

RAJ RISHI GOVT. (AUTONOMOUS) COLLEGE, ALWAR (RAJ.)



(An Autonomous Institute Affiliated to RRBMU, Alwar)



**THREE/FOUR YEAR UNDERGRADUATE
PROGRAMME**

FACULTY OF SCIENCE

Programme : Bachelor of Science

Programme Code: UG0102 Bachelor of Science (Maths Group)

Subject/Course/Discipline-Mathematics

Medium of Instruction : Hindi / English

(Syllabus as per NEP-2020 and Choice Based Credit System)




(Academic Year 2023-24 Onwards)




Name of College	Raj Rishi Govt. (Autonomous) College Alwar (Rajasthan)
Name of Faculty	Science
Name of Programme	Three/Four Year Bachelor of Science (Maths Groups)
Name of Discipline	Mathematics


SEMESTER - WISE PAPER TITLES WITH DETAILS

Three/Four Year Bachelor of Science (Maths Groups)										
S. No.	Level	Semester	Type	Mathematics	Credits					Total
				Programme Code	Course Code	Title	L	T	P	
1.	5	I	MJR	UG0102	MAT-51T-101	Discrete Mathematics and Optimization Techniques.	6	0	0	6
2	5	II	MJR	UG0102	MAT -52T-102	Calculus	6	0	0	6

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27.9.2023





**RAJ RISHI GOVT. (AUTONOMOUS) COLLEGE,
ALWAR (Raj.)**

SYLLABUS

(Three/Four Year under Graduate Programme in Science)

I & II Semester

Examination-2023-24

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As per NEP - 2020



SYLLABUS

SCHEME OF EXAMINATION AND COURSE OF STUDY

UNDER NEP 2020

For


(SEMESTER SCHEME: I & II Semester)


FACULTY OF SCIENCE

**UG0102-Three/Four Year Bachelor of Science
(Maths Group)**

Medium of Instruction: Hindi and English

EXAMINATION 2023-2024 AND ONWARDS


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PROGRAMME PREREQUISITES
Mathematics course of XIIth std. of Central Board of Secondary Education or equivalent.
PROGRAMME OUTCOMES (PO)
The program would enable students to take on advanced courses in Mathematics with global needs and to serve as a formidable skill-force in research, academia, industry, government, and other sectors where Mathematics is reckoned as a strong devising and design tool with diverse interdisciplinary applications.

Syllabus: UG0102-Three/Four Year Bachelor of Science (Maths Group)

**I-Semester-Mathematics
(2023-2024 & onwards)**

Type	Paper code and Theory Nomenclature	Duration of Examination	Maximum Marks (CA+ EOSE)	Minimum Passing Marks (CA + EOSE)
Theory	UG0102-MAT-51T-101- Discrete Mathematics & Optimization Techniques	1 Hrs-CA 3 Hrs-EOSE	30 Marks-CA 120 Marks-EOSE	12 Marks-CA 48 Marks-EOSE

Semester	Code of the Course	Title of the Course/Paper	NHEQF Level	Credits
I	UG0102-MAT-51T- 101	Discrete Mathematics & Optimization Techniques	5	6
Level of Course	Type of the Course	Delivery Type of the Course		
Introductory	UG	Lecture, Ninety Lectures		
Prerequisites	Mathematics course of XII std. of Central Board of Secondary Education or equivalent.			
Objectives of the Course:	The objective of the course is to expose discrete structures and involved topology, an optimization of real world problems.			

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Syllabus

UG0102-MAT-51T-101-Discrete Mathematics & Optimization Techniques

Teaching: 6 Hours per Week

Duration of Examination: 3 Hours

Maximum Marks (CA + EoSE): 30 Marks-CA and 120 Marks -EoSE

Minimum Passing Marks (CA + EOSE): 12 Marks - CA and 48 Marks-EOSE

The Question Paper will be divided into two parts, Part-A and Part-B. Part-A: Part-A contains one compulsory question consisting of 8 short answer type questions, each carrying 3 marks. These 8 short answer questions are selected from all the units, with two questions from each unit. The Part-A of the question paper evaluates the candidate's knowledge, understanding, and application of the topics/texts covered in the syllabus.

Part-B: Part-B comprises four questions with one question from each unit, each carrying 24 marks. Each question in Part-B has four subparts. The candidate must attempt all four units by selecting any two subparts from each question. Each subpart within a question carries equal marks.

Note: The question Paper will be set in both Hindi and English.

Unit-I

Relations on a set, Equivalence class, partial order relations, Chains and Anti-chains. Lattices, Distributive and Complemented Lattices, Boolean algebra, conjunctive normal form, disjunctive normal form, Pigeon hole principle. Principle of inclusion and exclusion, Propositional calculus, Basic logical operations, Truth tables, Tautologies and contradictions

Unit -II

Discrete numeric functions, Generating functions, Recurrence relations, linear recurrence relation with constant coefficients and their solutions, Total solutions, Solution by the method of generating functions. Basic concepts of graph theory, Types of graphs, Planar graphs, Walks, Paths & Circuits, Shortest path problem.

Unit -III

Planar graphs, Operations on graphs (union, join, products). Matrix representation of graphs, Adjacency matrices, Incidence matrices. Hamiltonian and Eulerian graphs. Tree, Spanning tree, Minimum spanning tree, Distance between vertices, Center of tree, Binary tree, Rooted tree.

Unit-IV

Linear programming problems. Basic solution. Some basic properties and theorems on convex sets. Simplex algorithm, Two-phase method. Duality. Solution of dual problems. Transportation problems. Assignment problems.

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Suggested Books and References -

1. V.K.Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India.
3. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
4. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-Graw Hills, New Delhi, 2003.
5. G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.
6. Hamdy A. Taha, Operations Research, An Introduction (9th edition), Prentice-Hall, 2010.

Course Learning Outcomes:

The course would enable the student

1. To understand the ideas in discrete structures viz. Partially ordered sets, Lattices, Graphs etc. and allied conceptual intricacies with applications.
2. To understand mathematical formulation of optimization problems and allied theoretical concepts for solution methodologies.

Syllabus: UG0102-Three/Four Year Bachelor of Science (Maths Group)

II-Semester-Mathematics (2023-2024 & onwards)

Type	Paper code and Theory Nomenclature	Duration of Examination	Maximum Marks (CA+ EOSE)	Minimum Passing Marks (CA + EOSE)
Theory	UG0102-MAT-52T-102-Calculus	1 Hrs-CA 3 Hrs-EOSE	30 Marks-CA 120 Marks-EOSE	12 Marks-CA 48 Marks-EOSE

Semester	Code of the Course	Title of the Course/Paper	NHEQF Level	Credits
II	UG0102-MAT-52T- 102	CALCULUS	5	6
Level of Course	Type of the Course	Delivery Type of the Course		
Introductory	UG	Lecture, Ninety lectures		
Prerequisites	Mathematics course of XII std. of Central Board of Secondary Education or equivalent.			
Objectives of the Course:	The objective of the course is to provide students with a comprehensive understanding of the fundamental concepts of calculus as a tool for dynamic systems.			

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Syllabus

UG0102-MAT-52T-102-Calculus

Teaching: 6 Hours per Week

Duration of Examination: 3 Hours

Maximum Marks (CA + EoSE): 30 Marks - CA and 120 Marks - EoSE

Minimum Passing Marks (CA + EOSE): 12 Marks - CA and 48 Marks - EOSE

The Question Paper will be divided into two parts, Part-A and Part-B. Part-A: Part-A contains one compulsory question consisting of 8 short answer type questions, each carrying 3 marks. These 8 short answer questions are selected from all the units, with two questions from each unit. The Part-A of the question paper evaluates the candidate's knowledge, understanding, and application of the topics/texts covered in the syllabus.

Part-B: Part-B comprises four questions with one question from each unit, each carrying 24 marks. Each question in Part-B has four subparts. The candidate must attempt all four units by selecting any two subparts from each question. Each subpart within a question carries equal marks.

Note: The question Paper will be set in both Hindi and English.

Unit I

Taylor's theorem, Maclaurin's theorem, Power series expansion of a function, Power series expansion of $\sin x$, $\cos x$, e^x , $\log_e(1+x)$, $(1+x)^n$, Derivative of the length of an arc. Pedal equations Curvature: Various formulae, Centre of curvature and chord of curvature. Partial differentiation, Euler's theorem for homogeneous functions, Chain rule of partial differentiation, Total differentiation, Differentiation of implicit functions,

Unit II

Envelopes: One parameter family of curves when two parameters are connected by a relation. Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers, Asymptotes: Definition, Parallel to coordinate axes, General rational algebraic curves, inspection method, Intersection of a curve and its asymptotes. Multiple points, Curve tracing of standard curves (Cartesian and Polar curves).

Unit III

Beta and Gamma functions, Reduction formulae (simple standard formulae), Double integrals in Cartesian and Polar Coordinates, Change of order of integration, Triple integrals. Dirichlet's integral. Rectification, Area, Volume and Surface of solids of revolution

Unit IV

Scalar and Vector point functions. Differentiation of vector point functions Directional derivative. Differential operators, Gradient, Divergence and Curl, Integration of vector point functions. Line, Surface and Volume integral, Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Handwritten signatures and dates in blue ink at the bottom of the page, including the date 127.9.2023 and the name Sita Meena.

Suggested Books and References -

1. Shanti Narayan and P.K. Mittal, Integral Calculus, S. Chand & Co., N. D., 2013.
2. H.S. Dhama, Differential Calculus, Age Int. Ltd., New Delhi, 2012.
3. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
4. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
5. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Understand the concept of curvature and pedal equations.
2. Understand the concept of maxima-minima, double triple integration and its applications.
3. Understand the concept of vector calculus viz. operators, vector integration.

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