Maharaja Surajmal Brij University

Bharatpur (Rajasthan)

Syllabus

Multidisciplinary Courses

Subject: Mathematics

Semester-III, IV & V

Academic Session (2024-25)

अरूण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Three/Four Years Bachler of Arts/Science								
				Mathematics	Credits			
S. No	Level	Semester	Type	Title	L	T	P	Total
1.	5	III	MDC	ELEMENTSOFMATHEMATICS MDC-MAT-20T-1001		4	0	4
2.	6	IV	MDC	PRELIMINARYMATHEMATICS MDC-MAT-20T-2001		4	0	4
3.	7	V	MDC	INTRODUCTIONOFCALCULUS MDC-MAT-20T-3001		4	0	4

Syllabus

Regular Students–

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA+EoSE)	Minimum Passing Marks (CA+ EoSE)
Theory	MDC-MAT-20T-1001	1Hrs-CA 3Hrs-EoSE	20Marks-CA 80Marks-EoSE	8Marks-CA 32Marks-EoSE
	ELEMENTS OF MATHEMATICS			

Non-Collegiate Students–

Type	Paper code and Nomenclature	Duration of Examination (EoSE)	Maximum Marks (EoSE)	Minimum Passing Marks (EoSE)
Theory	MDC-MAT-20T-1001 ELEMENTS OF MATHEMATICS	3 Hrs	100Marks	40Marks

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Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
III	MDC-MAT-20T-1001	ELEMENTSOFMATHEMATICS				5	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	UG	4	0	4	Yes	Lecture, Sixty lectures	
List of Programme Codes in which Offered as Minor Discipline							
Prerequisites		Mathematics courses of X Std. of Central Board of Secondary Education or equivalent.					
Objectives of the Course:		The objective of the course is to mastering the fundamental concepts in each topic area, with an emphasis on understanding, application, and problem-solving.					

Detailed Syllabus

MDC-MAT-20T-1001

ELEMENTS OFMATHEMATICS

UNIT-I

Sets: Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers especially intervals (with notations). Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement.

UNIT-II

Relations & Functions: Cartesian product of sets. Number of elements in the Cartesianproduct of two finite sets. Cartesian product of the set of reals with itself. Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function,domain, co-domain and range ofa function.Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

UNIT-III

Complex Numbers: Definition,real andimaginary parts, complexconjugate, representation of a complex number in a plane, modulus and argument of a complex number, algebra of complex numbers, cube root of unity.

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UNIT-IV

Permutation and Combination: Fundamental principle of counting, factorial notation, permutation mean of $P(n,r)$, and combination mean of $C(n,r)$.Applications of permutation and combination.

Suggested Books and References–

1. Higher Algebra, Hall & Knight, Arihant Publications India Limited, 2019.
2. An Introduction to the Theory of Numbers, Ivan Niven, Herbert S. Zuckerman, Hugh L. Montgomery, 2008.
3. Complex Variables and Applications, James Brown and Ruel Churchill, Mc Graw Hill, 2021
4. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M. Ross, Elsevier Science Publishing Co Inc, 2014
5. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2012.

Course Learning Outcomes: The course will enable the students to:

- Understand the definition of complex numbers and distinguish between real and imaginary parts, sequences, and series.
- Apply the fundamental principle of counting, permutations, and combinations.
- Understand and apply the Binomial Theorem and properties of binomial coefficients.
- Understand and apply properties of matrices and determinants, and solve linear equation systems using a matrix's inverse.
- Understand the cartesian system and analyze parallel and perpendicular lines, intercepts of a line, and angles between two lines.

These outcomes will equip students with a comprehensive understanding of each topic and the ability to solve related mathematical problems effectively.

Syllabus

Regular Students–

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA+ EoSE)	Minimum Passing Marks (CA+EoSE)
Theory	MDC-MAT-20T-2001 PRELIMINARY MATHEMATICS	1Hrs-CA 3Hrs-EoSE	20Marks-CA 80Marks-EoSE	8Marks-CA 32Marks-EoSE

Non-Collegiate Students–

Type	Paper code and Nomenclature	Duration of Examination (EoSE)	Maximum Marks (EoSE)	Minimum Passing Marks (EoSE)
Theory	MDC-MAT-20T-2001 PRELIMINARY MATHEMATICS	3 Hrs	100Marks	40Marks

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
IV	MDC-MAT-20T-2001	PRELIMINARYMATHEMATICS			6	4
Level of Course	**Type of the Course**	**Credit Distribution**			**Offered to NC Student**	**Course Delivery Method**
		Theory	**Practical**	**Total**		
Introductory	UG	4	0	4	Yes	Lecture, Sixty lectures
List of Programme Codes in which Offered as Minor Discipline						
Prerequisites		Mathematics courses of X Std. of Central Board of Secondary Education or equivalent.				
Objectives of the Course:		The objective of the course is to gain a solid foundation in the key areas of mathematics and enables to apply these concepts to theoretical and practical problems.				

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Detailed Syllabus
MDC-MAT-20T-3001

PRELIMINARY MATHEMATICS

UNIT-I

Binomial Theorem: Statement and proof of the binomial theorem for positive integral indices. Pascal' striangle, simple applications.

Sequences and Series: Sequence and series (finite and infinite), n^{th} term, arithmetical progression (A.P.), sum of n terms of anA.P., arithmetic mean (G.M.), Geometric progression (G.P.), sum of n terms and infinite terms of a G.P., Geometric mean (G.M.), Harmonic progression (H.P.), Harmonic mean (H.M.), relation between A.M., G.M. and H.M.

UNIT-II

Two-Dimensional Co-ordinate Geometry: Cartesian coordinate system, distance, and section formula, condition for collinearity of three points in a plane, equation of a straight-line slope form, intercept form, general form, parallel and perpendicular line, intercept of a line, the angle between two lines, distance of a point from a line.

UNIT-III

Statistics and Probability: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data. Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events. Probability of an event, probability of 'not', 'and' and 'or' events.

UNIT-IV

Matrices and Determinants: Concept of a matrix, Types of matrices, Transpose and adjoint of a matrix, addition, and multiplication of matrices, rank of matrix, elementary row, and column transformations, the inverse of a matrix, solutions of linear equations in two or three variables using the inverse of a matrix, Determinants of a square matrix, properties of determinates.

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Suggested Books and References–

1. Higher Algebra, Hall & Knight, Arihant Publications India Limited, 2019.
2. The elements of coordinate geometry, S. L. Loney, London: Macmillan and Co., 1896.
3. Introduction to Probability and Statistics, William Mendenhall, Robert J. Beaver, and Barbara M. Beaver: Brooks/Cole Cengage Learning, 2012
4. Matrix Algebra, Jemes E. Gentle, Springer, 2007
5. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2012.

Course Learning Outcomes: The course will enable the students to:

- Understand the basic concepts of sets, relations, functions, and induction.
- Understand mathematical logic and logical operations in various fields.
- Understand the notion of order and maps between partially ordered sets.
- Minimize a Boolean polynomial and apply Boolean algebra techniques to decode switching circuits. Learn modeling of real-world problems by graphs.

Syllabus

Regular Students–

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA+EoSE)	Minimum Passing Marks (CA+EoSE)
Theory	MDC-MAT-20T-3001 INTRODUCTION OF CALCULUS	1Hrs-CA 3Hrs-EoSE	20Marks-CA 80Marks-EoSE	8Marks-CA 32Marks-EoSE

Non-Collegiate Students–

Type	Paper code and Nomenclature	Duration of Examination (EoSE)	Maximum Marks (EoSE)	Minimum Passing Marks (EoSE)
Theory	MDC-MAT-20T-3001 INTRODUCTION OF CALCULUS	3 Hrs	100 Marks	40 Marks

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Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
V	MDC-MAT-20T-3001	INTRODUCTION OF CALCULUS				7	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	UG	4	0	4	Yes	Lecture, Sixty lectures	
List of Programme Codes in which Offered as Minor Discipline							
Prerequisites		Mathematics courses of X Std. of Central Board of Secondary Education or equivalent.					
Objectives of the Course:		The objective of the course is to gain a solid foundation in the key areas of mathematics and enables to apply these concepts to theoretical and practical problems.					

Detailed Syllabus
MDC-MAT-20T-3001

INTRODUCTION OF CALCULUS

UNIT-I

Limits and Derivatives: Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to scope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

UNIT-II

Integration: integral as the converse of differentiation, indefinite integral, integration by substitution, integration of the product of two functions, definite integrals, properties and problems, substitution in definite integrals, Basic properties of definite integrals and evaluation of definite integrals.

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UNIT-III

Differential Equations: Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree.

UNIT-IV

Vectors: Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), addition of vectors, multiplication of a vector by a scalar, scalar(dot) product of vectors, vector (cross) product of vectors.

Suggested Books and References–

1. Calculus, Thomas and Finny, Pearson Education Asia,1999
2. Advanced Engineering Mathematics, H.K. Dass, S.Chand and Company Ltd., New Delhi, 2009.
3. Differential Calculus, Shanti Narayan, S. Chand Limited, 2005.
4. Schaum's Outline of Calculus, 6th Edition, Frank Ayres, Jr., Elliott Mendelson, The McGraw-Hill Companies, 2013.
5. Calculus: A Complete Course, Robert A. Adams, Christopher Essex, Pearson Canada, 2009

Course Learning Outcomes: The course will enable the students to:

- Understand and define limits and the concept of rate of change and apply the concept of limits to various functions and scenarios.
- Understand the concept of derivatives of polynomial and trigonometric functions.
- Understand and apply rules for differentiation.
- Understand the concept of integration as the inverse process of differentiation.
- Understand the concept of vectors.

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