COURSE TITLE	**CALCULUS**
COURSE CODE	**01MA0106**
COURSE CREDITS	**4**

Objective:

1 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.

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

1 Explain the concepts and significance of partial derivatives.
2 Apply derivatives to construct Taylor and Maclaurin series.
3 Solve real-life problems using first-order differential equations.
4 Use partial derivatives in computer engineering applications.
5 Analyse and compute volume, area, and moment of inertia using multiple integrals.

Pre-requisite of course: Basics of differentiation ,integration

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Improper Integral** Improper integral of the first kind,, second kind and third kind, convergence and divergence of the improper integral	5
2	**Expansion of functions and Differentiability** 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 series expansion	10
3	**Ordinary Differential Equations** Reorientation, order and degree , Variable separable method, Linear differential Equations , Bernoulli's and Exact differential equations	7
4	**Partial differentiation** Partial derivatives, Euler's theorem, Modified Euler's theorem and their Applications , Implicit functions, Chain rule, Total differentials.	10

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Contents : Unit	Topics	Contact Hours
5	**Applications of Partial differentiation** Tangent plane and normal line to a surface , Constrained optimization using Lagrange's multiplier, Jacobian	7
6	**Multiple Integrals** Calculation of double and triple integrals, reverse the order of integration, Change into polar coordinates	8
Total Hours		**47**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorial :1** Improper Integral	1
2	**Tutorial:2** Limit ,continuity and mean value theorems	1
3	**Tutorial :3** ODE	1
4	**Tutorial :4** Partial Differentiations	1
5	**Tutorial :5** Applications of Partial differentiation	1
6	**Tutorail:6** Multiple Integrals	1
7	**Tutorial : 7** Implicit functions, Chain rule, Total differentials	1
8	**Tutorial : 8** Euler's theorem, Modified Euler's theorem and their Applications	1
9	**Tutorial : 9** Tangent plane and normal line to a surface, Jacobian	1
10	**Tutorial : 10** Lagrange's multiplier	1
11	**Tutorial : 11** Calculation of double integrals	1
12	**Tutorial : 12** Reverse the order of integration	1
13	**Tutorial : 13** Change into polar coordinates	1
14	**Tutorial : 14** Calculation of triple integrals	1
Total Hours		**14**

Textbook :

1 Advanced Engineering Mathematics, , Wylie & Barrett, Mc graw Hill pub., 2003

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References:

1 Thomas' Calculus, Thomas' Calculus, M. D. Weir et al, 14th Ed., Pearson Eduaction,, 2008

2 Calculus Early Transcendental, Calculus Early Transcendental, Stewart James, 7th Ed., Thomson India, 2017

3 Advanced Engineering Mathematics, Advanced Engineering Mathematics, Greenberg M D, 4th ed., Pearson., 2004

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	20.00	30.00	15.00	10.00	5.00

Instructional Method:

1 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.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

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

Supplementary Resources:

1 http://mathworld.wolfram.com

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