

***CENTRE OF EXCELLENCE,
GOVERNMENT COLLEGE SANJAULI, SHIMLA
DEPARTMENT OF MATHEMATICS
LESSON PLAN - ACADEMIC SESSION 2026-2027***

Subject	Differential Calculus	Course Code	DSC-MATH-111
Semester	First Semester	Credits	4

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
1	July 2026 Week 1	1-2	Section I: Limits: introduction and basic properties	Practice questions on basic limits.
2	July 2026 Week 1	3-5	Section I: Epsilon-delta definition of limit	Solve epsilon-delta based exercises.
3	July 2026 Week 2	6-7	Section I: Continuity and its basic properties	Worksheet on continuity.
4	July 2026 Week 3	8-9	Section I: Indeterminate forms	Class exercise on identifying indeterminate forms.
5	July 2026 Week 4	10-11	Section I: L'Hospital Rule and applications	Assignment on limits using L'Hospital Rule.
6	July 2026 Week 4	12	Section I: Types of discontinuities	Short class exercise.
7	August 2026 Week 1	13	Section I: Differentiability of functions	Practice problems.
8	August 2026 Week 1	14	Section I: Successive differentiation	Home assignment.
9	August 2026 Week 1	15	Section I: Leibnitz's theorem and applications	Problems based on Leibnitz's theorem.
10	August 2026 Week 2	16-17	Section II: Rolle's theorem: statement, interpretation and examples	Verify Rolle's theorem for given functions.

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
11	August 2026 Week 2	18-20	Section II: Mean Value Theorems and applications	Problem set on mean value theorems.
12	August 2026 Week 3	21-23	Section II: Taylor's theorem	Class problems.
13	August 2026 Week 4	24-25	Section II: Lagrange's form of remainder	Assignment on remainder estimation.
14	September 2026 Week 1	26	Section II: Cauchy's form of remainder	Short exercise.
15	September 2026 Week 1	27	Section II: Taylor's series	Practice expansion.
16	September 2026 Week 2	28-30	Section II: Maclaurin series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$	Assignment on standard expansions.
17	September 2026 Week 3	31-32	Section III: Concavity and convexity	Graph-based exercise.
18	September 2026 Week 3	33	Section III: Points of inflexion	Practice questions.
19	September 2026 Week 4	34-36	Section III: Singular and double points of curves	Problem set.
20	October 2026 Week 1	37-40	Section III: Curvature	Assignment on curvature.
21	October 2026 Week 2	41-43	Section III: Polar coordinates	Class exercise.
22	October 2026 Week 3	44-45	Section III: Relation between polar and Cartesian coordinates	Conversion problems.
23	October 2026	46-48	Section IV: Functions of	Practice questions.

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
	Week 4		two variables	
24	November 2026 Week 1	49-52	Section IV: Limits of functions of two variables	Problem set on two-variable limits.
25	November 2026 Week 2	53-55	Section IV: Continuity of functions of two variables	Worksheet.
26	November 2026 Week 3	56-58	Section IV: Partial differentiation	Assignment on partial derivatives.
27	November 2026 Week 4	59-60	Section IV: Euler's theorem for homogeneous functions	Problems based on Euler's theorem.

Learning Outcomes:

After completion of the planned lessons, students will be able to explain the concept of limit and apply basic limit laws.; interpret and verify simple limits using the epsilon-delta definition.; determine continuity of functions at a point and on intervals.; identify standard indeterminate forms.; evaluate suitable indeterminate limits using L'Hospital Rule.; classify different types of discontinuities.; test differentiability of functions at specified points.; compute higher-order derivatives.; apply Leibnitz's theorem to successive differentiation.; understand the hypotheses and apply Rolle's theorem.; apply mean value theorems to suitable functions.; understand and apply Taylor's theorem.; use Lagrange's form of remainder in Taylor expansion.; understand Cauchy's form of remainder.; expand suitable functions in Taylor series.; obtain and use standard Maclaurin expansions.; determine intervals of concavity and convexity.; locate points of inflexion.; identify and analyze singular and double points.; compute curvature for standard curves.; work with polar coordinates and equations.; convert between polar and Cartesian forms.; understand functions of two variables and their domains.; analyze limits of functions of two variables.; test continuity of functions of two variables.; compute first and higher partial derivatives.; apply Euler's theorem to homogeneous functions..

Subject	Elementary Algebra	Course Code	SEC-MATH-113
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Semester	First Semester	Credits	3
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Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
1	July 2026 Week 1	1-3	Section I: Polynomials in one variable	Basic polynomial exercises.
2	July 2026 Week 2	4-6	Section I: Multiplication of polynomials	Practice assignment.
3	July 2026 Week 3	7-9	Section I: Division of polynomials	Division exercises.
4	July 2026 Week 4	10-11	Section I: Remainder Theorem	Class exercise.
5	July 2026 Week 4	12	Section I: Synthetic division	Short exercise.
6	August 2026 Week 1	13-14	Section I: Horner's process	Practice problems.
7	August 2026 Week 1	15	Section I: Highest common divisor of two polynomials	Home assignment.
8	August 2026 Week 2	16-18	Section II: Algebraic equations	Practice questions.
9	August 2026 Week 3	19-20	Section II: Identity theorem	Short assignment.
10	August 2026 Week 3	21-23	Section II: Fundamental Theorem of Algebra	Concept questions.
11	August 2026 Week 4	24-25	Section II: Imaginary roots of equations with real coefficients	Problem set.
12	September 2026 Week 1	26-28	Section II: Relation between roots and coefficients	Assignment on roots and coefficients.
13	September 2026	29-30	Section II: Discovery of	Practice problems.

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
	Week 2		multiple roots	
14	September 2026 Week 3	31-34	Section III: Cardan's formulas	Problems on cubic equations.
15	September 2026 Week 4	35-36	Section III: Discussion of solution	Class exercise.
16	October 2026 Week 1	37	Section III: Irreducible case	Short exercise.
17	October 2026 Week 1	38-39	Section III: Trigonometric solution	Assignment.
18	October 2026 Week 2	40	Section III: Criterion of the nature of roots of a cubic	Practice questions.
19	October 2026 Week 2	41-42	Section III: Biquadratic equations: Descartes' method	Problem set.
20	October 2026 Week 3	43-44	Section III: Biquadratic equations: Ferrari's method	Problem set.
21	October 2026 Week 3	45	Section III: Descartes' Rule of Signs	Short assignment.

Learning Outcomes:

After completion of the planned lessons, students will be able to understand polynomial terminology and operations.; multiply polynomial expressions accurately.; perform polynomial division.; apply the Remainder Theorem.; use synthetic division efficiently.; apply Horner's process to polynomial computations.; find the HCF of two polynomials.; understand algebraic equations and their roots.; apply the identity theorem in polynomial problems.; explain the Fundamental Theorem of Algebra and its consequences.; recognize conjugate imaginary roots for real-coefficient equations.; use relations between roots and coefficients.; identify multiple roots of polynomial equations.; use Cardan's formulas for cubic equations.; analyze possible solutions of cubic equations.; understand the irreducible case of a cubic.; solve suitable cubic equations trigonometrically.; determine the nature of roots of a cubic.;

solve biquadratic equations by Descartes' method.; solve biquadratic equations by Ferrari's method.; use Descartes' Rule of Signs to discuss positive and negative roots..

Subject	Ordinary Differential Equations	Course Code	DSC-MATH-121
Semester	Second Semester	Credits	4

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
1	January 2027 Week 1	1-3	Section I: Differential equations: definition, formulation and solutions	Basic formulation exercises.
2	January 2027 Week 2	4-7	Section I: First-order and first-degree differential equations	Problem set.
3	January 2027 Week 3	8-11	Section I: Homogeneous differential equations	Assignment.
4	January 2027 Week 4	12-13	Section I: Equations reducible to homogeneous form	Practice questions.
5	February 2027 Week 1	14-15	Section I: Linear differential equations (Leibnitz's) and solutions	Class assignment.
6	February 2027 Week 2	16-19	Section II: Exact differential equations	Problem set.
7	February 2027 Week 3	20-22	Section II: Standard rules for finding integrating factors	Assignment on integrating factors.
8	February 2027 Week 4	23-25	Section II: First-order higher-degree equations solvable for x, y and p	Practice problems.

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
9	March 2027 Week 1	26-27	Section II: Clairaut's equation and its solution	Short exercise.
10	March 2027 Week 2	28-30	Section II: Linear homogeneous and non-homogeneous differential equations with constant coefficients	Assignment.
11	March 2027 Week 3	31-35	Section III: Cauchy-Euler equations	Problem set.
12	March 2027 Week 4	36-39	Section III: Legendre's form and solutions	Assignment.
13	April 2027 Week 2	40-43	Section III: Linear differential equations of second order	Practice questions.
14	April 2027 Week 3	44-45	Section III: Method of variation of parameters	Home assignment.
15	April 2027 Week 4	46-53	Section IV: Simultaneous linear differential equations with constant coefficients	Problem set and class test.
16	May 2027 Week 2	54-60	Section IV: Total differential equations and solutions	Assignment and revision exercise.

Learning Outcomes:

After completion of the planned lessons, students will be able to understand basic terminology and formulate differential equations.; solve standard first-order, first-degree equations.; identify and solve homogeneous differential equations.; transform and solve equations reducible to homogeneous form.; solve first-order linear differential equations.; test exactness and solve exact differential equations.; find integrating factors using standard rules.; solve higher-degree first-order equations in standard solvable forms.; recognize and solve Clairaut's equation.; solve linear differential equations with constant coefficients.; solve Cauchy-Euler differential equations.; solve differential equations in Legendre's form.; solve standard second-

order linear differential equations.; apply variation of parameters to second-order equations.; solve simultaneous linear differential equations with constant coefficients.; recognize and solve total differential equations..

Subject	Logic and Sets	Course Code	SEC-MATH-123
Semester	Second Semester	Credits	3

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
1	January 2027 Week 1	1-2	Section I: Definition and introduction to logic	Concept questions.
2	January 2027 Week 1	3-5	Section I: Propositions and truth tables	Truth-table worksheet.
3	January 2027 Week 2	6-7	Section I: Negation	Short exercise.
4	January 2027 Week 3	8	Section I: Conjunction and disjunction	Class exercise.
5	January 2027 Week 3	9-10	Section I: Conditional propositions	Practice questions.
6	January 2027 Week 4	11	Section I: Biconditional propositions	Short exercise.
7	January 2027 Week 4	12-14	Section I: Converse, contrapositive and inverse propositions	Assignment.
8	February 2027 Week 1	15	Section I: Precedence of logical operators	Class exercise.
9	February 2027 Week 2	16-18	Section II: Propositional equivalence	Equivalence exercises.
10	February 2027	19-21	Section II: Logical equivalences	Assignment.

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
	Week 3			
11	February 2027 Week 4	22-24	Section II: Predicates and quantifiers	Practice questions.
12	March 2027 Week 1	25-26	Section II: Sets and subsets	Set exercises.
13	March 2027 Week 1	27	Section II: Power set of a set	Short exercise.
14	March 2027 Week 2	28	Section II: Set operations	Class exercise.
15	March 2027 Week 2	29	Section II: Venn diagrams	Venn diagram worksheet.
16	March 2027 Week 2	30	Section II: Finite and infinite sets	Concept questions.
17	March 2027 Week 3	31-33	Section III: Counting principle	Problem set.
18	March 2027 Week 4	34-35	Section III: Classes of sets	Short assignment.
19	March 2027 Week 4	36-37	Section III: Set identities	Practice questions.
20	April 2027 Week 1	38-39	Section III: De Morgan's Law	Worksheet.
21	April 2027 Week 2	40	Section III: Product set	Class exercise.
22	April 2027 Week 2	41	Section III: Composition of relations	Practice question.
23	April 2027 Week 2	42	Section III: Types of relations	Short assignment.
24	April 2027 Week 3	43	Section III: Partitions	Class exercise.

Sr. No.	Month & Week	Lecture No.	Topic	Assessment / Assignment
25	April 2027 Week 3	44-45	Section III: Equivalence relations with congruence modulo relation	Assignment and revision.

Learning Outcomes:

After completion of the planned lessons, students will be able to understand the role and basic language of logic.; identify propositions and construct truth tables.; form negations of propositions.; use conjunction and disjunction correctly.; analyze conditional propositions.; interpret biconditional propositions.; distinguish converse, contrapositive and inverse statements.; apply precedence rules in compound propositions.; recognize equivalent propositions.; use standard logical equivalences.; use predicates and quantifiers correctly.; describe sets and identify subsets.; construct the power set of a finite set.; perform standard set operations.; represent set operations using Venn diagrams.; distinguish finite and infinite sets.; apply basic counting principles.; recognize different classes of sets.; verify and apply standard set identities.; apply De Morgan's laws to sets.; construct Cartesian/product sets.; compute composition of relations.; classify relations by their properties.; identify partitions of sets.; test equivalence relations and understand congruence modulo as an example..