S. S. Jain Subodh P. G. (Autonomous) College

Affiliated to University of Rajasthan

Re-Accredited with 'A' Grade with (Highest Rating in Northern India) CGPA - 3.72 by NAAC - UGC

SCHEME OF EXAMINATION

&

DETAILED COURSE STRUCTURE

FOR

BACHELOR OF SCIENCE (B.Sc. Hons.)

SUBJECT – MATHEMATICS

(2016-2017 to 2018-2019)

DEPARTMENT OF MATHEMATICS

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

RAMBAGH CIRCLE, JAIPUR-302004

BACHELOR OF SCIENCE B.SC. (HONS.)
SUBJECT – MATHEMATICS

Examination Scheme:

	Semester- I		
Paper	**Nomenclature of Paper**	**Paper Code**	**Max. Marks**
Paper-I	Discrete Mathematics	MH-101	100 Marks
Paper-II	Calculus-I	MH -102	100 Marks
Paper-III	Three Dimensional Geometry and Vector Calculus	MH -103	100 Marks
Paper-IV	Number Theory-I	MH -104	100 Marks
	Mathematics Practical	PR-101	50 Marks
	Semester- II		
Paper	**Nomenclature of Paper**	**Paper Code**	**Max. Marks**
Paper-I	Graph Theory	MH -201	100 Marks
Paper-II	Calculus-II	MH -202	100 Marks
Paper-III	Optimization theory	MH -203	100 Marks
Paper-IV	Number Theory-II	MH -204	100 Marks
	Mathematics Practical	PR-201	50 Marks
	Semester- III		
Paper	**Nomenclature of Paper**	**Paper Code**	**Max. Marks**
Paper-I	Real Analysis-I	MH -301	100 Marks
Paper-II	Differential Equation-I	MH -302	100 Marks
Paper-III	Numerical Analysis	MH -303	100 Marks
Paper-IV	Operations Research-I	MH -304	100 Marks
	Mathematics Practical	PR-301	50 Marks
	Semester- IV		
Paper	**Nomenclature of Paper**	**Paper Code**	**Max. Marks**
Paper-I	Advanced Analysis and Metric Space	MH -401	100 Marks
Paper-II	Differential Equation-II	MH -402	100 Marks
Paper-III	Advanced Numerical Analysis	MH -403	100 Marks
Paper-IV	Operations Research-II	MH -404	100 Marks
	Mathematics Practical	PR-401	50 Marks
	Semester- V		
Paper	**Nomenclature of Paper**	**Paper Code**	**Max. Marks**
Paper-I	Abstract Algebra-I	MH -501	100 Marks
Paper-II	Complex Analysis-I	MH -502	100 Marks
Paper-III	Dynamics	MH -503	100 Marks
Paper-IV	Statistics-I	MH -504	100 Marks
	Mathematics Practical	PR-501	50 Marks
	Semester- VI		
Paper	**Nomenclature of Paper**	**Paper Code**	**Max. Marks**
Paper-I	Abstract Algebra-II	MH -601	100 Marks
Paper-II	Complex Analysis-II	MH -602	100 Marks
Paper-III	Mechanics	MH -603	100 Marks
Paper-IV	Statistics-II	MH -604	100 Marks
	Mathematics Practical	PR-601	50 Marks

Examination Scheme for each Paper
Part A 8 QUESTIONS (very short answer question with any 7out of 8)
7X 2 Mark Each = 14 Marks
Part B 4 QUESTIONS (1 question from each unit with Internal choice)
4 X 14Mark Each = 56 Marks
Total of End semester exam (duration of exam 3 hours) = 70 Marks
Internal assessment = 30 Marks
Maximum Marks (Each theory paper) = 100Marks
Max. Practical Marks = 50 Marks
(Internal Marks 20+ external marks 30)

Total of Theory Papers: 4 X 100Marks Each = 400 Marks (Min. Pass Marks 40%)

Total of Practical Marks = 50Marks

Grand Total of Subject per Semester = 450 Marks

Scheme of Practical Exam

Mathematics Practical (Five questions in each Unit)
Duration:2 hrs.
Max. Practical Marks = 50 Marks
Internal Marks = 20 Marks
External Practical Exam. (Duration:2 hrs.) = 30 Marks

Note: This Question Paper contains two questions one question taken from each unit. Student attempt both Questions**.** Each question will carry 10 marks

2 Question 2X10 = 20
Viva =05
Record =05
Total (External Exam) =30

One Subsidiary subject is compulsory for each student which is same in all the semesters.

Subsidiary Subject: Physics/ Chemistry

I Semester			
Chemistry		**Physics**	
Paper	**Paper Title**	**Paper**	**Paper Title**
I	Inorganic chemistry	I	Mechanics-I
II	Organic chemistry	II	Electromagnetism-I
III	Physical chemistry	III	Oscillation and Waves-I
Practical	Chemistry practical	Practical	Physics Practical-I
II Semester			
I	Inorganic chemistry	I	Mechanics-II
II	Organic chemistry	II	Electromagnetism-II
III	Physical chemistry	III	Oscillation and Waves-II
Practical	Chemistry practical	Practical	Physics Practical-II
III Semester			
I	Inorganic chemistry	I	Statistical and Thermo dynamical Physics- I
II	Organic chemistry	II	Optics-I
III	Physical chemistry	III	Electronics and Solid state devices-I
Practical	Chemistry practical	Practical	Physics Practical-III
IV Semester			
I	Inorganic chemistry	I	Statistical and Thermo dynamical Physics- II
II	Organic chemistry	II	Optics-II
III	Physical chemistry	III	Electronics and Solid state devices-II
Practical	Chemistry practical	Practical	Physics Practical-IV
V Semester			
I	Inorganic chemistry	I	Mathematical Physics and Special theory of Relativity-I
II	Organic chemistry	II	Quantum Mechanics-I
III	Physical chemistry	III	Solid State Physics
Practical	Chemistry practical	Practical	Physics Practical-V
VI Semester			
I	Inorganic chemistry	I	Mathematical Physics and Special theory of Relativity-II
II	Organic chemistry	II	Quantum Mechanics-II
III	Physical chemistry	III	Nuclear Physics
Practical	Chemistry practical	Practical	Physics Practical-VI

BACHELOR OF SCIENCE
Subject: Mathematics
Semester I

Paper code	Paper Title	Type of paper	Contact Hours Per semester	Per week	Maximum marks	Minimum marks	ESE in hrs.	
							Theory	Practical
MH-101	Discrete Mathematics	Theory	45	3	70	28	3	-
MH -102	Calculus-I	Theory	45	3	70	28	3	-
MH -103	Three dimensional Geometry and Vector Calculus	Theory	45	3	70	28	3	-
MH -104	Number Theory-I	Theory	45	3	70	28	3	-
PR-101	Mathematics Practical	Practical	10	2	50	20	-	2
				14				

The details of the courses with code and title assigned are given below.
ESE = End Semester Examination

SCHEME OF EXAMINATION
(Semester Scheme)

Examination scheme

Sr. No.	Paper	ESE	CIA	Total
1.	Theory	70%	30%	100
2.	Practical	60%	40%	100

Each theory paper syllabus is divided into four units. Each theory paper 3 hours duration
Each Practical /Lab work 2 hours duration
The number of papers and the maximum marks for each paper/ practical shall be shown in the syllabus for the paper concerned. It will be necessary for a candidate to pass in theory part as well as practical part of a subject separately.

Note: Maximum marks for a theory paper is 100 marks which include 70 marks for ESE and 30marks for internal assessment.

BACHELOR OF SCIENCE(Hons.)
Subject : Mathematics
Semester I

Max.hrs: 3 hrs. **Max. marks :70**

Part A- comprises of seven very short answer questions from all units.
(It's a compulsory question) 2x7= 14marks
Part B- comprises of eight long answer questions with two questions from each unit. Candidates have to answer any four questions, selecting one question from each unit. 14x4 = 56 marks
Total marks for End Semester Examination 70marks
Internal Assessment 30 marks

Total 100 marks

B.SC. HONOURS (MATHS) I SEMESTER

PAPER-I (MH-101) (DISCRETE MATHEMATICS) **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Sets and Propositions: Russell's paradox, fundamental operations of set, Mathematical Induction. Principle of inclusion and exclusion.

UNIT II: Relations and Functions: Binary Relations, Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Anti-chains. Pigeon Hole Principle,

UNIT III: Boolean algebras: - Boolean functions and expressions (Using Identity / Truth table), Lattices and algebraic structure, Duality, Distributive and complemented lattices, 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.

PAPER-II (MH-102) CALCULUS-I **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Infinite Series: Convergence of series of non-negative terms, their various tests (Comparison; D'Alembert's ratio, Cauchy's nth root, Rabbe's, Gauss, Logarithmic, De-Morgan 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: Taylor's theorem, Maclaurin's Theorem. Power series, Expansion of a function, power series expansion of Sin x, Cos x, exp(x), $\log_e(1+x)$, $(1+x)^n$. 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, Differentiation of implicit functions.

UNIT IV: Envelops, Maxima and Minima of function of two variables, Lagrange's Method of undetermined multipliers.

PAPER-III (MH-103) THREE DIMENSIONAL GEOMETRY AND VECTOR CALCULUS **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Sphere:- Equation of sphere, intersection of two spheres, diameter form, tangent line and tangentplane, condition of tangency, pole and polar plane, condition of orthogonality. Cone: Enveloping cone,tangent plane, condition of tangency, reciprocal cone, right circular cone.

UNIT II: Cylinder Cylinder: Equation of cylinder, enveloping cylinder, circular cylinder. Right circular cylinder, Central Conicoids - Ellipsoid, Hyperboloid of one and two sheets, Condition of tangency for a plane, Normal plane sections, director sphere

UNIT III: Generating lines of hyperboloid of one sheet and its properties. Reduction of general equation of second degree in three-dimensions to standard forms, reduction of the general equation of second degree, principal plane and principal direction, centre of a conicoid, canonical form.

UNIT IV: Scalar point function. Vector point function. Differentiation and integration of vector point functions. Directional derivative, Gradient, Divergence and Curl and identities involving there operators. Gauss divergence Theorems Green's and Stoke's Theorems (without proof) and their application..

PAPER-IV (MH-104) NUMBERS THEORY-I **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Divisibility - Division Algorithm, the Greatest Common Divisor, Euclidean algorithm. Greatest Common Divisor of more than two integers, least common multiple, least common multiple of n integers.

UNIT II: Linear Diophantine equations, the equations - ax + by = c, ax + by + cz = d, Prime Numbers, Infinitude of primes, Fundamental theorem of Arithmetic. The sieve of Eratodhenes, the Goldbach conjecture, Fibonacci sequence.

UNIT III: Congruence, properties of Congruence, Linear conguruence, Chinese remainder theorem. Congruence of higher degree.

UNIT IV: Fermat's Factorization Method, Fermat's little theorem, Fermat's Last theorem, Wilson theorem, Euler's Factorization Method, Mersenne's Factorization Method.

PRACTICAL (PR-101)

Unit I: Assignment Problems: Balance, Unbalance, Maximum, Minimum.

Unit II: Transportation Problems: Balance, Unbalance, Maximum, Minimum, Degeneracy.

BACHELOR OF SCIENCE

Subject: Mathematics

Semester II

Paper code	Paper Title	Type of paper	Contact Hours Per semester	Per week	Maximum marks	Minimum marks	ESE in hrs.	
							Theory	Practical
MH -201	Graph Theory	Theory	45	3	70	28	3	-
MH -202	Calculus-II	Theory	45	3	70	28	3	-
MH -203	Optimization theory	Theory	45	3	70	28	3	-
MH -204	Number Theory-II	Theory	45	3	70	28	3	-
PR-201	Mathematics Practical	Practical	10	2	50	20	-	2
				14				

The details of the courses with code and title assigned are given below.

ESE = End Semester Examination

B.SC. HONOURS (MATHS) II SEMESTER

PAPER-I (MH-201) GRAPH THEORY — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I:. Graph Theory- Basic Terminology, Multi graphs, Weighted Graphs, Paths and circuits, Shortest paths, Eulerian paths and Circuits.

UNIT II: Union, Join, Product, and composition of graphs,. Digraphs- Simple Digraph, Symmetric & Asymmetric Digraph and Complete Digraph, Digraph and Binary Relations.

UNIT III: Trees- Properties, Spanning Tree, Minimal Spanning Tree, Binary and Rooted Tree.

UNIT IV: Planar graph, region, homeomorphic graph and Dual graphs, Matrix representation of graphs.

PAPER-II (MH-202) CALCULUS-II — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

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.

UNIT III: Evaluation of Double Integration by change of order and changing into polar coordinates, Triple integrals, Dirichlet's Integration.

UNIT IV: Rectification, Areas, Volumes and surfaces of solids of revolution.

PAPER-III (MH-203) OPTIMIZATION THEORY **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: The linear programming problem formulation. L.P.P. matric notation. Graphical solution of linear programming problems. Basic solution. Some basic properties of convex sets, Theorems based on convex sets.

UNIT II: Fundamental theorem of L.P.P. Simplex method (Phase-I) for solution of a L.P.P.

UNIT III: Duality. Fundamental theorem and Properties of duality.

UNIT IV: Simulation

PAPER-IV (MH-204) NUMBERS THEORY-II **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Number theoretic functions, the multiplicativefunction. The function ζ & σ, The Mobius function, Greatest integer function, Euler's Φ function, properties of Φ function. Application to the Calender.

UNIT II: Quadratic Residues, Elementary properties, Legender symbols, Quadratic Reciprocity Law, Quadratic Congruence.

UNIT III: The Fermat Conjecture, Pythagorean Triples, Fermat's last theorem.

UNIT IV: Representation of integers as sum of two squares, sum of three or more squares. The Diophantine equation $X^2 + Y^2 = Z^2$, $X^4 + Y^4 = Z^4$, General integral solution of the equation $X^2 + Y^2 + Z^2 = W^2$, (X,Y,Z,W)=1

PRACTICAL (PR-201)

Unit I: Simplex Method: Problem based on slack, surplus, artificial variable.

Unit II: Duality: Problem based on Inequalities, Equations and unrestricted variables.

BACHELOR OF SCIENCE
Subject: Mathematics
Semester III

Paper code	Paper Title	Type of paper	Contact Hours Per semester	Per week	Maximum marks	Minimum marks	ESE in hrs.	
							Theory	Practical
MH -301	Real Analysis-I	Theory	45	3	70	28	3	-
MH -302	Differential Equation-I	Theory	45	3	70	28	3	-
MH -303	Numerical Analysis	Theory	45	3	70	28	3	-
MH -304	Operations Research-I	Theory	45	3	70	28	3	-
PR-301	Mathematics Practical	Practical	10	2	50	20	-	2
				14				

The details of the courses with code and title assigned are given below.
ESE = End Semester Examination

B.SC. HONOURS (MATHS) III SEMESTER

PAPER-I (MH-301) REAL ANALYSIS-I — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Real numbers as a complete ordered field, limit point, Bolzano-Weierstrass Theorem, Closed and open sets, union and intersection of such sets, concept of compactness, Heine-Borel Theorem, Connected sets. Real sequence- Limit and Convergence of a sequence, Monotonic sequences.

UNIT II: Cauchy's Sequences, Subsequences, Cauchy's general Principle of convergence, Properties of continuous function on closed intervals.

UNIT III: Properties of derivable functions, Darboux's and Roll's Theorem, Notion of Limit and Continuity for functions of two variables.

UNIT IV: Riemann Integration – Lower and upper Riemann integral, Riemann Integrability, Mean value Theorem of integral Calculus, Fundamental theorem of Integral calculus.

PAPER-II (MH-302)DIFFERENTIAL EQUATION-I — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Degree and order of a differential equation, Equations of first order and first degree, Equation in which the variables are separable, Homogeneous equations and equation reducible to homogeneous form, Linear equations and Equation reducible to Linear form, Exact Differential Equations and equations which can be made exact.

UNIT II: First order but higher degree differential equations, solvable for x, y and p. Clairaut's form, and singular solutions with extraneous loci, linear differential equation with constant coefficients,complementary functions, particular integral.

UNIT III: Homogeneous Linear differential Equation, Simultaneous differential Equation.

UNIT IV: Exact Linear Differential Equation of nth order, existence and uniqueness theorem.

PAPER-III (MH-303)NUMERICAL ANALYSIS **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Differences. Relation between difference and derivatives Differences of a polynomial. Factorial function, Newton's formulae for forward and backward interpolation. Divided differences. Newton's divided differences, Interpolation formula. Lagrange's interpolation formula.

UNIT II: Central differences. Gauss's Stirling's and Bessel's interpolation formulae. Numerical differences. Numerical Differentiation(Without derivations).

UNIT III: Numerical integration, Newton- Cote's formula, Trapezoidal rule, Simpson's one-third, Simpson's three-eighth and Gauss's Quadrature formulae (upto 3 point).

UNIT IV: Gauss elimination, Iterative methods (Jacobi and Gauss Seidal), Method of Factorization and Matrix Inversion Method for solving system of linear algebraic simultaneous equations.

PAPER-IV (MH-304) Operations Research-I **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Basics of Operation Research, Introduction, Models, Scope, Classification, Limitations of OR.

UNIT II: Theory of Games - Introduction, Basic definitions, Minimax (Maximin) criterion and optimal strategy, Saddle point, Minimax-Maximin principle for mixed strategy games. Inventory Models - Definition, Types of inventory models.

UNIT III: Fundamental theorem of game theory, Two-by-two games without saddle point, Arithmetic method for 2 X 2 games, graphical method for 2 X 2 games.

UNIT IV: Probability theory – Probability distributions of a random variable, Standard deviation, Variance, Mathematical expectation, Binomial , Poisson and Normal distributions.

PRACTICAL (PR-301)

Unit I: Numerical Differentiation with equal (N-G forward and backward interpolation, Centre Interpolation) and unequal interval (Newton Divide Difference and Lagrange's formula) and Numerical Integration (Simpson's 1/3 and 3/8 rule, Trapezoidal Rule)

Unit II: Solution of system of linear equation (Gauss elimination, Jacobi and Gauss Seidal Method)

BACHELOR OF SCIENCE
Subject: Mathematics
Semester IV

Paper code	Paper Title	Type of paper	Contact Hours Per semester	Per week	Maximum marks	Minimum marks	ESE in hrs.	
							Theory	Practical
MH -401	Advanced Analysis and Metric Space	Theory	45	3	70	28	3	-
MH -402	Differential Equation-II	Theory	45	3	70	28	3	-
MH -403	Advance Numerical Analysis	Theory	45	3	70	28	3	-
MH -404	Operations Research-II	Theory	45	3	70	28	3	-
PR-401	Mathematics Practical	Practical	10	2	50	20	-	2
				14				

The details of the courses with code and title assigned are given below.
ESE = End Semester Examination

B.SC. HONOURS (MATHS) IV SEMESTER

PAPER-I (MH-401) ADVANCED ANALYSIS AND METRIC SPACE — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Sequence and series of functions- Point wise and Uniform Convergence, Cauchy's Criterion, Weiertrass M- Test, Abel's Test, Drichlet's test for Uniform Convergence of series of function. Uniform convergence and continuity of series of functions, Term by Term Differentiation and Integration.

UNIT II: Metric Space- Definition and Examples, open and closed sets, Interior and closure of a set, limit point of a set.

UNIT III: Subspace of a metric space, Product space, Continuous mappings, Sequence in a metric space, Cauchy's sequence.

UNIT IV: Complete Metric space, Baire's Theorem, Compact sets and Compact spaces, Connected Metric Spaces.

PAPER-II (MH-402) DIFFERENTIAL EQUATION – II — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Linear Differential Equation of second order, Linear Independence of solutions, Solution by transformation of the equations by changing the dependent variable/ independent variables, Factorization of Operators, Method of Variation of parameters, Method of undetermined coefficients.

UNIT II: Non-linear differential equation of particular forms, Partial Differential Equations of first order, Lagrange's Linear Equation, Charpit's Method.

UNIT III: Homogeneous and non-homogeneous Linear Partial Differential Equations with constant coefficients, Partial Differential Equations reducible to equations with constant coefficients.

UNIT IV: Partial Differential Equations of second order: Simple problem based on Monge's method, Separation of variable and canonical form.

PAPER-III (MH-403) ADVANCED NUMERICAL ANALYSIS **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Numerical solution of algebraic and transcendental equations. Bisection method, Regula-Falsi method, Method of iteration, Newton-Raphson method.

UNIT II: Horner Method, Graffe's Root Squaring Method, Lin-Bairstow's Method, Ramanujan Method, Mullar's Method, Chebyshev's Method.

UNIT III: Solutions of ordinary differential equations of first order with initial and boundary conditions usingPicard's, Euler's methodsand Taylor's Series method.

UNIT IV: Runge-Kutta methodsupto fourth method,Milne's Predictor and Corrector Method, Adam's Predictor and Corrector Method, , Eigen Value and Eigenvector Problems.

PAPER-IV (MH-404) Operations Research-II **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

Unit- I: Network Scheduling by PERT/ CPM, Simulation, Types of Simulation, Monti-Carlo Technique, Generation of Random Variable.

Unit II: Queuing Theory – Introduction, Probability distributions in queuing systems. Models-(M/M/1):(∞/FCFS),(M/M/1):(N/FCFS),(M/M/s):(∞/FCFS), (M/M/s): (N/FCFS).

Unit III: Inventory Models-Deterministic models, The Economic Order Quantity (EOQ) model, Sensitivity analysis, price-break Model. Probabilistic Inventory models, Single-period inventory models, fixed order quantity model, fixed time period model.

Unit IV: Sequencing Models: Sequencing Problems, Processing n jobs through two machines. Processing n jobs through three machines. Processing two through m machines, processing n jobs through shortest cyclic Route models. Minimal path problem (shortest Acyclic Route Models).

PRACTICAL (PR-401)

Unit I: Horner Method, Graffe's Root Squaring Method, Lin-Bairstow's Method

Unit II: Milne's Predictor and Corrector Method, Adam's Predictor and Corrector Method, Taylor's Series Method

BACHELOR OF SCIENCE
Subject: Mathematics
Semester V

Paper code	Paper Title	Type of paper	Contact Hours Per semester	Per week	Maximum marks	Minimum marks	ESE in hrs.	
							Theory	Practical
MH -501	Abstract Algebra-I	Theory	45	3	70	28	3	-
MH -502	Complex Analysis-I	Theory	45	3	70	28	3	-
MH -503	Dynamics	Theory	45	3	70	28	3	-
MH -504	Statistics-I	Theory	45	3	70	28	3	-
PR-501	Mathematics Practical	Practical	10	2	50	20	-	2
				14				

The details of the courses with code and title assigned are given below.

ESE = End Semester Examination

B.SC. HONOURS (MATHS) V SEMESTER

PAPER-I (MH-501) ABSTRACT ALGEBRA-I — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Definition and simple properties of Groups and subgroup, cyclic group, Permutation group.

UNIT II: Cosets, Lagrange's theorem on the order of subgroups of a finite order group, Cayley's theorem. Normal subgroups and Quotient groups.

UNIT III: Morphism of groups,Fundamental theorems of Isomorphism. 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.

PAPER-II (MH-502) COMPLEX ANALYSIS - I — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Complex plane, Connected and Compact sets, Curves and Regions in complex plane. Jordan Curve Theorem (statement only), Extended complex plane, Stereographic projection, Complex valued function-Limits, Continuity and Differentiability.

UNIT II: Analytic functions, Cauchy-Riemann equations (Cartesian and polar form), Harmonic functions, Construction of an analytic function.

UNIT III: Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions.

UNIT IV: Cauchy integral formula, Analyticity of the derivative of an analytic function, Morera's theorem, Poisson integral formula, Liouville's theorem.

PAPER-III (MH-503) DYNAMICS **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Velocity and acceleration-along radial and transverse directions, along tangential and normal directions. Work and Energy.

UNIT II: S.H.M., Hooke's law, Motion along horizontal and vertical elastic strings. Motion in resisting medium- Resistance varies as velocity and square of velocity.

UNIT III: Projectile Motion,Motion on a smooth curve in a vertical plane.Motion on the inside and outside of a smooth vertical circle.

UNIT IV: Moment of inertia-M. I. of rods, Circular rings, Circular disks, Solid and Hollow spheres, Rectangular lamina, Ellipse and Triangle. Product of Inertia, Theorem of Parallel axis and Perpendicular axis, Momental Ellipse, Principal axis.

PAPER-IV(MH-504)-Statistics-I **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Introduction, Growth of Statistics, Importance , limitations, Distrust and function of statistics, collection of data, classification, seriation and tabulation, Diagrammatic representation of data, demographic ratios, percentages and logarithm, Mesure of central tendency, Arithmetic Average, A.M., G.M. H.M., relationship between A.M., G.M., and H.M.; Median, Mode.

UNIT II: Moving Average, Progressive Average, Limitations of average, Measures of dispersion-mean deviation, root mean square deviation, variance, standard deviation. Skewness and Kurtosis, Moments of frequency distributions, relationship between measures and dispersion.

UNIT III: Correlation and Regression, Index Numbers, Multiple and partial correlation, Methods of least squares and curve fitting, Analysis of time series, interpolation and extrapolation, Association of Attributes.

UNIT IV: Sampling Theory: Introduction, Definition, Sampling Methods, sampling and data collection, Simple sampling of attributes, standard error, sampling of variables, levels of significance, student's t-distribution.

PRACTICAL (PR-501)

Introduction of C-Language: Flow Chart, programming in C-constants, variables, arithmetic and logical expressions, Input-Output, Implementing loops in Programs, defining and manipulation arrays and functions.

Use of C- Programming in Numerical Analysis

UNIT I: Numerical Solutions of algebraic and Transcendental Equations, Bisection Method, Regula-Falsi Method, Method of Iteration, Newton-Raphson Method.

UNIT II: Solutions of ordinary differential equations of first order with initial boundary condition using Picard's, Euler's and modified Euler's method, Runge-Kuttafourth order method.

BACHELOR OF SCIENCE
Subject: Mathematics
Semester VI

Paper code	Paper Title	Type of paper	Contact Hours Per semester	Per week	Maximum marks	Minimum marks	ESE in hrs.	
							Theory	Practical
MH -601	Abstract Algebra-II	Theory	45	3	70	28	3	-
MH -602	Complex Analysis-II	Theory	45	3	70	28	3	-
MH -603	Mechanics	Theory	45	3	70	28	3	-
MH -604	Statistics-II	Theory	45	3	70	28	3	-
PR-601	MathematicsPractical	Practical	10	2	50	20	-	2
				14				

The details of the courses with code and title assigned are given below.

ESE = End Semester Examination

B.SC. HONOURS (MATHS) VI SEMESTER

PAPER-I (MH-601) ABSTRACT ALGEBRA-II — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Ideals and Quotient Ring, Maximal ideal and Prime ideal, Principal Ideal domain.

UNIT II: Field of quotients of an integral domain, Prime fields. Definitions, Examples and Simple properties of Vector spaces and Subspaces.

UNIT III: Linear combination, Linear dependence and Linear independence of vectors. Basis and Dimension, Generation of subspaces. Sum of subspaces.Direct sum and Complement of subspaces

UNIT IV: Quotient space and its dimension, Linear Transformation and simple properties, Kernel of Linear transformation.

PAPER-II (MH-602) COMPLEX ANALYSIS – II — 45 Hrs (3hrs/Week)

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Power series-Absolute convergence, Abel's theorem, Cauchy-Hadamard theorem. Circle and Radius of convergence, Analyticity of the sum function of a power series, Analytic continuation. Power series method of analytic continuation.

UNIT II: Taylor's theorem. Laurent's theorem, Maximal modulus theorem, Singularities of an analyticfunction.

UNIT III: Branch point, Meromorphic and Entire functions, Riemann's theorem, Casorati-Weierstrasstheorem, Residue at a singularity, Cauchy's residue theorem, Argument Principle. Rouche's theorem.

UNIT IV: Fundamental theorem of Algebra. Conformal mapping. Bilinear transformation and itsproperties. Elementary mappings:w(z)= 1/z, (z+1/z), z^2, , e^z, sin z, cos z and log z. Evaluation of a realdefinite integral by contour integration.

PAPER-III (MH-603) MECHANICS **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Catenary, Virtual Work, Friction.

UNIT II: General conditions of equilibrium of rigid body under several coplanar forces, Envelope of the paths of a projectile.

UNIT III: Central orbits p-r equations, Apses, Time in an orbit, Kepler's laws of planetary motion.

UNIT IV: Collision of elastic bodies, direct impact, oblique impact, impact on an inclined plane.

PAPER-IV (MH-604)-Statistics-II **45 Hrs (3hrs/Week)**

Note: In all five questions are to be answered. First question will be short answer type,compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT I: Probability - Introduction, definitions, events, algebra of events, Bernoulli's trials, Probability, conditional probability, Theorem of Total Probability, Baye's theorem.

UNIT II: Random variable & their event space, probability distribution, probability generating function, expectations, moments, Mathematical expectation of sum and product of two random variates, co-variance of a variate, Moment generating and cumulant generating functions. Life time of a component, Reliability, computations of mean time to failure.

UNIT III: Discrete & continuous Probability distribution: Binomial, Poisson, normal rectangular and exponential distribution & their PDF's, moments and MGF's for above distributions, Functions of one random variable: distribution, mean, variance, moments and characteristics functions, function of two random variables.

UNIT IV: Two functions of two random variables, Joint moments, Joint characteristics functions, Conditional distributions, conditional expected values, statistical independence. Multiple random variables: multiple functions of multiple random variables, jointly Gaussian random variables, sums of random variable, Central limit theorem.

PRACTICAL (PR-601)

Use of C- Programming in Numerical Analysis

UNIT I: Solutions of ordinary differential equations of first order with initial boundary condition using Milne's and Adam Predictor and corrector method.

UNIT II: Solutions of ordinary differential equations of first order with initial boundary condition using Taylor's series method and Ramanujan Method.