

Annexure-I

Real Number System, Archimedean Property, Convergence of a Sequence, Monotone Sequences, Cauchy Criterion, Bolzano-Weierstrass Theorem.

Infinite Series, Convergence Tests and Alternating series. Limit, Continuity, Existence of Maxima, Intermediate Value Property. Differentiability, Rolle's Theorem, Mean Value Theorem. L'Hospital Rule, Fixed Point Iteration Method, Taylor's Theorem, Taylor Series, Power Series.

Riemann Integration, Fundamental Theorems of Calculus, Riemann Sum. Improper Integrals, Beta-Gamma Functions, Differentiation under integration. Review of vectors, Calculus of Vector Valued Functions, Functions of Several Variables:

limit, Continuity and Differentiability, Chain Rule, Directional Derivative, Gradient.

Mixed Derivative Theorem, MVT, Extended MVT, Taylor's Theorem in Multiple Variables, Hessian, Maxima, Minima, Second Derivative Test, Lagrange Multiplier Method. Double Integrals, Change of Variable in a Double and Triple Integrals, Area of a Parametric Surface and surface integral. Surface Area, Surface Integrals, Line Integrals Green's Theorem and Applications.

Course Objective:

CO1: To understand all the basic fundamental definitions of Calculus.

CO2: To identify the convergence or divergence of a wide class of sequence/series.

CO3: To develop the fundamental ideas of the differential and integral calculus to functions of one variable.

CO4: To understand the concepts of the differential and integral calculus to functions of multivariable.

CO5: To develop the problem-solving skills related to limit, continuity, differentiation, integration etc. using some computational software packages.

Text Books:

1. Maurice D. Weir and Joel Hass, "*Thomas' Calculus*", 12th Edition, Pearson Education India, 2016.

2. K. A. Ross, "*Elementary Analysis: The Theory of Calculus*", 2nd Edition, Springer, 2013.

Reference Books:

1. S. R. Ghorpade and B. V. Limaye, "*An Introduction to Calculus and Real Analysis*", Springer India, 2006.

2. James Stewart, "*Calculus*", 7th Edition, Brooks Cole Cengage Learning, 2012.

3. Bartle and Shebert, "*Introduction to Real Analysis*", 4th Edition, Wiley, 2014.

4. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10th edition, Wiley, 2010.

Annexure-II

Evaluation policy of the course:

Quiz: 30%

Mid semester exam: 30%

End semester exam: 40%

Annexure-III

S. No.	Course Contents	No. of Hours
1	The Real Number System, Archimedean Property, Convergence of a Sequence, Monotone Sequences, Cauchy Criterion, Bolzano-Weierstrass Theorem, Limit inferior and Limit Superior	5
2	Infinite Series, Convergence Tests and Alternating series	3
3	Limit, Continuity, Existence of Maxima, Intermediate Value Property	4
4	Differentiability, Rolle's Theorem, Mean Value Theorem	2
5	Convexity, Concavity, L'Hospital Rule, Fixed Point Iteration Method, Taylor's Theorem, Taylor Series, Power Series	4
6	Riemann Integration, Fundamental Theorems of Calculus, Riemann Sum	3
7	Improper Integrals, Beta-Gamma Functions, Differentiation under integration	3
8	Area between two curves; Polar Coordinates, Volumes by slicing, Washer and Shell Methods, Length of a plane curve, Areas of Surfaces of Revolution	3
9	Review of vectors, Calculus of Vector Valued Functions, Functions of Several Variables: limit, Continuity and Differentiability, Chain Rule, Directional Derivative, Gradient	5
10	Mixed Derivative Theorem, MVT, Extended MVT, Taylor's Theorem in Multiple Variables, Hessian, Maxima, Minima, Second Derivative Test, Lagrange Multiplier Method	3
11	Double Integrals, Change of Variable in a Double and Triple Integrals, Area of a Parametric Surface and surface integral	3
12	Surface Area, Surface Integrals, Line Integrals Green's Theorem and Applications	4
	Total Lectures	42