(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01MAMTH01	Title of the Course	Calculus
Total Credits of the Course	4	Hours per Week	4 hours

Course Objectives:	1.To teach Calculus in more depth. 2.To make practice of drawing curves in plane. 3. To teach Calculus of Functions in two and three variables.

Course Content		
Unit	Description	Weightage* (%)
1.	Successive Derivative, Higher order Derivatives, n^{th} Derivatives of standard Form, Leibnitz's Theorem and its Applications, Curvature: Definition, Length of Arc as a function. Derivative of Arc Length, Arc length, Radius of Curvature in Cartesian, Parametric and Polar equations. Intrinsic equation of a curve: Derivation of formula and examples.	25%
2.	Functions of Two variables, Neighbourhood of a Point, Partial Derivatives, Euler's Theorem on Homogeneous Functions of Two and Three Variables, Theorem on Total Differentials, Differentiation of Composite and Implicit Functions.	25%
3.	Sketching of curves in Cartesian coordinates system using symmetry, intercepts, horizontal and vertical asymptotes. Sketching of curves in parametric coordinates system using intercepts, tangents parallel to axes; horizontal, vertical and oblique asymptotes. Cycloids and its parametric equations.	25%
4	Polar coordinates in two dimensions, Relation between Cartesian and Polar coordinates, Sketching of curves in polar coordinate system using symmetry, extent and closeness of a curve. Limacons, Lemniscates, Rose curves and spirals.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the power of Leibnitz's Theorem.
2.	Students will be able to find areas and surface areas using basic Calculus.
3.	Students will be able to take us course of Calculus of multivariable functions.

Suggested References:	
Sr. No.	References
1.	Shanti Narayan, Differential Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 5, 6(6.6 Only), 9, 10, 12(12.1, 12.2, 12.3 Only)
2.	Shanti Narayan, Integral Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 4(Except 4.7, 4.8, 4.9), 8(Except 8.5)
3.	H. M. Vasavda, Analytic Geometry of Two and Three Dimensions, 1992 Chapter: 2(Only 11, 12, 13), 3, 4(1 to 5)

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01MAMTH02 (PART-1)	Title of the Course	PROBLEMS AND EXERCISES IN CALCULUS (PART-1)
Total Credits of the Course	2	Hours per Week	4 hours

Course Objectives:	1. To teach Higher Order and Partial Derivatives in more depth. 2. To teach Higher Order and Partial Derivatives of Functions in two and three variables.

Course Content		
Unit	Description	Weightage*(%)
1.	Properties of Hyperbolic Functions, Problems of Derivatives and Integration of Hyperbolic Functions and its Inverse Functions.	12.50%
2.	L' Hospital Rule, Indeterminate Forms and Problems of Indeterminate Forms.	12.50%
3.	Problems of Reduction Formulae for Integration of $sin^n x$, $cos^n x$, $sin^p x cos^q x$, $tan^n x$, $cot^n x$, $cosec^n x$.	12.50%
4.	Problems of Length of an Arc, Radius of Curvature, Intrinsic equations.	12.50%
5.	Intrinsic Equation of a curve in Cartesian and Polar Equations	12.50%
6.	Rectification of curves in Cartesian and Parametric Equations	12.50%
7.	Rectification of curves in Polar Equation	12.50%
8.	Problems of Homogeneous Functions, Euler's Result, Differentiation of Composite and Implicit Functions.	12.50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Group discussion, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage

1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the power of Leibnitz's Theorem and L'Hosptal's Rule.
2.	Students will be able to find areas and surface areas using basic Calculus.
3.	Students will be able to take us course of Calculus of multivariable functions.

Suggested References:	
Sr. No.	References
1.	Shanti Narayan, Differential Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 5, 6(6.6 Only), 9, 10, 12(12.1, 12.2, 12.3 Only)
2.	Shanti Narayan, Integral Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 4(Except 4.7, 4.8, 4.9), 8(Except 8.5)

On-line resources to be used if available as reference material
On-line Resources

(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01MAMTH02 (PART-2)	Title of the Course	PROBLEMS AND EXERCISES IN CALCULUS (PART-2)
Total Credits of the Course	2	Hours per Week	4 hours

Course Objectives:	1.To teach Geometry in more depth. 2.To make practice of drawing curves in plane.

Course Content		
Unit	Description	Weightage*(%)
1.	Curve tracing in Cartesian Equation – 1	12.50%
2.	Curve tracing in Cartesian Equation – 2	12.50%
3.	Curve tracing in Parametric Equations	12.50%
4.	Parametric equations of Cycloids	12.50%
5.	Curve tracing in Polar Coordinates	12.50%
6.	Tracing of Limacons	12.50%
7.	Tracing of Rose curves	12.50%
8.	Tracing of Lemniscates and Spirals	12.50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Group discussion, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the importance of curve sketching.
2.	Students will be able to draw various curves using its properties.

Suggested References:	
Sr. No.	References
1.	H. M. Vasavda, Analytic Geometry of Two and Three Dimensions, 1992 Chapter: 2(Only 11, 12, 13), 3, 4(1 to 5)

On-line resources to be used if available as reference material
On-line Resources

(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01MIMTH01	Title of the Course	Analytic Geometry
Total Credits of the Course	2	Hours per Week	2 hours

Course Objectives:	1.To teach Geometry in more depth. 2.To make practice of drawing curves in plane.

Course Content		
Unit	Description	Weightage* (%)
1.	Sketching of curves in Cartesian coordinates system using symmetry, intercepts, horizontal and vertical asymptotes. Sketching of curves in parametric coordinates system using intercepts, tangents parallel to axes; horizontal, vertical and oblique asymptotes. Cycloids and its parametric equations.	50%
2.	Polar coordinates in two dimensions, Relation between Cartesian and Polar coordinates, Sketching of curves in polar coordinate system using symmetry, extent and closeness of a curve. Limacons, Lemniscates, Rose curves and Spirals.	50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the importance of curve sketching.
2.	Students will be able to draw various curves using its properties.

Suggested References:	
Sr. No.	References
1.	H. M. Vasavda, Analytic Geometry of Two and Three Dimensions, 1992 Chapter: 2(Only 11, 12, 13), 3, 4(1 to 5)

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01MIMTH02	Title of the Course	PROBLEMS AND EXERCISES IN ANALYTIC GEOMETRY
Total Credits of the Course	2	Hours per Week	4 hours

Course Objectives:	1.To teach Geometry in more depth. 2.To make practice of drawing curves in plane.

Course Content		
Unit	Description	Weightage*(%)
1.	Curve tracing in Cartesian Equation – 1	12.50%
2.	Curve tracing in Cartesian Equation – 2	12.50%
3.	Curve tracing in Parametric Equations	12.50%
4.	Parametric equations of Cycloids	12.50%
5.	Curve tracing in Polar Coordinates	12.50%
6.	Tracing of Limacons	12.50%
7.	Tracing of Rose curves	12.50%
8.	Tracing of Lemniscates and Spirals	12.50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Group discussion, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the importance of curve sketching.
2.	Students will be able to draw various curves using its properties.

Suggested References:	
Sr. No.	References
1.	H. M. Vasavda, Analytic Geometry of Two and Three Dimensions, 1992 Chapter: 2(Only 11, 12, 13), 3, 4(1 to 5)

On-line resources to be used if available as reference material
On-line Resources

(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01IDMTH01	Title of the Course	Higher Order and Partial Derivatives
Total Credits of the Course	2	Hours per Week	2 hours

Course Objectives:	1.To teach Higher Order and Partial Derivatives in more depth. 2. To teach Higher Order and Partial Derivatives of Functions in two and three variables.

Course Content		
Unit	Description	Weightage* (%)
1.	Successive Derivative, Higher order Derivatives, n^{th} Derivatives of standard Form, Leibnitz's Theorem and its Applications, Curvature: Definition, Length of Arc as a function. Derivative of Arc Length, Arc length, Radius of Curvature in Cartesian, Parametric and Polar equations. Intrinsic equation of a curve: Derivation of formula and examples.	50%
2.	Functions of Two variables, Neighbourhood of a Point, Partial Derivatives, Euler's Theorem on Homogeneous Functions of Two and Three Variables, Theorem on Total Differentials, Differentiation of Composite and Implicit Functions.	50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the power of Leibnitz's Theorem.
2.	Students will be able to find areas and surface areas using basic Calculus.
3.	Students will be able to take us course of Calculus of multivariable functions.

Suggested References:	
Sr. No.	References
1.	Shanti Narayan, Differential Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 5, 6(6.6 Only), 9, 10, 12(12.1, 12.2, 12.3 Only)
2.	Shanti Narayan, Integral Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 4(Except 4.7, 4.8, 4.9), 8(Except 8.5)

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (I)

Course Code	US01IDMTH02	Title of the Course	PROBLEMS AND EXERCISES IN HIGHER ORDER AND PARTIAL DERIVATIVES
Total Credits of the Course	2	Hours per Week	4 hours

Course Objectives:	1. To teach Higher Order and Partial Derivatives in more depth. 2. To teach Higher Order and Partial Derivatives of Functions in two and three variables.

Course Content		
Unit	Description	Weightage*(%)
1.	Properties of Hyperbolic Functions, Problems of Derivatives and Integration of Hyperbolic Functions and its Inverse Functions.	12.50%
2.	L' Hospital Rule, Indeterminate Forms and Problems of Indeterminate Forms.	12.50%
3.	Problems of Reduction Formulae for Integration of $sin^n x$, $cos^n x$, $sin^p x cos^q x$, $tan^n x$, $cot^n x$, $cosec^n x$.	12.50%
4.	Problems of Length of an Arc, Radius of Curvature, Intrinsic equations.	12.50%
5.	Intrinsic Equation of a curve in Cartesian and Polar Equations	12.50%
6.	Rectification of curves in Cartesian and Parametric Equations	12.50%
7.	Rectification of curves in Polar Equation	12.50%
8.	Problems of Homogeneous Functions, Euler's Result, Differentiation of Composite and Implicit Functions.	12.50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Group discussion, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage

1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will realize the power of Leibnitz's Theorem and L'Hosptal's Rule.
2.	Students will be able to find areas and surface areas using basic Calculus.
3.	Students will be able to take us course of Calculus of multivariable functions.

Suggested References:	
Sr. No.	References
1.	Shanti Narayan, Differential Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 5, 6(6.6 Only), 9, 10, 12(12.1, 12.2, 12.3 Only)
2.	Shanti Narayan, Integral Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 4(Except 4.7, 4.8, 4.9), 8(Except 8.5)

On-line resources to be used if available as reference material
On-line Resources

(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (1)

Course Code	US01SEMTH01	Title of the Course	Number Theory-1
Total Credits of the Course	2	Hours per Week	2 hours

Course Objectives:	1. To teach students Introductory Number Theory. 2. To teach students types of fundamental operations and functions in Number Theory. 3. To teach students various properties of Prime Numbers.

Course Content		
Unit	Description	Weightage* (%)
1.	Divisibility: definition and properties, Common divisors, Greatest common divisor(G.C.D.): definition and examples, Properties of G.C.D. Fundamental theorem of divisibility, Square number,	50%
2.	Least common multiple(L.C.M.): definition and examples, Properties of L.C.M, Relation between G.C.D. and L.C.M., Prime numbers, Fundamental property of prime number, Factorization in prime numbers , Unique factorization theorem.	50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand basic concepts of Number Theory.
2.	use various operations and functions in Number Theory to solve problems.
3.	take up an Elementary to Intermediate course in Number Theory.

Suggested References:	
Sr. No.	References
1.	D. Burton, elementary Number Theory, 6th Ed, Tata Mc Graw-Hill Edition, Indian reprint.
2.	I. Niven And H. Zuckermar, An Introduction to the theory of Numbers, Wiley- Eastern Publication.
3.	S. Barnardand J. N. Child, Higher Algebra, Mc Millan and Co. Ltd.
4.	Neville Robinns, Beginning Number Theory, 2nd Ed., Narosa Publishing House Pvt. Ltd. Delhi, 2007.

On-line resources to be used if available as reference material
On-line Resources: NPTEL/Swayam

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (1)

NOTE: Students who have passed 12th science with Biology group can only opt this course.

Course Code	US01SEMTH02	Title of the Course	Basic Calculus
Total Credits of the Course	2	Hours per Week	2 hours

Course Objectives:	1. To teach students Introductory Calculus. 2. To teach students Sets, Relations and Functions, Trigonometric functions. 3. To teach students limits, continuity, differentiability.

Course Content		
Unit	Description	Weightage* (%)
1.	Sets and their Representations, Empty set, Finite and Infinite Sets, Equal Sets, Subsets, Universal Set, Venn Diagrams, Operations on Sets, Complement of a Set, Cartesian product of Sets, Relations, Functions, Trigonometric functions, Sum and Difference of two angles.	50%
2.	Limits, Limits of Trigonometric functions, Derivatives, Continuity, Differentiability, Exponential and Logarithmic functions, Logarithmic Differentiation, Derivatives of functions in parametric forms, Second order derivative.	50%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand basic concepts of Calculus.
2.	use various operations and functions in Calculus to solve problems.
3.	take up an Elementary to Intermediate course in Calculus.

Suggested References:	
Sr. No.	References
1.	Mathematics Text Book for class 11, National Council of Educational Research and Training (NCERT), November 2022 Edition.
2.	Mathematics Text Book for class 12, National Council of Educational Research and Training (NCERT), October 2022 Edition.

On-line resources to be used if available as reference material
On-line Resources: NPTEL/Swayam

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