<u>Calculus-I</u>

Credits-4(3 L + 1T)

Objectives: This course is primarily concerned with developing the students understanding of the concepts of calculus and providing experience with its methods and applications to create mathematical models in order to arrive into an optimal solution.

Learning Outcomes: The students who take this course will be able to:

(i) Understand continuity and differentiability in terms of limits.

(ii) Describe asymptotic behaviour in terms of limits involving infinity.

(iii) Use derivatives to explore the behaviour of a given function, locating and classifying its extrema, and graphing the function.

<u>Unit- I</u> Definition and properties of functions, exponentials, logarithms, trigonometric functions and their inverses. Definition of limits, computing limits, squeeze theorem, continuity, infinite limits and limits at infinity.

<u>Unit-II</u> Definition and intuition for the derivative. Computing derivatives, product rule, quotient rule, chain rule. Derivatives of inverse functions, implicit differentiation (logarithmic differentiation if time / interest). Linear approximation.

<u>Unit- III</u> Max/min problems, optimization, applications of derivatives. L'Hopital's rule. Related rates. Curve sketching using limits and derivatives.

Recommended Books:

1. Anton, Howard, Bivens, Irl, & Davis, Stephen (2013). Calculus (10th ed.). Wiley India Pvt. Ltd. New Delhi. International Student Version. Indian Reprint 2016.

2. Prasad, Gorakh (2016). Differential Calculus (19th ed.). Pothishala Pvt. Ltd. Allahabad.

3. H. S. Dhami, Differential Calculus, New Age Publishers (1 January 1998)

Additional Reading:

1. Thomas Jr., George B. and R. L. Finney, Calculus and Analytic Geometry Pearson Education India (30 January 2010)

2. Tom M. Apostol Calculus: One-Variable Calculus with An Introduction to Linear Algebra, Vol 1, Wiley; Second edition (1 January 2007)

Calculus-II

Credits-4(3 L + 1T)

Objectives: The aim of this course is to introduce Integration techniques and ordinary differential equations together with its applications in several branches of science and humanities.

Learning outcomes: The course will enable the students to understand:

(i) Notion of integration, techniques and its applications.

(ii) Formation of differential equations and their applications.

Unit-I The definite integral as area under the curve. Antiderivatives and indefinite integrals, Fundamental Theorem of Calculus.

Unit-II Integration techniques: basic integration, substitution, integration by parts, using tables of integrals (partial fractions and/or trig substitution if time/interest). Applications of integration: area between curves, volumes of solids.

Unit-III Introduction to differential equations: initial value problems, slope fields, separable equations. Applications of differential equations and modelling, logistic equation. Parametric equations, arc length of parametric curves.

Recommended Books:

1. Prasad, Gorakh (2016), Integral Calculus (19th ed.). Pothishala Pvt. Ltd. Allahabad.

2. Erwin Kreyszig, Advanced Engineering Mathematics Wiley; 10th edition (August 16, 2011).

3. H. S. Dhami, Integral Calculus, New Age Publishers (1 January 2001).

Additional Reading:

1. Thomas Jr., George B. and R. L. Finney, Calculus and Analytic Geometry Pearson Education India (30 January 2010)

2. Tom M. Apostol Calculus: One-Variable Calculus with An Introduction to Linear Algebra, Vol 1, Wiley; Second edition (1 January 2007)