

**Himachal Pradesh University
Summer Hill, Shimla-171005**



Syllabus and Scheme of Examination

For

**Three Year B. A./ B.Sc./ with major in Mathematics
Four Year B. A./ B. Sc. (Hons./ Hons with research) with major/ and minor in
Mathematics**

under the

National Education Policy 2020

w.e.f.

Academic Session 2025-26 onwards

HIMACHAL PRADESH UNIVERSITY
B.Sc. First Year Syllabus and Examination Scheme
First Semester

Course Code	DSC-MATH-111
Credits	4
Name of the Course	Differential Calculus
Type of the Course	Discipline Specific Course (DSC A1)
Number of hours required for this course	60 hrs.
Attendance-05 Marks Class Test-15 Marks Assignments & Presentations-10 Marks	Max. Marks:30
Semester Term End Examination	Max Marks: 70 Maximum Time: 3 hrs.
Lectures to be Delivered (One Hour Each)	60

Instructions

- Instructions for paper setter:** The question paper will consist of five parts A, B, C, D and E of 70 marks and the examiner shall set 9 questions in all. Two questions will be set from each section I, II, III and IV of the syllabus and each question will carry 14 marks. Section E will be compulsory and have 10 short answer type questions from all the sections (I, II, III, IV) of the syllabus.
- Instructions for Candidates:** Candidates are required to attempt five questions in all. Section E is compulsory in which students should attempt 7 questions in total and they are required to attempt one question from each Section A, B, C and D in the question paper.

DSC A1: Differential Calculus

Course Objectives: After thorough learning of the course, students will be able to

- Understand the basic tools of calculus.
- Attain a basic level of competency in developing their mathematical skill.
- Handle business and economic problems with derivatives.
- Differentiate any function using standard derivatives and rules of differentiation.

Course Learning Outcomes: By the end of the course, students will be able to

- Compute and analyze functions using limits, derivatives, and continuity.
- Understand the method of successive differentiation and Taylor series expansions.
- Develop the concepts of asymptotes, curvature and singular points.
- Apply the concepts of calculus for tracing and rectification of the curves.

Section I (15 hrs.)

Basic properties of Limit and Continuity (epsilon and delta definition), Indeterminate forms (L'Hospital Rule), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem and its applications.

Section II (15 hrs.)

Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series. Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$

Section III (15 hrs.)

Concavity, Convexity & Points of Inflexion, Singular and Double points of curves, Curvature, Polar Coordinates and its relation with Cartesian coordinates.

Section IV (15 hrs.)

Functions of two variables, Limit and Continuity of function of two variables, Partial differentiation, Euler's theorem for homogeneous functions.

Recommended Books:

1. H. Anton, I. Birens and S. Davis, *Calculus*, John Wiley and Sons, Inc., 2002.
2. G.B. Thomas and R.L. Finney, *Calculus*, Pearson Education, 2007.

HIMACHAL PRADESH UNIVERSITY
B.Sc. First Year Syllabus and Examination Scheme
Second Semester

Course Code	DSC-MATH-121
Credits	4
Name of the Course	Ordinary Differential Equations
Type of the Course	Discipline Specific Course (DSC A2)
Number of hours required for this course	60 hrs.
Attendance-05 Marks Class Test-15 Marks Assignments & Presentations-10 Marks	Max. Marks:30
Semester Term End Examination	Max Marks: 70 Maximum Time: 3 hrs.
Lectures to be Delivered (One Hour Each)	60

Instructions

- Instructions for paper setter:** The question paper will consist of five parts A, B, C, D and E of 70 marks and the examiner shall set 9 questions in all. Two questions will be set from each section I, II, III and IV of the syllabus and each question will carry 14 marks. Section E will be compulsory and have 10 short answer type questions from all the sections (I, II, III, IV) of the syllabus.
- Instructions for Candidates:** Candidates are required to attempt five questions in all. Section E is Compulsory in which students should attempt 7 questions in total and they are required to attempt one question from each Section A, B, C and D in the question paper.

DSC A2: Ordinary Differential Equations

Course Objectives: The main objectives of the course are

- To understand the basic concepts of differential equations and its solutions.
- To acquire the knowledge of linear differential equations (Leibnitz's and Bernoulli's equations), their solutions, exact differential equations and standard rules for finding their integrating factors.
- To gain knowledge of Clairaut's equation as well as the linear homogenous and non-homogenous differential equations with constant coefficients and their solutions.
- To acquire the knowledge of linear differential equations and their variable coefficients (Cauchy- Euler and Legendre's form).
- To understand simultaneous linear differential equations with constant coefficients and total differential equations with their solutions.

Course Learning Outcomes After the completion of course, the students will be able to

- Describe basic concepts of differential equations and its solutions.
- Solve linear differential equations (Leibnitz's and Bernoulli's equations) as well as exact differential equations and standard rule for finding their integrating factors.
- Understand and solve Clairaut's equation and its solution as well as the linear homogenous and non-homogenous differential equations with constant coefficients.
- Attain and solve various linear differential equations with variable coefficients (Cauchy- Euler and Legendre's form).
- Understand simultaneous linear differential equations with constant coefficients along with total differential equations and their solutions.

Section-I (15 hrs.)

Differential equations (Definition, formulation and solutions), Differential equations of first order and first degree, Homogeneous differential equations and equations reducible to homogeneous form and their solutions, Linear differential equation (Leibnitz's) and their solutions.

Section-II (15 hrs.)

Exact differential equations and standard rule for finding their integrating factors, Differential equations of first order and higher degree solvable for x, y, p , Clairaut's equation and its solution, Linear homogenous and non-homogenous differential equations with constant coefficients and their solutions.

Section-III (15 hrs.)

The linear differential equations and its variable coefficients (Cauchy- Euler and Legendre's form) and their solutions, Linear differential equations of second order and its solution by the method of variation of parameters.

Section-IV (15 hrs.)

Simultaneous linear differential equations with constant coefficients and their solutions, Total differential equations and its solutions.

Recommended Books:

1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley and sons. New York, 2015.