

**Subject Code: 01MA0106**
**Subject Name: Calculus**
**B.Tech. Year – I**

**Objective:** This subject aims to provide an essential background of differential and integral calculus to students of science and engineering courses at graduate level. A good science or engineering graduate is expected to have a sound knowledge of these two areas of mathematics as Differential and integral calculus are essential tools for learning Technology, Engineering and Sciences.

**Credits Earned:** 4 Credits

**Course Outcomes:** After completion of this course, student will be able to

- Apply the concepts of derivatives in Taylor and Maclaurin's series.
- Identify first order differential equations and will be able apply them to solve real life problems.
- Understand the concepts of partial derivatives.
- Apply the partial derivatives in various directions of mathematics.
- Understand the role of multiple integral in finding volume of three dimensional objects, finding area between to two curves, finding moment of inertia etc.

**Pre-requisite of course:** NA

### Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
3	1	0	4	50	30	20	25	25	150

### Contents:

Unit	Topics	Contact Hours
1	<b>Improper Integral</b> Improper integral of the first kind, second kind and third kind, convergence and divergence of the improper integral	5
2	<b>Expansion of functions and Differentiability</b> Limit, continuity and differentiability of a function, intermediate value property, Roll's theorem, Lagrange's theorem (LMVT), Cauchy's mean value theorem, Concept of Expansion of functions, Taylor's series expansion, Maclaurin's	10

	series expansion	
3	<b>Ordinary Differential Equations</b> Reorientation, order and degree, Variable separable method, Linear differential Equations, Bernoulli's and Exact differential equations.	7
4	<b>Partial differentiation</b> Partial derivatives, Euler's theorem, Modified Euler's theorem and their Applications, Implicit functions, Chain rule, Total differentials.	10
5	<b>Applications of Partial differentiation</b> Tangent plane and normal line to a surface, Constrained optimization using Lagrange's multiplier, Jacobian.	7
6	<b>Multiple Integrals</b> Calculation of double and triple integrals, reverse the order of integration, Change into polar coordinates	8
	<b>Total Hours</b>	47

**References:**

1. M. D. Weir et al: Thomas' Calculus, 14th Ed., Pearson Education, 2008.
2. Stewart James: Calculus Early Transcendental, 7th Ed., Thomson India, 2017
3. Wylie & Barrett: Advanced Engineering Mathematics, Mc graw Hill pub.
4. Greenberg M D: Advanced Engineering Mathematics, 4th ed., Pearson.

**Suggested Theory distribution:**

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
20 %	20 %	30 %	15 %	10 %	05 %

**Laboratory work:**

Tutorial work will be based on Improper Integration, Expansion of functions, Linear equations and non-linear equations, Euler's theorems with 14 tutorials to be incorporated that will be considered for evaluation.

**Instructional Method:**

- a) The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b) The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c) Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

- d) Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

**Supplementary Resources:**

- a) <http://mathworld.wolfram.com>
- b) <http://en.wikipedia.org/wiki/Math>