Course Outline

Program	BS Solid State Physics	**Course Code**	SSP-102	**Credit Hours**	3
Course Title	**Calculus I**				

Course Introduction
The Calculus course is a comprehensive mathematical journey that teaches students the fundamentals of functions, their behavior, and real-world problems. It covers the basics of realnumbers, functions, and inverse functions, as well as limits, continuity, derivatives, differentiation techniques, graphing, optimization, and partial derivatives. The course also covers the role of derivatives in graphing and applications, such as concavity and relative extrema. By the end of the course, students will have a solid understanding of calculus, enablingthem to navigate the complexities of functions, derivatives, and their applications in theory and practice.

Learning Outcomes
The course introduces the subject of differential calculus at undergraduate level. Its objectivesare as following. 1. Understanding the concepts of functions, limit and differentiation. 2. Study the application of differentiation. 3. Be able to solve relevant numerical problems. 4. Be able to use calculus in physics and advance courses in mathematics.

Course Content	
Week 1	Functions, Domain and Range
	Introduction to Limit, Limit at infinity
Week 2	Rigorous definition of limit, Technique for evaluation limits.
	Continuity: Definition and examples, Properties of continuous functions
Week 3	Derivative: Tangent lines and rates of change
	Derivative rules: Power, Product, Quotient, and chain rules
Week 4	Differentiability and continuity
	High order derivative and Leibniz theorem
Week 5	Increasing and decreasing functions
	Extrema, maxima and minima
Week 6	Convexity and point of inflection
	Curve sketching

Week 7	Mean value theorem
	Intermediate forms and L'Hopital's rule
Week 8	Functions of two or more variables, partial derivatives
	Local linear approximation;
Week 9	Integration as antiderivative
	Riemann sum and definite integral
Week 10	Integration by substitution
	Integration of elementary and trigonometric functions
Week 11	Integration of logarithmic and exponential functions
	Integration by parts
Week 12	Integration by partial fraction
	Improper integrals
Week 13	Average value
	Area between curves
Week 14	Volume by slicing
	Volumes by Cylindrical shells
Week 15	Length of a plane curve
	Area of surface of revolution,
Week 16	Work, Moments, Centre of gravity, and Centroids
	Using Computer algebra systems and tables of integrals

Textbooks and Reading Material

1. Calculus, H. Anton, I. Bevens, S. Davis (10th Edition), *Laurie Rosatone*(2012).
2. Calculus by Thomas (13th Edition), *Addison Wesley* (2005)
3. Calculus with Analytic Geometry, E. W. Swokowski, *PWS Publishers, Boston* (1988).
4. Calculus and Analytic Geometry (9^{th}Edition), G.B. Thomas and R.L. Finney, *Addison-Wesley Publishing Company* (1995).
5. Calculus and Analytics Geometry, C. H. Edward and E. D Penney, *Prentice Hall* (1988).

Teaching Learning Strategies

The instructor is required to make use of Mathematica/Maple/Python to teach the concepts through visualization/antimutation and symbolic/numerical calculations. The students are required to solve a large portion of related exercises/questions/problems of the main textbooks.

Assignments: Types and Number with Calendar

At least two assignments and two quizzes. A course project may also be assigned.

Assessment

Sr. No.	Elements	Weightage	Details

1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. At least fifty percent of the question paper would involve new problems related to the concepts learned in the course. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.