FACULTY OF ENGINEERING & TECHNOLOGY

First Year Bachelor of Engineering

Course Code: 102000104

Course Title: Calculus

Type of Course: Basic Science Course

Course Objectives: The course is aimed to convey to the student a sense of continuum of higher secondary calculus and its applications to develop basic understanding of engineering subjects. This course is a cohesive one which unifies differential and integral calculus with approximations and their applications.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	2	0	4	30 / 9	20 / 6	70 / 21	30 / 9	150 / 45

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Differentiation: Successive Differentiation, Leibnitz's Rule (Without Proof) Indeterminate Forms, Expansions of Functions- Taylor's, Maclaurin's Series and their applications.	5
2	Partial Differentiation and its Applications: Functions of two or more Variables, Limits and Continuity, Partial derivatives, Which variable is to be treated as Constant, Homogeneous Functions, Euler's Theorem and its corollaries (Without Proof), Total derivative, Implicit Functions, Change of Variables, Jacobians, Directional Derivatives and Gradients, Tangent Planes and Normal Lines, Taylor's Theorem for functions of two Variables, Errors and Approximations, Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.	12
3	Tracing of Curves: Tracing of Cartesian, Parametric, Polar Curves (Standard Curves Only)	5
4	Integration: Reduction Formulae (Without Proof), Beta-Gamma Functions, Error Functions, Improper Integrals of both kinds.	5
5	Multiple Integrals: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Change of Variables, Area by using Double Integration, Triple Integrals, Volume as Triple Integral.	10

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6	Infinite Sequence and Series: Infinite Sequence, Infinite Series, Geometric Series, Telescoping Series, The nth term test for a Divergent Series, The Integral Test, Comparison Tests, D Alembert's Ratio Test and Cauchy's Root Test, Alternating Series, Absolute and Conditional Convergence, Power Series and Convergence, The Radius and Interval of Convergence of a Power Series.	**10**

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
20%	40%	30%	10%	--	--	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1 Thomas' Calculus George B. Thomas, Maurice D. Weir, Joel R. Hass, Pearson Education

2 Elementary Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers

3 Engineering Mathematics Vol 1 S S Sastry, Prentice Hall of India

4 Introduction to Engineering Mathematics- Vol1 H K Dass, S Chand Publication

5 Calculus with Early Transcendental Functions James Stewart, Cengage Publication

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Extend their learning of differential calculus at plus two levels	**15**
CO-2	Get necessary knowledge of functions of several variables and its applications	**25**
CO-3	Free hand traces the curves in Cartesian, Parametric and Polar curves	**15**
CO-4	Extend their knowledge of integration of one variable to two and three variables and its applications	**25**
CO-5	Check that given an infinite series is convergent or divergent by using different methods. Also, they can be able to find radius and interval of convergence for the power series.	**20**

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List of Practicals / Tutorials:

Students should be provided assignments for the practice during the tutorial hours. It is highly required to solve the problems by them provided in the assignment.

1	Successive Differentiation, Leibnitz's Rule (Without Proof)
2	Indeterminate Forms, Expansions of Functions- Taylor's, Maclaurin's Series and their applications.
3	Limits and Continuity, Partial derivatives
4	Homogeneous Functions, Euler's Theorem and its corollaries
5	Directional Derivatives and Gradients, Tangent Planes and Normal Lines, Taylor's Theorem for functions of two Variables, Errors and Approximations
6	Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.
7	Reduction Formulae (Without Proof), Beta-Gamma Functions, Error Functions, Improper Integrals of both kinds
8	Tracing of Curves
9	Double Integrals, Change of Order of Integration
10	Double Integrals in Polar Coordinates, Change of Variables
11	Triple Integrals, Volume as Triple Integral
12	Infinite Sequence, Infinite Series, Geometric Series, Telescoping Series, The nth term test for a Divergent Series. The Integral Test, Comparison Tests, D Alembert's Ratio Test and Cauchy's Root Test
13	Alternating Series, Absolute and Conditional Convergence, Power Series and Convergence, The Radius and Interval of Convergence of a Power Series

Supplementary learning Material:

1. Lecture Note
2. NPTEL Engineering Mathematics I: https://nptel.ac.in/courses/111105121/
3. https://www.classcentral.com/course/swayam-engineering-mathematics-i-13000

Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22

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