Algebra (3)	DSC -16 (2)							
	DSC-6 Graph Theory (3)								
	DSCP Mathematics Practical (6)	DSCP (2)							
	Students on exit shall be awarded Undergraduate Certificate in Science (Subject Honours) after securing the requisite 46 credits in Semesters I and II								46+4
III	DSC-7 Numerical Analysis (3)	DSC -17 (2)		Choose one from pool of courses, GE -1 (2)**		Computer Science (2)		Choose one from a pool of courses (0)	25 credits
	DSC-8 Real Analysis-I (3)	DSC -18 (2)							
	DSC-9 Differential Equations-I (3)								
	DSCP Mathematics Practical (6)	DSCP (2)							
IV	DSC-10 Complex Analysis (3)	DSC -19 (2)		Choose one from pool of courses GE - 2 (2)**		Env. Sc. and Sustainable Dev. (2)		Choose one from a pool of courses (0)	25 credits
	DSC11 Real Analysis-II (3)	DSC -20 (2)							
	DSC-12 Differential Equations-II (3)								
	DSCP Mathematics Practical (6)	DSCP (2)							
	Students on exit shall be awarded Undergraduate Diploma in Science (Subject Honours) after securing the requisite 96 credits on completion of Semester IV								96+4
V	Choose three from pool of courses, DSE-1 Advanced Abstract Algebra or Operation Research -I (3)	Choose two from poolofcourses, DSE -1 (2)				Mental ability & reasoning (2)		Choose one from a pool of courses (0)	23 credits
	DSE 2 Advanced Complex Analysis or Matrices (3)	DSE-2 (2)							
	DSE-3 Dynamics or Statistics (3)								
	DSEP Mathematics Practical (6)	DSEP (2)							
VI	Choose three from pool of courses, DSE-4 Linear Algebra or Operation Research -II(3)	Choose two from poolof courses, DSE -3 (2)				Anandam - Joy of giving (2) or NCC/NSS/Rovers and Rangers/ Red Ribbon Club/ Sports/ Extra-curricular and co-curricular activities (2)		Choose one from a pool of courses (0)	23 credits
	DSE-5 Number Theory or Theory of Equations (3)	DSE -4 (2)							
	DSE-6 Mechanics or Vector Calculus (3)								
	DSEP Mathematics Practical (6)	DSEP (2)							
	Students on exit shall be awarded Bachelor of Science(Subject Honours) (3 years) after securing the requisite 142 credits on completion of Semester VI								142+4

** *Students may select Generic elective paper in Semester III and IV from the pool of courses given. The GE paper must be from the other faculty or discipline.*

Paper I : Differential Calculus
Paper Code: MH 10 }
Course Type: DSC

Prerequisite: Student must know about differentiation and its applications.
Course Objective: The primary objective of this course is to introduce the basic tools of calculus, the idea of derivative, tangent line to the graph of a function.

Unit I: Infinite Series: Convergence of series of non-negative terms, their various tests (Comparison; D'Alembert's ratio, Cauchy's n^{th} root, Raabe's, Gauss, Logarithmic, DeMorgan and Bertrand's, Cauchy's condensation (proof of tests not required)) for convergence. Alternating series, Leibnitz's test, Series of arbitrary terms, absolute and conditional convergence.
Unit II: Derivative of the length of an arc, Pedal Equations, Curvature-various formulae, Centre of curvature, Chord of curvature and related problems.
Unit III: Partial differentiation, Euler's Theorem for Homogeneous functions, Chain Rule of Partial Differentiation, Total differential Coefficient, Differentiation of implicit functions.
Unit IV: Envelops, Maxima and Minima of function of two variables, Lagrange's Method of undetermined multipliers.

Reference Books:

1. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
2. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
3. International Publication, New Delhi
4. Gupta &Kapoor, 2000 (First Edition), "Text book of differential calculus", S. Chand Publication, New Delhi.
5. A.R. Vasishtha, S.K. Sharma, A. K. Vasishtha, 1989 (First Edition)"Differential Calculus", Krishna Prakashan Media, Meerut.

Course Outcome: On successful completion of this course, Students is able to understand the idea of derivative, tangent line to the graph of a function, how a derivative can be used to describe the rate of change of one quantity with respect to another, and how to relate the geometric ideas to the analytic ideas.

Learner support Material: Swayam (https://swayam.gov.in), E-library, E-books, online PDF material etc.

Online resources: https://www.coursera.org/ , https://www.khanacademy.org/ , https://alison.com/tag/maths

Paper II : Analytic Geometry
Paper Code: MH 102
Course Type: DSC

Prerequisite: Student must know about the basic knowledge of geometry.
Course Objective: The aim of the course is to develop connection between algebra and geometry through graphs of lines and curves.to understand the concept of conic, sphere, cone and central conicoid.

Unit I: Polar equation of conic: General equation of Conic (Focus being the pole), Director Circle, Auxiliary circle, Chord, Tangent, Chord of Contact, Normal, Pole and Polar, perpendicular lines and Asymptotes.
Unit II: Sphere: Equation of sphere, intersection of two spheres, diameter form, tangent line and tangent plane, condition of tangency, pole and polar plane, condition of orthogonality.
Unit III: Cone: Equation of Cone (whose vertex and guiding curve are given), Enveloping cone, right circular cone.
Cylinder: Equation of cylinder, enveloping cylinder, Right circular cylinder.
Unit IV: Central Conicoid: Introduction, Intersection of a line and a Central Conicoid, Tangent line and tangent planes, condition of tangency for a plane. Generating lines of hyperboloid of one sheet and its properties.

Course Outcome: On successful completion of this course, Students will be able to understand the basic applications of coordinate geometry. They will develop ability to pursue advanced studies and research in pure and applied mathematical science.

Learner support Material: Swayam (https://swayam.gov.in), E-library, E-books, online PDF material etc.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and Sons (Asia) Pvt. Ltd., 2002.
3. S.L. Loney, The Elements of Coordinate Geometry, McMillan and Company, London.
4. R.J.T. Bill, Elementary Treatise on Coordinate Geometry of Three Dimensions, McMillan India Ltd., 1994.

Online resources: https://www.coursera.org/, https://www.khanacademy.org/, https://alison.com/tag/maths.

B.SC. HONOURS (MATHS) I SEMESTER

PaperIII:Discrete Mathematics
Paper Code: MH 103
Course Type: DSC

Prerequisite: student must know about Set, Relation and Function.
Course Objective: This course aims at introducing the concepts of lattices, Boolean algebra and recurrence relation. The course discusses some important applications of Boolean algebra in real life situations.

Unit I: Sets: Principle of inclusion and exclusion, Russell Paradox and Mathematical Induction. Propositional calculus, Basic logical Proposition, truth table, Tautologies and contradiction.
Unit II: Relations and Functions: Binary Relations, Equivalence Relations and Partitions. Partial and total Order Relations, Lattices and algebraic structure. Chains and Anti-chains. Pigeon Hole Principle.
Unit III: Boolean algebras: Boolean functions and expressions (Using Identity / Truth table), conjunctive and disjunctive normal form, Duality, Boolean Lattices.
Unit IV: Discrete numeric Function and Generating Function, Recurrence Relations and recursive algorithm-Linear recurrence relations with constant coefficients. Homogeneous solutions, particular solution, Total solution, Solution by the method of generating functions.

Course Outcome: After completion of the course students are expected to be able to:
1. Analyze logical propositions via truth tables.
2. Prove mathematical theorems using mathematical induction.
3. Understand sets and perform operations and algebra on sets.
4. Determine properties of relations, identify equivalence and partial order relations, sketch relations.
5. Identify functions and determine their properties.

Reference Books:
1. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory 2nd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2003.
2. Rudolf Lidl and Günter Pilz, Discrete Mathematics: Elementary and Beyond, 2003.

Learner support Material: Swayam (https://swayam.gov.in), E-library, E-books, online PDF material etc.

Online resources: https://www.coursera.org/, https://www.khanacademy.org/, https://alison.com/tag/maths

MHP 101-Mathematics Practical

The paper will contain four practicals. The candidates are required to attempt all practical.

Course Objective: The main objective of this course is to gain proficiency in the field of optimization theory. The objectives of this course to understand the solution of linear programming problems and engineering problems related to Assignment and Transportation problems with applications of many real-world problems

Unit I: Linear programming problem formulation. Graphical solution of linear programming problems. Basic solution.
Unit II: Simplex method for solution of a L.P.P (Numerical Problems)
Unit III: Duality (Numerical Problems)
Unit IV: Modeling of Industry and engineering problems into Assignment and Transportation problems and their solution (Numerical Problems)

Course Outcome: On successful completion of this course students are able to understand the linear optimization theory and its applications. Student can identify the appropriate methods for the efficient computation of optimal solutions of a problem and a set of linear constraints.

Reference books:

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear programming and Network Flows, 2nd Ed., John Wiley and Sons, India, 2004.
2. F.S. Hillier and G.J. Lieberman, Introduction to Operations Research, 8th Ed., Tata McGraw Hill, Singapore, 2004.
3. Hamdy A. Taha, Operations Research, An Introduction, 8th Ed., Prentice-Hall India, 2006.

B.SC. HONOURS (MATHS) II SEMESTER

Paper I : Integral Calculus
Paper Code: MH 201
Course Type: DSC

Prerequisite: student must know about integration and its properties.
Course Objective: The primary objective of this course is to gain proficiency in Integral Calculus. The objectives of this course are to consider applications of derivatives for sketching of curves, concept of Double and Triple integral, application of definite integrals for calculating volumes of solids of revolution, length of plane curves, Areas which are helpful in understanding their applications in plenary motion, design of telescope and to many real-world problems.

Unit I: Asymptotes, Multiple points, Curve tracing of standard curves (Cartesian and polar curves).

Unit II: Introduction of Beta and Gamma functions. Double integrals in Cartesian and polar coordinates. Change of order of integration (Cartesian and polar coordinates).

Unit III: Triple integrals, Dirichlet's Integration, Rectification.

Unit IV: Areas, Volumes and surfaces of solids of revolution.

Course Outcome: On successful completion of this course, Students will enable to sketch curves in a plane using its mathematical properties in the different coordinate systems of reference. Student will able to compute the length of curve, area bounded by the curves, area and volume of surface of solid of revolution.

Learner support Material: Swayam (https://swayam.gov.in), E-library, E-books, online PDF material etc.

Reference Books:

1. Anton, Howard, Bivens, Irl, & Davis, Stephen, Calculus (10th Ed.), John Wiley & Sons Singapore Pvt. Ltd. Reprint (2016) by Wiley India Pvt. Ltd. Delhi.
2. Strauss, M. J., Bradley, G. L., & Smith, K. J. (2007). Calculus (3rd Ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Sixth impression 2011.
3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.

Online resources: https://www.coursera.org/ , https://www.khanacademy.org/ , https://alison.com/tag/maths

Paper II : Abstract Algebra
Paper Code: MH 202
Course Type: DSC

Prerequisite: The student must know the basic knowledge of set, relation and functions.
Course Objective: The main aim of the course is to introduce you to basic concepts from abstract algebra, especially the notion of a group. The Abstract Algebra module focuses on the power of abstraction by developing mathematical theories from axioms in several contexts – Group Theory, Rings and Fields.

UNIT I: Definition and simple properties of Groups and subgroup, cyclic group, Permutation group. Cosets, Lagrange's theorem on the order of subgroups of a finite order group.
UNIT II: Normal subgroups and Quotient groups. Morphism of groups, Fundamental theorems of Isomorphism, Cayley's theorem.
UNIT III: Definition and simple properties of Rings, Integral domain and field.
UNIT IV: Characteristics of a Ring and Field, Sub rings, Subfield, Embedding of a ring, Morphism of rings.

Course Outcome: The students who succeeded in this course; will able construct and compare algebraic structures and substructures and analyze a given structure in detail. They also understand a new structure based on given structures.

Learner support Material: Swayam (https://swayam.gov.in), E-library, E-books, online PDF material etc.

Reference Books:

1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A. Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa Publishing House, New Delhi, 1999.
4. Joseph J. Rotman, An Introduction to the Theory of Groups, 4th Ed., Springer Verlag, 1995.
5. I.N. Herstein, Topics in Algebra, Wiley Eastern Limited, India, 1975.
6. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005.
7. D.A.R. Wallace, Groups, Rings and Fields, Springer Verlag London Ltd., 1998

Online resources: https://www.coursera.org/, https://www.khanacademy.org/, https://alison.com/tag/maths.

B.SC. HONOURS (MATHS) II SEMESTER

Paper III: Graph Theory
Paper Code: MH 203
Course Type: DSC

Prerequisite: The student must know the basic knowledge of set, relation and function.
Course Objective: The course aims at introducing the concepts of types of graphs, Paths and circuits. It also includes introduction to Digraph and Binary Relations, some operations of graphs. Then some important concept of Trees explained. The other part of the course deals with planar graphs and matrix representation also.

Unit I: Graph Theory- simple graph, Multi graph, properties of graph, Degree of Vertex, Directed Graph, Undirected Graph, Digraph and binary relation, Regular graph, n-Regular graph, size of n-Regular graph, Sub Graphs, Complete Graph, Cycles, wheels, Bipartite graph, Matrix representation of Graph and Digraph.
Unit II: Union, Join, Product, and composition of graphs, Complementary graph, Isomorphic graph, Cut sets, bridge, edge connectivity, vertex connectivity, Connected and disconnected graphs, Seperable graph, walk, open and closed walk, length of walk, Trail, Path, Circuit, Euler path, Euler graph, Hamiltonian cycle and path, Hamilton Graph.
Unit III: Weighted graph, Shortest path problem, Planar & non-Planar Graph and its properties, region, degree of region, Euler's formula, Homeomorphic graph and Dual graphs.
Unit IV: Trees- Properties, Distance between two vertices, eccentricity of vertex, centre of a graph, Rooted Tree, Binary Tree, Height of a tree, Balanced rooted tree, Spanning Tree, Minimal Spanning Tree: Kruskal's Algorithm and Prim's Algorithm.

Course Outcome: The students will be able to

1. Understand the basics of graph theory and their various properties.
2. Model problems using graphs and to solve these problems algorithmically.
3. Apply graph theory concepts to solve real world applications like routing, TSP/traffic control, etc.

Learner support Material: Swayam (https://swayam.gov.in), E-library, E-books, online PDF material etc.

Reference Books:

1. Davey, B. A., & Priestley, H. A. (2002). Introduction to Lattices and Order (2nd Ed.). Cambridge University press, Cambridge.
2. Goodaire, Edgar G., & Parmenter, Michael M. (2011). Discrete Mathematics with Graph Theory (3rd ed.). Pearson Education (Singapore) Pvt. Ltd. Indian Reprint.
3. Lidl, Rudolf & Pilz, Gunter. (2004). Applied Abstract Algebra (2nd ed.), Undergraduate Texts in Mathematics. Springer (SIE). Indian Reprint.

Online resources: https://www.coursera.org/, https://www.khanacademy.org/, https://alison.com/tag/maths.

MHP 201- Mathematics Practical

The paper will contain four practicals by the use of SCI Lab. The candidates are required to attempt all practical.

Course Objective: Student will learn about the application of SCI Lab.

Unit I: Plotting the graphs of the following function ax, $\sqrt{ax+b}$, $|ax+b|$, $c \pm |ax+b|$, $x^{\pm n}$, $x^{1/n}(n \in Z)$, e^{ax+b}, $log(ax+b), sin(ax+b), cos(ax+b), |sin(ax+b)|, |cos(ax+b)|$. Observe and discuss the effects of change in the real constant a, b and c on the graphs

Unit II: Graphs of hyperbolic functions and inverse trigonometric functions, Plotting and analyzing the graphs of polynomials and their derivatives.

Unit III: Complex numbers: Operations like addition, subtraction, multiplication, division, Modules and inbuilt functions conj, imag, imult, isreal, real.
Marix operations: Addition, Multiplication, Inverse. Transpose. Determinant, Rank and inbuilt functions eye, ones, zeros

Unit IV: Solving the system of linear equations, Solution of linear programming problems by using inbuilt functions of SCI Lab

Course Outcome: Student will able to plot the graphs of various functions and apply the SCI lab in the calculation for Complex numbers, Matrix and linear equations.

References: 1. SCI Lab Free Software to MATLAB) by Ramachandran Hema Nair Achuthsankar S.
2. Programming in SCI Lab, Ranjan Goyal, Mansi Dhingra.
3. SCI Lab by Praveen Garg, Jaipur Publishing House