INDIRA GANDHI (P.G.) MAHILA MAHAVIDYALAYA, KAITHAL

Affiliated to Kurukshetra University, Kurukshetra

Department Of Mathematics

Lesson Plan (Session 2026-2027)

Class: B.Sc.(Physical Science) Semester: **I**
Name of the Course: Calculus Course Code :B23-MAT-101
Dates: 1August,2026 – 5 Dec.,2026

SYLLABUS

Maximum Marks: 100 Time: 3 hours
End Term Exam Marks: 70 Marks Assessment: 30 Marks

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of short type question covering the entire syllabus in addition to that eight more questions will be set, two question from each unit. Students will be required to attempt in all. In addition to the compulsory question, student will have to attempt four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
Unit: I	ε-δ definition of limit and continuity of a real valued function, Basic properties of limits, Types of discontinuities, Differentiability of functions, Application of L'Hospital rule to indeterminate forms, Successive differentiation, Leibnitztheorem, Taylor's and Maclaurin's series expansion with different forms of remainder.	12
Unit: II	Asymptotes: Horizontal, vertical and oblique asymptotes for algebraic curves, Asymptotes for polar curves, Intersection of a curve and its asymptotes, Curvature and radius of curvature of curves (cartesian, parametric, polar & intrinsic forms), Newton's method, Centre of curvature and circle of curvature.	12
Unit: III	Multiple points, Node, Cusp, Conjugate point, Tests for concavity and convexity, Points of inflexion, Tracing of curves, Reduction formulae.	12
Unit: IV	Rectification, intrinsic equation of a curve, Quadrature, Area bounded by closed curves, Volumes and surfaces of solids of revolution	12

Text Books :

1. M.L. Jain, Dr. J.S. Sikka, Dr. Satyabir Mehla, Pankaj Kalra, "Elements of Calculus", Jeevansons Publications

Course Outcomes

After completing this course, the learner will be able to:

1. Gain knowledge of the concepts and theory of limit, continuity and differentiability of functions. Attain skills of calculating the limit of functions and examining the continuity and differentiability of different types of functions, and perform successive differentiation of functions. To apply the procedural knowledge to obtain the series expansions of functions which find multidisciplinary applications.

2. Understand concepts of asymptotes and curvature, the geometrical meaning of these terms and to have procedural knowledge to solve related problems.

3. Determine singular points of a curve and classify them. Understand the concept of rectification of curves andderive the reduction formulae.

4. Have theoretical knowledge and practical skills to evaluate the area bounded by the curves, and volume and surface area of solids formed by revolution of curves.

Lesson Plan

SR. NO.	Date	Course Content
		Theory (4)
1	1August2026	Introduction
2	3August-8August	ε-δ definition of limit and continuity of a real valued function, Basic properties of limits
3	10August-14August	Types of discontinuities, Differentiability of functions
4	17 August -22 August	Application of L'Hospital rule to indeterminate forms, Successive differentiation
5	24August - 29August	Leibnitztheorem, Taylor's and Maclaurin's series expansion with different forms of remainder
6	31August – 05Sept.	Asymptotes: Horizontal, vertical and oblique asymptotes for algebraic curves
7	07Sept.-12Sept.	Asymptotes for polar curves, Intersection of a curve and its asymptotes
8	14 Sept. - 19 Sept.	Curvature and radius of curvature of curves (cartesian, parametric, polar & intrinsic forms)
9	21 Sept. - 26 Sept.	Newton's method, Centre of curvature and circle of curvature.
10	28 Sept. – 03 Oct.	Multiple points, Node
11	05 Oct. – 10 Oct.	Cusp, Conjugate point, Tests for concavity and convexity
12	12 Oct.- 17 Oct.	Points of inflexion
13	19 Oct.- 24 Oct.	Tracing of curves, Reduction formulae
14	26 Oct.- 31 Oct.	Rectification
15	10 Nov. - 14 Nov.	Intrinsic equation of a curve, Quadrature
16	16 Nov. – 21 Nov.	Area bounded by closed curves, Volumes and surfaces of solids of revolution
17	23 Nov.-28 Nov.	Revision
18	30 Nov. -05 Dec.2026	Revision

Signature of Teacher **Head of Department**

INDIRA GANDHI (P.G.) MAHILA MAHAVIDYALAYA, KAITHAL

Affiliated to Kurukshetra University, Kurukshetra

Department Of Mathematics

Lesson Plan (Session 2026-2027)

Class: B.Sc.(Physical Science) Semester :III
Name of the Course: Differential Equation-I CourseCode:B23-MAT-301
Dates: 1August 2026– 5Dec., 2026

SYLLABUS

Maximum Marks: 100 Time: 3 hours
End Term Exam Marks: 70 Marks Assessment: 30 Marks

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of short type question covering the entire syllabus in addition to that eight more questions will be set, two question from each unit. Students will be required to attempt in all. In addition to the compulsory question, student will have to attempt four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
Unit: I	Basic concepts and genesis of ordinary differential equations, Order and degree of a differential equation, Solutions of differential equations of first order and first degree, Exact differential equations, Integrating factor, First order higher degree equations solvable for x, y and p, Lagrange's equations, Clairaut's form and singular solutions. Orthogonal trajectories of one-parameter families of curves in a plane.	12
Unit: II	Solutions of linear ordinary differential equations with constant coefficients, linear non-homogeneous differential equations. Linear differential equation of second order with variable coefficients. Method of reduction of order, method of undetermined coefficients, method of variation of parameters. Cauchy-Euler equation	12
Unit: III	Solution of simultaneous differential equations, total differential equations. Genesis of Partial differential equations (PDE), Concept of linear and non-linear PDEs. Complete solution, general solution and singular solution of a PDE. Linear PDE of first order. Lagrange's method for PDEs of the form: $P(x,y,z)\,p + Q(x,y,z)\,q = R(x,y,z)$, where $p=\partial z/\partial x$ and $q=\partial z/\partial y$.	12
Unit: IV	Integral surfaces passing through a given curve. Surfaces orthogonal to a given system of surfaces. Compatible systems of first order equations. Charpit's method, Special types of first order PDEs, Jacobi's method. Second Order Partial Differential Equations with Constant Coefficients.	12

Text Books :

Recommended Books/e-resources:

1. M.L. Jain, Dr. Poonam K. Dhaonchak, Dr. Sanjay Garg, Dr. Arpana Garg, Kanika Goyal, "Elements of Differential Equations-I ", Jeevansons Publications
2. Dr. M.D. Raisinghania, "Differential equations", S. Chand Publishing house
3. Shepley L.Ross, "Differential Equations", Wiley Student Edition, Third Edition
4. Vakeel A.Khan, Ayhan Esi, Ayaz Ahmad, "Basics of Differential Equations", Narosa Publishing house
5. Dr. M.D. Raisinghania, "Advanced Differential equations", S. Chand Publishing house
6. D. Somasundaram, " Ordinary Differential Equations", Narosa Publishing house

Course Outcomes

After completing this course, the learner will be able to:

1. Gain knowledge of the basic concepts of ordinary differential equations and learn various techniques of finding exact solutions of certain solvable first order differential equations.

2. Have procedural knowledge and cognitive and technical skills of solving homogeneous and non-homogeneous second order linear ordinary differential equations with constant coefficients and with variable coefficients.

3. Gain knowledge of theory of total differential equations and basic concepts of partial differential equations. To learn methods and techniques for solving linear PDEs of first order and to acquire technical skills34(993) CLO 5 is related to the practical component. for accomplishing assigned tasks relating to formulation and solution of PDEs in broad multidisciplinary contexts.

Lesson Plan

SR. No	Date	Course Content
		Theory (4)
1	1August,2026	Introduction
2	03August-08August	Basic concepts and genesis of ordinary differential equations,
3	10August- 14 August	Order and degree of a differential equation, Solutions of differential equations of first order and first degree
4	17August -22August	Exactdifferential equations, Integrating factor, First order higher degree equations solvable for x, y and p,
5	24 August - 29 August	Lagrange's equations, Clairaut's form and singular solutions. Orthogonal trajectories of one-parameter families of curves in a plane.
6	31 August – 05Sept.	Solutions of linear ordinary differential equations with constant coefficients, linear non-homogeneousdifferential equations
7	07Sept.-12Sept.	Linear differential equation of second order with variable coefficients.
8	14 Sept. - 19 Sept.	Method of reduction of order, method of undetermined coefficients, method of variation of parameters. Cauchy-Euler equation
9	21Sept. - 26 Sept.	Solution of simultaneous differential equations, total differential equations.
10	28 Sept. - 03 Oct.	Genesis of Partial differential equations (PDE), Concept of linear and non-linear PDEs
11	05 Oct.-10 Oct.	Complete solution, general solution and singular solution of a PDE. Linear PDE of first order. Lagrange's method for PDEs of the form: $P(x,y,z)\,p + Q(x,y,z)\,q = R(x,y,z)$, where $p=\partial z/\partial x$ and $q=\partial z/\partial y$.
12	12 Oct.- 17 Oct.	Integral surfaces passing through a given curve.
13	19 Oct.- 24 Oct.	Surfaces orthogonal to a given system of surfaces
14	26 Oct.- 31 Oct.	Compatible systems of first order equations
15	10 Nov. - 14 Nov.	Charpit's method, Special types of first order PDEs, Jacobi's method
16	16 Nov. – 21 Nov.	Second Order Partial Differential Equations with Constant Coefficients
17	23 Nov. - 28 Nov.	Revision
18	30 Nov. - 05 Dec.2026	Revision

Signature of Teacher **Head of Department**

INDIRA GANDHI (P.G.) MAHILA MAHAVIDYALAYA, KAITHAL

Affiliated to Kurukshetra University, Kurukshetra

Department Of Mathematics

Lesson Plan (Session 2026-2027)

Class: B.Sc.(Physical Science) Semester: **V**

Name of the Course: Sequence and Series Course Code :B23-MAT-501

Dates: 01August,2026 – 05 Dec., 2026

SYLLABUS

Maximum Marks: 100 Time: 3 hours

End Term Exam Marks: 70 Marks Assessment: 30 Marks

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of short type question covering the entire syllabus in addition to that eight more questions will be set, two question from each unit. Students will be required to attempt in all. In addition to the compulsory question, student will have to attempt four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
Unit: I	Boundedness of the set of real numbers, Least upper bound and Greatest lower bound of a set. Archimedean, algebraic and ordered properties in $\mathbb{R}$. The real number system as a complete ordered field. Neighbourhoods, interior points, isolated points, limit points, Open sets, closed sets, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem. Open covers, compact sets and Heine-Borel theorem.	12
Unit: II	Denumerable and non-denumerable sets, Denumerability of integers, rationals and non-denumerability of real numbers. Sequences: Real sequences and their convergence, Theorems on limit of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences and subsequential limits, Limit superior and limit inferior.	12
Unit: III	Infinite series: Convergence and divergence of Infinite Series, Comparison tests of positive terms infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or pseries, D-Alembert's ratio test, Raabe's test, Logarithmic test, Cauchy's nth root test, De-Morgan and Bertrand's test, GaussTest, Cauchy's integral test, Cauchy's condensation test.	12
Unit: IV	Alternating series, Absolute and conditional convergence, Leibnitz test. Arbitrary series, Abel's and Dirichlet's test, Insertion and removal of parenthesis, Re-arrangement of terms in a series, Riemann's re-arrangement theorem and Pringsheim's theorem (statement only). Cauchy product of series (definitions and examples only).	12

Text Books :

1. M.L. Jain, Sarita Ganotra, Dr. Raj Kamal Pilania, "Elements of Sequence and Series", Jeevansons Publications

Course Outcomes

After completing this course, the learner will be able to:

1. Understand basic concepts of real number system, set theory and preliminary results on neighbourhood of a point, interior and limit points, open sets, closed sets etc.

2. Learn about denumerability of subsets of real numbers, sequences, their limits, boundedness and convergence. Determine the convergence and divergence of a sequence. Understand Cauchy sequence and Cauchy general principle of convergence of sequence.

3. Attain skills to determine convergence of a series of real numbers by applying various tests.

4. To know absolute and conditional convergence of alternating series and apply theory to check the convergence of arbitrary series.

Lesson Plan

SR. No	Date	Course Content
		Theory (4)
1	1 August,2026	Introduction
2	03August -8 August	Boundedness of the set of real numbers, Least upper bound and Greatest lower bound of a set
3	10 August - 14 August	Archimedean, algebraic and ordered properties in $\mathbb{R}$. The real number system as a complete ordered field.
4	17 August - 22August	Neighbourhoods, interior points, isolated points, limit points, Open sets, closed sets, interior of a set
5	24 August -29 August	Closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem. Open covers, compact sets and Heine-Borel theorem.
6	31 August - 05 Sept.	Denumerable and non-denumerable sets, Denumerability of integers, rationals and non-denumerability of real numbers
7	07 Sept. - 12 Sept.	Sequences: Real sequences and their convergence, Theorems on limit of sequence, Bounded and monotonic sequences, Cauchy's sequence
8	14 Sept. - 19 Sept.	Cauchy general principle of convergence, Subsequences and subsequential limits, Limit superior and limit inferior.
9	21 Sept. - 26 Sept.	Infinite series: Convergence and divergence of Infinite Series, Comparison tests of positive terms infinite series
10	28 Sept.- 03 Oct.	Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or pseries, D-Alembert's ratio test
11	05 Oct.- 10 Oct.	Raabe's test, Logarithmic test, Cauchy's nth root test, De-Morgan and Bertrand's test, GaussTest, Cauchy's integral test, Cauchy's condensation test
12	12 Oct.- 17 Oct.	Alternating series
13	19 Oct. – 24 Oct.	Absolute and conditional convergence, Leibnitz test
14	26 Oct. -31 Oct.	Arbitrary series, Abel's and Dirichlet's test
15	10 Nov. - 14 Nov.	Insertion and removal of parenthesis, Re-arrangement of terms in a series
16	16 Nov. -21 Nov.	Riemann's re-arrangement theorem and Pringsheim's theorem (statement only). Cauchy product of series (definitions and examples only).
17	23 Nov. – 28 Nov.	Revision.
18	30 Nov. – 05 Dec. ,2026	Revision

Signature of Teacher **Head of Department**