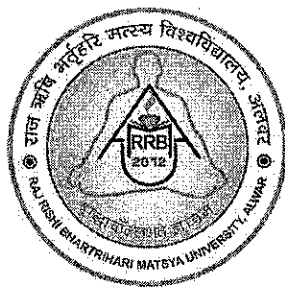# RRBMU ALWAR

SYLLABUS

(Three/Four Year under Graduate Programme in Science)

I & II Semester

Examination-2023-24

As per NEP - 2020

SYLLABUS

SCHEME OF EXAMINATION AND COURSE OF STUDY

UNDER NEP 2020

For

(SEMESTER SCHEME: I & II Semester)

FACULTY OF SCIENCE

UG0803-Three/Four Year Bachelor of Science

(Maths Group)

Medium of Instruction: Hindi and English

EXAMINATION 2023-2024 AND ONWARDS

As per NEP - 2020

Name of University	RRBMU, Alwar
Name of Faculty	Science
Name of Programme	UG0803-Three/Four Year Bachelor of Science (Maths Group)
Name of Discipline	Mathematics

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.

Scheme of Examination-

1 credit = 25 marks for examination/evaluation

Continuous assessment, in which sessional work and the terminal examination will contribute to the final grade, Each course in Semester Grade Point Average (SGPA) has two components- Continuous Assessment (CA) (20% weightage) and End of Semester Examination (EOSE) (80% weightage).

1. Continuous Assessment will consist of class tests, mid-semester examination(s), homework assignments, etc., as determined by the faculty in charge of the courses of study.
2. Each Paper of EOSE shall carry 80% of the total marks of the course/subject. The EOSE will be of 3 hours duration. Each question will carry equal marks and have two parts as -
    ➢ Part-A of the question paper shall consist first question with 08 short answer type questions of 3 marks each, two from each of the units. The first question shall be based on knowledge, understanding and applications of the topics/texts covered in the syllabus.
    ➢ The Part-B of the question paper shall consist four questions of 24 marks each, one from each unit. Each Question will have four parts. A Candidate is required to attempt all four units by taking any two parts from each question.
3. 75% Attendance is mandatory for appearing in EOSE.
4. To appear in the EOSE examination of a course/subject student must appear in the Continuous Assessment (CA) and obtain at least a "C" grade in the course/subject.
5. Credit points in a Course/Subject will be assigned only if, the student obtains at least a C grade in CA and EOSE examination of a Course/Subject

Contact Hours –

15 Weeks per Semester

L- Lecture	(1 Credit = 1 Hour/Week)
T-Tutorial	(1 Credit = 1 Hour/Week)
S - Seminar	(1 Credit = 2 Hours/Week)
P - Practical/Practicum	(1 Credit = 2 Hours/Week)
F.- Field Practice/Projects	(1 Credit = 2 Hours/Week)
SA - Studio Activities	(1 Credit = 2 Hours/Week)
1 – Internship	(1 Credit = 2 Hours/Week)
C-Community Engagement and Service	(1 Credit = 2 Hours/Week)

Exit and Entrance Policy

1. Students who opt to exit after completion of the first year and have secured 48 credits will be awarded a UG Certificate if, in addition, they complete one internship of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

2. Students who opt to exit after completion of the second year and have secured 96 credits will be awarded the UG diploma if, in addition, they complete one internship of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.

3. Students who wish to undergo a 3-year UG programme will be awarded UG Degree in the Major discipline after successful completion of three years, securing 150 credits and satisfying the minimum credit requirement.

4. A four-year UG Honours degree in the major discipline will be awarded to those who complete a four-year degree programme with 200 credits and have satisfied the minimum credit requirements.

5. Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation under the guidance of a faculty member of the University/College. The research project/dissertation will be in the major discipline. The students who secure 200 credits, including 12 credits from a research project/dissertation, are awarded UG Degree (Honours with Research).

Letter Grades and Grade Points

Letter Grade	Grade Point	Marks Range (%)
O (outstanding)	10	91 - 100
A+ (Excellent)	9	81 - 90
A (Very good)	8	71 - 80
B+ (Good)	7	61 - 70
B (Above average)	6	51 - 60
C (Average)	5	40 - 50
P (Pass)	4	
F (Fail)	0	
Ab (Absent)	0	

When students take audit courses, they may be given a pass (P) or fail (F) grade without any credits.

Name of University	RRBMU, Alwar
Name of Faculty	Science
Name of Programme	UG0803-Three/Four Year Bachelor of Science (Maths Group)
Name of Discipline	Mathematics

Syllabus: UG0803-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	UG0803-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	UG0803-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.			

Syllabus

UG0803-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.

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: UG0803-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	UG0803-MAT-52T-103-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	UG0803-MAT-52T- 103	CALCULUS	5	6
Level of Course	Type of the Course	Delivery Type of the Course		
Introductory	UG	Lecture, Ninety lectures		
Prerequisites	Mathematics course of XIIth 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.			

Syllabus

UG0803-MAT-52T-103-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.
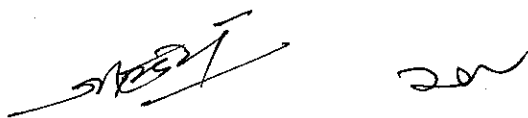
Suggested Books and References -

1. Shanti Narayan and P.K. Mittal, Integral Calculus, S. Chand & Co., N. D., 2013.
2. H. S. Dhami, 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.