MAHARSHI DAYANAND SARASWATI UNIVERSITY, AJMER

NAAC Accredited 'B++' Grade State University

Structure of B.Sc. Hons. Mathematics/Hons. with Research – (4 Year course as per NEP-2020)

Year	Semester	DSC		IDC1	IDC2	AEC	Total Credits
I	I	Mathematical Calculus(6)		Physics(6)	Chemistry(6)	Hindi/English(2)	20
	II	Mathematical Theory(6)		Physics(6)	Chemistry(6)	Hindi/English(2)	20
	Semester	DSC 1		DSC 2	IDC	SEC	Total Credits
2	III	**Abstract Algebra(6)**		**Numerical Analysis(6)**	**Physics OR Chemistry (6)**	**Scientific Calculator (2)**	20
	IV	**Differential Equation(6)**		**Discrete Mathematics(6)**	**Physics OR Chemistry (6)**	**Scientific Calculator (2)**	20
	Semester	DSC	DSE	AEC	VAC	SEC	Total Credits
3	V	**Real Analysis (6)**	**Complex Analysis OR Statics (6)**	**Introduction to R Software (2)**	**MOOCS (3)**	**Research Methodology(3)**	20
	VI	**Linear Programming Problem(6)**	**Statistics OR Dynamics(6)**	**Use of R Software in Mathematics (2)**	**MOOCS(3)**	**Use of MS Excel in LPP OR Internship* (3)**	20
	Semester	DSC 1	DSC 2	DSE 1	DSE 2		Total Credits
4	VII	Special Functions(6)	Optimization Techniques(6)	Tensor Analysis OR Fluid Dynamics (4)	Differential Geometry OR Computational Fluid Dynamics (4)		20
	Semester	DSE 1		DSE 2			Total Credits
	VIII	Integral Transform OR Mathematical Programming(4)		Differential & Integral Equations OR Theory of Relativity (4)		Dissertation (12)	20

*Compulsory for Hons. With Research.

Paper with credit 6 is divided into 4(Theory) + 2(Internal/Practical) credit.

(डॉ संजय जैन)

संयोजक - गणित अध्ययन समिति

B.Sc. Hons. Mathematics/Hons. with Research
Semester – I

Year	Semester	DSC	IDC1	IDC2	AEC	Total Credits
I	I	Mathematical Calculus(6)	Physics(6)	Chemistry(6)	Hindi/English(2)	20

SEM I DSC - Mathematical Calculus (Paper - 4 Credit + Practical – 2 Credit = 6 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of Paper of 4 Credits.

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

MATHEMATICAL CALCULUS **Max Marks: 70**

Unit-I **Differential Calculus**

Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates. Partial Differentiation, Euler Theorem.

Unit –II **Integral Calculus**

Fundamental theorem of integral calculus, Mean value theorems of integral calculus, Pappus theorem, Quadrature. Rectification, Volumes and Surfaces generated by Solid of revolution, Multiple integrals, Change of order of double integration, Dirichlet's theorem and Liouville's theorem for multiple integrals (Only Statement of Theorems)

Unit –III **Vector Calculus**

Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors. Gradient, divergence and curl. Line and Surface integral, Problems based on Gauss, Green's & Stoke's theorems and problem based on these theorems (Only Statement of Theorems).

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and Internal marks obtained by students are submitted to University before semester examination start.

One Practical Paper of 2 credit (Theory 35+ Internal 15 = 50 Marks)

Theory and Tutorial: 2 Classes/Week/Hour (Total 30 Hours per Semester) of paper of 2 Credits.

GeoGebra

Practical Syllabus:

Conduct 10 practical of following GeoGebra tools, 02 from each tools:

- Graphing Calculator
- Scientific Calculator
- Basic tools
- Edit tools
- Construct tools

The marks distributions in practical exam is as follows:

• Practical Exercise 1	15 Marks
• Practical Exercise 2	15 Marks
• Viva Voce	5 Marks
• Practical Record	15 Marks
Total:	50 Marks

Note: IDC 1 (Physics & Practical),
IDC 2 (Chemistry & Practical) and AEC Hindi / English are same subject syllabus as given in BSc Pt I, Semester I Syllabus of MDS University Ajmer.

B.Sc. Hons. Mathematics/Hons. with Research
Semester – II

Year	Semester	DSC	IDC1	IDC2	AEC	Total Credits
I	II	Mathematical Theory(6)	Physics(6)	Chemistry(6)	Hindi/English(2)	20

SEM II DSC - Mathematical Theory (Paper - 4 Credit + Practical – 2 Credit = 6 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of each Paper of 4 Credits

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

MATHEMATICAL THEORY **Max Marks: 70**

Unit-I **Theory of Equations**

Maximum and Minimum values of a polynomials, General properties of equations, Descarte's rule of signs positive and negative rule, Relation between the roots and the coefficients of equations. Symmetric functions, Applications of symmetric function of the roots

Unit – II **Number Theory**

Division algorithm, Lame's theorem, Diophantine equation, prime counting function, binary and decimal representation of integers, linear congruences, complete set of residues. Number theoretic functions, sum and number of divisors, totally multiplicative functions, greatest integer function,

Unit –III **Coordinate Geometry**

Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola. Conic sections and standard equations for parabola, ellipse and hyperbola. Spheres, Radical plane, Radical centre, Cylindrical surfaces. Illustrations of graphing standard quadric surfaces like cone, ellipsoid.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

One Practical Paper of 2 credit (Theory 35+ Internal 15 = 50 Marks)

Theory and Tutorial: 2 Classes/Week/Hour (Total 30 Hours per Semester) of paper of 2 Credits.

Advanced GeoGebra

Practical Syllabus:

Conduct 10 practical of following GeoGebra tools, 02 from each advance tools:

- Measure
- Circle
- Polygon
- Transform
- 3 D Calculator

The marks distributions in practical exam is as follows:

• Practical Exercise 1	15 Marks
• Practical Exercise 2	15 Marks
• Viva Voce	5 Marks
• Practical Record	15 Marks
	Total: 50 Marks

Note: IDC 1 (Physics & Practical), IDC 2 (Chemistry & Practical) and AEC Hindi / English are same subject syllabus as given in BSc Pt I, Semester II Syllabus of MDS University Ajmer.

B.Sc. Hons. Mathematics/Hons. with Research
Semester – III

Year	Semester	DSC 1	DSC 2	IDC	SEC	Total Credits
2	III	**Abstract Algebra(6)**	**Numerical Analysis(6)**	**Physics OR Chemistry (6)**	**Scientific Calculator (2)**	20

SEM III DSC 1 – Abstract Algebra (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Abstract Algebra Max Marks: 70

Unit-I :

Definition of group, general properties of group, order of element of a group, cyclic group, permutation group, subgroup, cosets,

Unit-II :

Normal subgroup and Quotient group, Ring, general properties of Ring, Subring.

Unit – III:

Integral domain and their properties, Field and their properties with examples. Subfield, Prime field, Ideals and their properties.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

SEM III DSC 2 – Numerical Analysis (Paper - 4 Credit + Practical – 2 Credit = 6 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of each Paper of 4 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Numerical Analysis Max Marks: 70

Unit - I

Basic properties of finite difference theory. Operators E and delta. nth difference of polynomial of degree n. Interpolation with equal intervals Newton Gregory formula for forward and backward differences. Newton divided difference formula for unequal intervals. Lagrange's interpolation.

Unit - II

Central differences formulas -Gauss, Sterling and Bessel's formulas. Inverse interpolation, Numerical differentiation.

Unit - III

Numerical integration, General quadrature formula, Trapezoidal rule, Simpsons 1/3rd rule, Simpsons 3/8th rule, Weddle's, rule, Solution of algebraic and transcendental equations, D'carte's rules of signs bisection method, Newton Raphson method, Regula Falsi method and their rate of convergence.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

Semester – III Numerical Analysis (Practical) Credit– 2

Theory and Tutorial: 2 Classes/Week/Hour (Total 30 Hours per Semester) of paper of 2 Credits.

Algorithm and Flow Chart on Numerical Methods Max Marks-50

Out of six practical, select one from first three and one from last three for practical exam.

1. *Draw Algorithm and Flow Chart of Newton equal interval for Interpolation.*
2. *Draw Algorithm and Flow Chart of Newton unequal interval for Interpolation.*
3. *Draw Algorithm and Flow Chart of Lagranges unequal interval for Interpolation.*
4. *Draw Algorithm and Flow Chart of Gauss formula for Interpolation.*
5. *Draw Algorithm and Flow Chart of Besel formula for Interpolation.*
6. *Draw Algorithm and Flow Chart of Stirling formula for Interpolation.*

The marks distributions in practical exam is as follows:

- Practical Exercise 1 15 Marks
- Practical Exercise 2 15 Marks
- Viva Voce 5 Marks
- Practical Record 15 Marks

Total: 50 Marks

Semester – III Mathematics (Skill Enhancement Course) Credit– 2

Theory and Tutorial: 2 Classes/Week/Hour (Total 30 Hours per Semester) of paper of 2 Credits.

Scientific Calculator Max Marks-(70+30)=100

Uses of scientific calculator for teaching and learning mathematics in many interdisciplinary subjects as skill enhancement course.

Unit-1 Solve the logarithmic and antilogarithmic functions for numerical values from scientific calculator.

Unit-2 Solve the exponential *and* trigonometric functions for numerical values from scientific calculator.

Unit-3 Solve the inverse trigonometric function *and* degree and radian conversion from scientific calculator.

Note: Internal Exam of 30 Marks on **Scientific Calculator** is taken at College level.

Note: **IDC Paper**:

Either Physics (Theory & Practical) **Or** CHEMISTRY (Theory & Practical)
is taken from BSc Pt II, Semester III Syllabus of MDS University Ajmer.

B.Sc. Hons. Mathematics/Hons. with Research
Semester – IV

Year	Semester	DSC 1	DSC 2	IDC	SEC	Total Credits
2	IV	**Differential Equation(6)**	**Discrete Mathematics(6)**	**Physics OR Chemistry (6)**	**Scientific Calculator (2)**	20

SEM IV **DSC-1** **Differential Equations** (Paper - 4 Credit + Practical – 2 Credit = 6 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of Paper of 4 Credits.
One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Differential Equations **Max. Marks: 70**

Unit-I Differential Equation:
Order and degree of differential equation, differential equation of first order, first and higher degree, linear differential equation, homogeneous differential equation, linear differential equation with constant coefficients, linear differential equation of second order, method of variation of parameters.

Unit-II Partial Differential Equation:
Partial differential equation of the first order, Lagrange's solution, Charpit method, Partial differential equation of second and higher order.

Unit-III Numerical Algebraic Equation:
Numerical integration, Trapezoidal, Simpson's, Weddle rule. Bisection, Regula falsi, Newton Raphson method for solution of algebraic and transcendental equations.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

Semester – IV **Mathematics (Practical)** **Credit– 2**

Theory and Tutorial: 2 Classes/Week/Hour (Total 30 Hours per Semester) of paper of 2 Credits.

Algorithm and Flow Chart on Numerical Equations Max Marks-50

Out of six practical, select one from first three and one from last three for practical exam.

1. *Draw Algorithm and Flow Chart of* Trapezoidal Rule.
2. *Draw Algorithm and Flow Chart of* Simpson's Rule.
3. *Draw Algorithm and Flow Chart of* Weddle Rule.
4. *Draw Algorithm and Flow Chart of* Bisection Method.
5. *Draw Algorithm and Flow Chart of* Regula Falsi Method.
6. *Draw Algorithm and Flow Chart of* Newton Raphson method.

The marks distributions in practical exam is as follows:

• Practical Exercise 1	15 Marks
• Practical Exercise 2	15 Marks
• Viva Voce	5 Marks
• Practical Record	15 Marks
Total:	**50 Marks**

SEM IV **DSC-2** **Discrete Mathematics** (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Discrete Mathematics **Max. Marks: 70**

UNIT-I

Sets, Relations and Functions: Combination of sets, finite and infinite sets, uncountable infinite sets, binary relations, equivalence relations and partitions. Partial order relations and lattices. Chains and anti-chains, a job scheduling problem, one-to-one, onto and invertible functions, Mathematical functions, exponential and logarithmic functions, sequences, indexed classes of sets, recursively defined functions, cardinality, algorithms and functions.

UNIT-II

Logic and Propositional Calculus: Propositions and compound propositions, basic logical operations, propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of propositions, conditional and bi-conditional statements, arguments, logical implication, propositional functions, quantifiers, negation of quantified statements. Boolean Algebra: Basic definitions, duality, basic theorems, Boolean algebras as lattices, representation theorem,

sum of products form for sets, sum of products from for Boolean algebras, minimal Boolean expressions, prime implicants, logic gates and circuits, truth tables Boolean functions.

UNIT-III

Graph Theory: Data structures, graphs and multigraphs, subgraphs, isomorphic and homomorphic graphs, paths, connectivity, the bridges of Konigsberg, traversable multigraphs, labeled and weighted graphs, complete, regular and bipartite graphs, tree graphs, planar graphs, graph colorings, shortest paths. Directed Graphs: Directed graphs, basic definitions, rooted trees, sequential representation of directed graphs.

Reference Books:

(1) Discrete Mathematics and its application: K.H. Rosen, McGraw Hill, 1999.
(2) Discrete Mathematics: N.L. Biggs, Oxford Science Publication, 1985

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

Semester – IV Mathematics (Skill Enhancement Course) Credit– 2

Theory and Tutorial: 2 Classes/Week/Hour (Total 30 Hours per Semester) of paper of 2 Credits.

Scientific Calculator Max Marks-(70+30) =100

Uses of scientific calculator for teaching and learning mathematics in many interdisciplinary subjects as skill enhancement course.

Unit-1 Solve the value of hyperbolic functions and the value of different algebraic polynomial up to degree 4.
Unit-2 Solve the value of n^{th} root of the number *and* the value of a factorial from scientific calculator.
Unit-3 Solve the value of Determinant and the multiplication of two Matrix from scientific calculator.
Note: Internal Exam of 30 Marks on **Scientific Calculator** is taken at College level.

Note: **IDC Paper**:

Either Physics (Theory & Practical) **Or** CHEMISTRY (Theory & Practical)
is taken from BSc Pt II, Semester IV Syllabus of MDS University Ajmer.

B.Sc. Hons. Mathematics/Hons. with Research
Semester – V

Year	Semester	DSC	DSE	AEC	VAC	SEC	Total Credits
3	V	**Real Analysis (6)**	**Complex Analysis OR Statics (6)**	**Introduction to R Software (2)**	**MOOCS (3)**	**Research Methodology(3)**	20

SEM V **DSC** **Real Analysis** (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Real Analysis **Max. Marks: 70**

Unit-I : Real number system as a complete ordered field, The point set theory, ε-δ definition of the limit of a function, basic properties of limits, continuous functions and classification of discontinuities, sequential continuity, properties of continuous functions defined on closed intervals, limit and continuity of functions of two variables.

Unit-II : Differentiability and its properties, mean value theorems and their geometrical interpretation, Darboux's intermediate value theorem for derivatives, Taylor's theorem for functions of two variables, Definition of a sequence, theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion.

Unit-III : Infinite series of non-negative terms and its convergence, different tests of convergence of infinite series (without proof), Fourier series, Fourier expansion of piecewise monotonic functions, uniform convergence of series of functions. Wirestrass M-test. Abel's test and Dirichlet's test.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

SEM V **DSE** **Complex Analysis OR Statics** (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Complex Analysis

Max. Marks: 70

Unit-I : Complex numbers as ordered pairs, curves and region in the complex plane, extended complex plane and stereographic projection, complex valued functions, limit and continuity, convergence, differentiability in the extended plane, analytic functions, Cauchy-Riemann equations, complex equation of a straight line and circle, polynomials, multiple valued functions, harmonic functions.

Unit-II : Mapping or transformations, Jacobian of a transformation, conformal mapping, necessary and sufficient conditions for w=f(z) to represent conformal mapping, some elementary transformations, bilinear transformation and its properties.

Unit-III : Sequences and series of functions, Power series, Complex line integral, reduction of complex integrals to real integrals, properties of complex integrals, Cauchy's fundamental theorem, Cauchy's integral formula, derivative of an analytic function, Morera's theorem, Liouville's theorem, Poisson's integral formula, expansion of analytic functions as power series, Taylor's and Laurent's theorems.

OR

SEM V **DSE** **Statics** **Max. Marks: 70**

Unit-1: Analytical conditions of equilibrium of coplanar forces, Friction.

Unit-2 : Virtual work, Common Catenary

Unit-3: Forces in three dimensions, stable and unstable equilibrium

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Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

B.Sc. Hons. Part III Semester -V Mathematics

Introduction to R Software (AEC) **2 Credit (70+30)**

Unit-I

Introduction to Algorithm and programming concepts. What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package.

Unit-II

Few commands to get started: installed. packages (), package Description(), help(), find. package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.

Unit -III

R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and Internal marks obtained by students are submitted to University before semester examination start.

REFERENCES: 1. "The Book of R" by Tilman M. Davies, no starch press (San Francisco)
2. "The Art of R programming" by Norman Matloff, no starch press (San Francisco)

SEM V **VAC** **MOOC (Practical)** **Credit– 3**

Theory and Tutorial: 3 Classes/Week/Hour (Total 45 Hours per Semester) of paper of 3 Credits.

*Every student should participate in one **Massive Open Online Course** (MOOCs) available at Swayam/NPTEL/Educational portal on one DSC/DSE paper elected by the students in V semester. The student makes a record of MOOC contents in form of a file for the Practical Exam conduct by the institute.*

The marks distributions in practical exam is as follows:

- Practical Exercise 1 30 Marks
- Practical Exercise 2 30 Marks
- Viva Voce 10 Marks
- Practical Record 30 Marks

Total: 100 Marks

B.Sc. Hons. Part –III, Semester – V, Mathematics

Theory and Tutorial: 3 Classes/Week/Hour (Total 45 Hours per Semester) of paper of 3 Credits.

SEM V **SEC** **Research Methodology** **3 Credits (70+30)=100**

Unit – I: Meaning of Research, Characteristic Features of Research, Science and Scientific Research, Research Methods, Methods of Data Collection, Requirements for Research.

Unit – II: Identification of Research Problem, Survey of Literature, Objectives of Data Analysis, Techniques of Data Analysis.

Unit – III: Sampling Theory, Formulation of Hypothesis, Applications of Z-test, t-test, F-test and Chi-Square test.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

References:

1. Business Research Methods (Second Revised & Enlarged Edition) – K. R. Sharma, National Publishing House, Jaipur and New Delhi.

2. Research Methodology : Methods and Techniques (Multi Colour Edition) – C. R. Kothari, Wiley Eastern, New Delhi.

B.Sc. Hons. Mathematics/Hons. with Research
Semester – VI

Year	Semester	DSC	DSE	AEC	VAC	SEC	Total Credits
3	VI	**Linear Programming Problem(6)**	**Statistics OR Dynamics(6)**	**Use of R Software in Mathematics (2)**	**MOOCS(3)**	**Use of MS Excel in LPP OR Internship* (3)**	20

SEM VI **DSC** **Linear Programming Problem** (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Linear Programming Problem

Max. Marks: 70

Unit –I: Simplex method, Big-M method, Two phase method.

Unit- II: Degeneracy in Simplex method and it's resolution. Concept of duality in linear programming problems, formulation of dual problems with elementary theorems. Introduction of Allocation problems as LPP.

Unit- III: Assignment problems, Hungarian method, minimum row-cover method, unbalanced assignment problems. Transportation problems, North- West corner method, lowest cost entry method, Vogels approximation method, degeneracy and optimal solution of Transportation problem.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

SEM VI **DSE** **Statistics OR Dynamics** (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Statistics

Max. Marks: 70

Unit-I : Measures of dispersion, moments, central moments, skewness, kurtosis, Pearson's coefficients, probability, law of total and compound probability. conditional probability, independent events. Bay's theorem, random variable. probability distribution of a discrete random variable, mathematical expectation, expectation and variance of a linear combination of random variables, moment generating of function, cumulates and its properties.

Unit-II Discrete distributions: Binomial and Poisson, properties of these distributions and moments up to fourth order, fittings of Binomial and Poisson distributions. Continuous distributions: Rectangular and normal distributions, properties of these distribution and moments up to fourth order.

Unit-III : Bivariate data, Scattered diagram, Correlation coefficient, rank correlation coefficient, Principal of least square, Fitting of a line and quadratic curves, simple linear regression correlation, correlation versus regression, properties of regression coefficients.

OR

SEM VI **DSE** **Dynamics** **Max. Marks: 70**

UNIT –I: Velocities and accelerations along radial, transverse, tangential and normal directions, Simple harmonic motion, Hooks law.

UNIT- II: Hook's law related problems on horizontal and vertical elastic strings, linear motion in resisting medium.

UNIT- III: Constrained motion on smooth plane curves (circular and cycloidal motion), impact (direct and oblique)

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

B.Sc. Hons. Part III Semester -VI Mathematics

Use of R Software in Mathematics (AEC) **2 Credit (70+30)**

Unit-I

R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement. Solving problems from Assignment sheet.

Unit-II

R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting

Unit -III

R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

SEM VI **VAC** **MOOC (Practical)** **Credit– 3**

Theory and Tutorial: 3 Classes/Week/Hour (Total 45 Hours per Semester) of paper of 3 Credits.

*Every student should participate in one **Massive Open Online Course** (MOOCs) available at Swayam / NPTEL/Educational portal on one DSC/DSE paper elected by the students in VI semester. The student makes a record of MOOC contents in form of a file for the Practical Exam conduct by the institute.*

The marks distributions in practical exam is as follows:

- Practical Exercise 1 30 Marks
- Practical Exercise 2 30 Marks
- Viva Voce 10 Marks
- Practical Record 30 Marks

Total: 100 Marks

SEM VI **Mathematics (Skill Enhancement Course Or Internship)** **Credit– 3**

Theory and Tutorial: 3 Classes/Week/Hour (Total 45 Hours per Semester) of paper of 3 Credits.

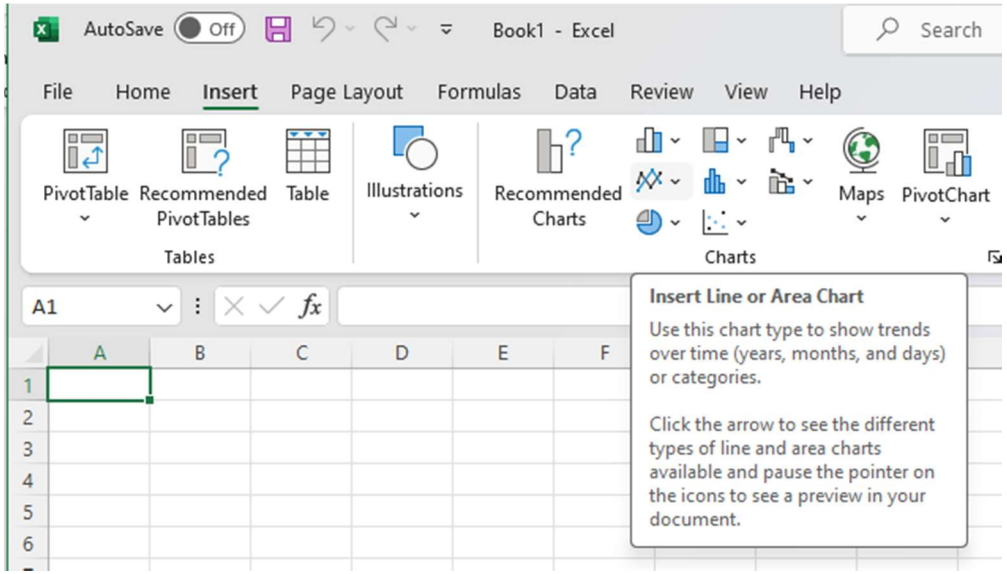
SEM VI **SEC** **Use of MS Excel in Linear Programming** Max Marks-(70+30) = 100

Uses of MS Excel for teaching and learning Applied Mathematics in interdisciplinary subjects as skill enhancement course.
Describe the procedure of MS Excel to draw/evaluate the following graphs:

Unit -1: Mean, Mode, Median, CORREL,
BINOM.DIST, POISSON.DIST.

Unit -2 Draw Constraints (≤ types),
Draw Constraints (≥ types),
Draw Constraints (= types),

Unit -3 Obtain Feasible region (Bounded type),
Obtain Feasible region (Unbounded type),
No feasible region.



Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

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OR

SEM VI **Internship (30 Hours for Internship+ 15 Hours for Report writing) of 3 Credits** **Max Marks 100**

A blend of theoretical mathematical concepts and their practical applications, along with the development of essential skills. Topics can range from linear algebra, calculus, and differential equations to more specialized areas like optimization, statistics, and data analysis. Additionally, internships often emphasize the development of generic skills like time management, communication, and teamwork.

Applications and Practical Skills:

- **Data Analysis:** Data cleaning, manipulation, visualization, and statistical analysis.
- **Modelling:** Building and validating mathematical models for various real-world scenarios.
- **Software Skills:** Programming languages like Python or R, and potentially experience with software packages used in the internship field.
- **Problem Solving:** Applying mathematical knowledge and tools to solve practical problems.
- **Communication:** Effectively communicating technical information, both orally and in writing.
- **Teamwork:** Collaborating with others on projects and contributing to a team effort.
- **Market Research:** Survey design, data collection, analysis of consumer behaviour.
- **Risk Modelling:** Developing and validating credit risk models for financial institutions.
- **Analytics:** Optimization, forecasting, and providing analytical support for various projects.
- **Cryptology and Communications:** Applications of abstract algebra, number theory, and cryptography.
- **Operations Research:** Network flows, optimization techniques, and decision-making.

The concerned Mathematics department sent to honours students for Industrial/Academic/Software Internship of at least four week. The student submit after internship the Report/Dissertation of the mathematical work done during internship.
A mentor is allotted to each student to guide/help about Internship places /Field (In Ajmer Area like HMT, RK Marble, Shri Cement, Railways Dept., Big Poultry farm etc.,) and supervise for Detail Report/Dissertation. Mentor also evaluate the Report/Dissertation and submit the marks out of 100 /credit score out of 3 to HOD for university submission.

*Note: Internship is compulsory for students who apply for BSc Hons. with Research degree.

B.Sc. Hons. Mathematics/Hons. with Research
Semester – VII

	Semester	DSC 1	DSC 2	DSE 1	DSE 2	Total Credits
4	VII	Special Functions(6)	Optimization Techniques(6)	Tensor Analysis OR Fluid Dynamics (4)	Differential Geometry OR Computational Fluid Dynamics (4)	20

SEM VII **DSC 1** **Special Functions** (Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Special Functions (DSC 1) Max Marks: 70

UNIT-I: Hypergeometric functions: Series solution of Gauss hypergeometric equation, Gauss hypergeometric function and its properties, integral representation, linear and quadratic transformation formulas, contiguous function relations, differentiation formulae, linear relation between the solutions of Gauss hypergeometric equation, Kummer's confluent hypergeometric function and its properties, integral representation, Kummer's first transformation.

UNIT-II: Bessel function and Legendre polynomial: Generating function for $J_n(x)$. alternative forms of generating functions, trigonometric expansions involving Bessel functions, Bessel's differential equation and its solutions, recurrence relations, Bessel's integrals, modified Bessel function, Orthogonality of Bessel functions, some integral involving Bessel functions, Legendre's polynomial, associated Legendre's functions, generating function, recurrence relation. Successive values of Legendre polynomial, Beltrami's result, Christoffel's expansion, Christoffel's summation formula, various forms of $P_n(x)$. Rodrigues formula, hypergeometric form, Laplace first and second integral of $P_n(x)$ and related problems, Legendre's differential equation and its general solution, Orthogonality properties, expansion involving Legendre polynomial, Legendre function of second kind and its properties.

UNIT-III: Hermite polynomial: Definition of Hermite polynomials $H_n(x)$.), recurrence relations, Rodrigues formula, other generating functions, Orthogonality, expansion of polynomials, more generating functions, hypergeometric representations, integral representation of Hermite polynomial, differential equation and its solution. Laguerre Polynomials: The Laguerre Polynomials $L_n(x)$, generalized Laguerre polynomial, generating functions, recurrence relations, Rodrigues formula, orthogonal, expansion of polynomials, special properties, other generating functions integral relations.

References:

(1) Special Functions: Earl D. Rainville, Chelsea Pub. Co.

(2) Special Functions with application: Saran, Sharma and Trivedi, Pragati Prakashan

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

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SEM VII **DSC 2** **Optimization Techniques (**Paper - 4 Credit + Internal – 2 Credit = 6 Credit)

Theory and Tutorial: 6 Classes/Week/Hour (Total 90 Hours per Semester) of each Paper of 6 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Optimization Techniques **(DSC 2)** Max Marks: 70

Unit I: Linear integer programming, importance of interior programming problem, definitions, Gomory's all LPP technique, how to construct Gomory's constraint, All LPP algorithm. Applications .of integer programming, Sequencing problems.

Unit II : Dynamic programming. Introduction, Decision tree and Bellman's principle of optimality. Cargo loading problem, Minimum path problem. Quadratic programming, Introduction to Nonlinear programming, Karush-Kuhn-Tucker (KKT) conditions.

Unit III: Inventory models. Definition, various cost involved in inventory problem, inventory models with deterministic demand, concept of economic ordering quantity (EOQ). Introduction to Probabilistic inventory models. Replacement Theory.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

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SEM VII **DSE 1** Tensor Analysis OR Fluid Dynamics (Paper + Internal = 4 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of each Paper of 4 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Tensor Analysis **(DSE 1)** **Max. Marks: 70**

UNIT-I: Transformation of co-ordinates, covariant, contravariant and mixed tensors, invariants, addition, subtraction and multiplication of tensors, contraction of tensors, quotient law of tensors, lenghth of curve, associated tensors.

UNIT-II: Christoffel symbols, Covariant differentiation of tensors, Law of covariant differentiation, geodesics, null geodesics, geodesics co-ordinates, parallelism

UNIT-III : Covariant derivative, Riemann-Christoffel tensor, curvature tensor, Ricci tensor, Bianchi identities, Riemann curvature, flat space, space of constant curvature

References:

(1) Tensor Calculus B. Spain
(2) Cartesin Tensor A. M. Goodbody

Or

Fluid Dynamics **(DSE 1)** **Max. Marks: 70**

Unit – I: Basics of Fluid Kinematics: General consideration of fluid, Lagrangian and Eulerian approach, Substantial derivative, Stream lines, Path lines, Streak lines, Divergence of a flow field, Translation, deformation and rotation of fluid element, Irrotational and rotational motions. Vortex lines, Reynolds Transport Theorem, Equation of Continuity. Euler's equation of motion, Bernoulli's theorem, Kelvin's circulation theorem, Vorticity equation.

Unit – II: Energy equation for an incompressible flow. Boundary conditions, Kinetic energy of liquid, Axially symmetric flows, Motion of a sphere through a liquid at rest at infinity, Liquid streaming past a fixed sphere, Force on a sphere, Equation of motion of a sphere.

Unit – III: Vorticity and Rotation, The Velocity potential φ, Stream functions ψ, Stokes stream functions. Uniform flow, Sources, Sinks and doublets, Images in a rigid impermeable infinite plane and in impermeable spherical surfaces, Conformal mapping, Milne-Thomson Circle theorem, Application to fluid mechanics, Blasius theorem, Joukovskii transformation, Joukovskii Aerofoils. Two-dimensional irrotational motion produced by motion of circular, co-axial and elliptic cylinders in an infinite mass of liquid, Vortex motion and its elementary properties,

References

1. W.H. Besaint and A.S. Ramsey, A Treatise on Hydromechanics, Part II, CBS Publishers, Delhi, 1988.
2. M.E.O'Neil and F. Chorlton, Ideal and Incompressible Fluid Dynamics, John Wiley & Sons.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

SEM VII **DSE 2** Differential Geometry OR Computational Fluid Dynamics (Paper + Internal = 4 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of each Paper of 4 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Differential Geometry **(DSE 2)** **Max. Marks: 70**

UNIT-I: Curves in space: Space curves, path, arc length, tangent line, contact of a curve and surface, inflexional tangent, the osculating plane, tangent at any point of a surface f(x,y,z)=0, normal plane, principal normal and binormal, curvature, torsion and skew curvature, Serret-Frenet formulae, Helices, fundamental theorems for space curves, circle of curvature, osculating sphere.

UNIT-II: Concept of surface and fundamental forms: Definition of surface, regular point and singularities on a surface, tangent plane and normal, first fundamental form. Relation between E, F, Q and H, Second fundamental form, Weingarten equations. Angle between parametric curves, direction coefficients.

UNIT-III: Curves on a surface: Curvature of normal section, Meunier's theorem, principal directions and principal curvatures, mean curvature, first curvature and total curvature, minimal surface, navel point, lines of curvature, envelope, edge of regression, ruled surfaces, developable surface, asymptotic lines.

References:

(1) Differential Geometry C.E. Weatherbum

(2) Coordinate Geometry of the three dimensions Robert, L., Bell J. T.

Or

SEM VII **Computational Fluid Dynamics (DSE-2)** **Credit (4)**

UNIT-I: Introduction and Basic Concepts: Introduction of CFD, Types of fluids and basic equations of flow, Mass Conservation and equation of continuity, Newton's second law of motion, Fluid flow governing equations, Navier– stokes equation, expanded form of Navier- stokes equations in Cartesian and polar coordinate system, Conservation of energy principle and equation of energy. Classification of second order partial differential equations, Initial and Boundary conditions.

UNIT-II: Differential Equations and Discretization: Derivation of Finite Difference Equations, Classes of finite differences: Forward, Backward, central and higher order differences, multi-dimensional finite difference, mixed order derivative. Solution of finite difference equations: Iterative solution methods, direct solution method: Gaussian elimination, Tridiagonal Matrix Algorithm. Application to heat conduction and convection problems of 1-D Steady State Diffusion Problems.

UNIT-III: Approximate Solutions of Differential Equations: Error Minimization Principles, Variational formulation. Boundary conditions in the variational form: Primary and secondary variables, Essential and natural boundary conditions, Properties of variational form. Weighted residual approach: trial function and weighting function and their requirement. Least square method, Point Collocation method, Galerkin's method, Rayleigh-Ritz method.Incompressible Viscous Flow with Finite Difference Method: Artificial compressibility, Pressure correction method, SIMPLE method, Marker-and-Cell method, Vortex Method.

References:

1. Computational Fluid Dynamics the Basics with Applications, John D Anderson, Jr., McGraw Hill Book Company.
2. Numerical Heat Transfer and Fluid Flow, Suhas V Patankar, Hemisphere Publishing Co.

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

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B.Sc. Hons. Mathematics/Hons. with Research
Semester – VIII

Year	Semester	DSE 1	DSE 2		Total Credits
4	VIII	Integral Transform OR Mathematical Programming(4)	Differential & Integral Equations OR Theory of Relativity (4)	Dissertation (12)	20

SEM VIII **DSE 1** Integral Transform OR Mathematical Programming (Paper + Internal = 4 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of each Paper of 4 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Integral Transform **(DSE 1)** **Max. Marks: 70**

Unit - 1 : Laplace transform: definition and it's properties, Laplace transform of derivatives and integrals, inverse Laplace transform, theorems of Laplace transform, application of Laplace transform to solution of differential equations, solving boundary value problems using Laplace transform.

Unit – 2: Fourier transform: definition and properties of Fourier sine, cosine and complex transforms, Convolution theorems, inversion theorems, Fourier transform of derivatives, sine and cosine Fourier transforms, solving differential equations using Fourier transform.

Unit - 3 : Hankel transform : definition and elementary properties , inversion theorem, Hankel transform of derivatives, Mellin transform: definition, properties and evaluation of transform, Convolution theorems of Mellin transforms.

Or

B.Sc. Hons. Part – IV Semester – VIII Mathematics

Mathematical Programming (DSE 1) **Max. Marks: 70**

Unit – I: Theory of Convex sets and their properties**,** Revised Simplex Method, Sensitivity Analysis in LPP, Parametric Linear Programming.

Unit – II: Transhipment and Travelling Salesmen Problems. Game Theory: Max-Min Principle**,** Algebraic method, Graphical method, Simplex method, Introduction to Goal Programming.

Unit – III: Single and Multi-Variable unconstrained Optimization, Kuhn – Tucker (K-T) conditions for constrained optimization, Separable Programming Problem.

Reference:

1. Operations Research (5^{th} edition) – J. K. Sharma, Trinity Press
2. Mathematical Programming Techniques – N. S. Kambo, Affiliated East – West Press
3.. Non-Linear and Dynamic Programming – G. Hadley, Addison – Wesley
4. Non-Linear Programming – O. L. Mangasarian, McGraw Hill

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

*Records of test is maintained by college and internal marks obtained by students are submitted to University before semester examination start.

SEM VIII **DSE 2** Differential & Integral Equations OR Theory of Relativity (Paper + Internal = 4 Credit)

Theory and Tutorial: 4 Classes/Week/Hour (Total 60 Hours per Semester) of each Paper of 4 Credit

One Paper of 100 Marks (External-70 Marks + Internal – 30 Marks)

Differential & Integral Equations **(DSE 2)** **Max. Marks: 70**

UNIT-I: Existence and Uniqueness of solution dy/dx=f(x,y), Sturm-Liouville boundary value problem, Green's Function, Cauchy Problem and characteristics.

UNIT-II: Canonical form, reduction of second order partial differential equation to canonical form and their solution, classification of second order partial differential equations, separation of variable of heat equation, wave equation and Laplace equation

UNIT-III: Definition and Classification, conversion of initial and boundary value problems to an integral equation, Linear integral equation, Linear integral equation of the first kind, Abel's Problem, Linear integral equation of second kind, relation between linear differential equation and Volterra's Integral equation, Non-linear equation, singular equation, type of solutions, Solution of Fredholm and Volterra Integral equation of second kind by method of successive substitution and successive approximation, resolvent kernel, Volterra's solution of Fredholm's equation, discontinuous solution

References:

(1) Advance Differential Equation Hari Kishan Atlantic
(2) Integral Equation Lovitte WV Dover

OR

Theory of Relativity **(DSE 2)** **Max. Marks: 70**

UNIT-I: Special Theory of Relativity: Inertial and non-inertial frames, special and general Galilean transformations, Newtonian relativity, electromagnetism and Newtonian relativity, Michelson and Marley experiment (reasons and consequences). Lorentz transformation equations, transformation equations for spatial and temporal intervals. Lorentz contraction and time dilation, transformation equation for velocity, particle acceleration, Velocity of light is fundamental velocity, aberration (relativistic), Doppler effect (Relativistic Treatment), the principles of the conservation of mass and momentum, mass of a moving particle, transformation equations for mass, momentum force, relation between mass, energy and momentum.

UNIT-II: Minkowski space, time like, light like and space like intervals, relativity and causality, null cone, proper time, world line of a particle, energy momentum tensor of a continuous material system.General Relativity: Need of general theory of relativity, principle of equivalence. Principle of general covariance. Mach's principle of rotating disc, geodesic postulate.

UNIT-III: Newtonian approximation of equation of motion, search for field equations, Finstein's field equations reduce to Poisson's equations, gravitational field in empty space, clock paradox in general relativity, Schwarzschild exterior line clement, isotropic form of Schwarzschild exterior line clement, planetary orbits, the trajectory of a light ray in a Schwarzschild field, three crucial test, energy momentum tensor for perfect fluid, Schwarzschild interior solution, Boundary conditions. Brikhoff theorem.

References:

1. Introduction to special Relativity: Robert Resnick, Wiley Eastern
2. Relativity Thermodynamics & Cosmology: R.C. Tolman; Oxford at the clarendon press
3. Introduction to General Relativity: Adler, Bazin and Schiffer

Internal Assessment **Max Marks: 30**

Three objective test conduct by Department of Mathematics at College level after completing each Unit.

I test from I Unit containing 10 Objective questions of 10 Marks

II test from II Unit containing 10 Objective questions of 10 Marks

III test from III Unit containing 10 Objective questions of 10 Marks

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Dissertation (12)

B.Sc. Hons. Part III Semester -VIII Mathematics

Dissertation

Guidelines for Dissertation **12 Credit (70+20+10)**

Student can take up Dissertation only after completing a minimum of three year after admission in BSc Hons Mathematics Programme.

1. **Objective**

The objective of the Dissertation is to help the student to develop ability to apply Mathematical multidisciplinary concepts, tools and techniques to solve modelling and real-world problems.

2. **Type of Dissertation**

The Dissertation may be from any one of the following types:

(a) Comprehensive case study (covering mathematical problem formulation, analysis and recommendations.)

(b) Mathematical study aimed at inter-firm or industry comparison/validation of theory/survey of Optimized practices.

(c) Field study (empirical study)

3. **Proposal Formulation**

The synopsis should clearly state the objectives and research methodology of the proposed mathematical problem to be undertaken. It should have full details of concepts, tools and techniques to be used, limitations, if any.

4. Dissertation Proposal Submission and Approval

After finalising the topic and the selection of the supervisor the student should send the synopsis signed by the supervisor to the HOD, Department of Mathematics of the concerned College for approval. Proposal incomplete in any respect will be straight away rejected.

5. Communication of Approval

A written communication regarding the approval/non-approval of the Dissertation Synopsis will be sent to you within two weeks of the receipt of the proposal in the Mathematics Department. In case of non-approval, the suggestions for reformulating the synopsis will be communicated to the student. Revised Dissertation Synopsis Performa and comments of the evaluator should be resubmitted by the student for approval.

6. Dissertation Formulation

The length of the report may be about 40 to 50 double spaced typed pages not exceeding approximately 15,000 words (excluding appendices and exhibits). However, 10% variation on either side is permissible. Dissertation must adequately explain the research methodology adopted and the directions for future research. The Dissertation should also contain the following: - Copy of the approved proposal proforma and synopsis. Certificate of originality of the work by the student and counter signed by the Guide. Four typed copy of the Dissertation is to be submitted to College by student for University evaluation process.

Viva Voce and External Evaluation of Dissertation

The Viva Voce (20 Marks) and presentation (10 Marks) is compulsory for external evaluation of the Dissertation (70 Marks). The student will be asked to appear for Viva Voce. The student will be duly intimated about it by the Controller of Examinations. Viva Voce will be conducted jointly by Head, Department of Mathematics his nominee and one external examiner at the concerned College or University.