Part A: Introduction

Program: Certificate Course	Class: B.Sc. Sem. I	Year: 2022	Session:2022-2023
1	Course Code	BMATHCT101	
2	Course Title	Calculus	
3	Course Type	Theory	
4	Course Learning Outcome (CLO)	This Course will enable the students to: - Calculate the limit and examine the continuity and understand the geometrical interpretation of differentiability. Apply various tests to determine convergence. - Understand the consequences of various mean value theorems. - Draw curves in Cartesian and polar coordinate systems. - Understand conceptual variations while advancing from one variable to severalvariables in calculus. - Inter-relationship amongst the line integral, double and triple integral formulations Beta and Gamma function.	
5	Credit Value	Theory & Tutorial: 4	
6	Total Marks	Maximum Marks : 100 (Ext. 80 + Int. 20)	Minimum Passing Marks:40

Part B: Content of the Course

Unit	Topics	No. of Hours
I	**Sequences, Continuity and Differentiability :** Notion of convergence of sequences and series of real numbers, ε-δ definition of limit and continuity of a real valued function; Sequential continuity, properties of continuous function on closed interval [a b], uniform continuity.Differentiability and its geometrical interpretation.	15
II	**Expansion of Functions:** Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometrical interpretations, Darboux's theorem. Successive differentiation and Leibnitz theorem, Maclaurin's and Taylor's theorems for expansion of a function, Taylor's theorem in finite form with Lagrange, Cauchy and Roche–Schlömilch forms of remainder.	15
III	**Curvature, Asymptotes , Curve Tracing:** Curvature; Asymptotes of general algebraic curves, Parallel asymptotes, Asymptotes parallel to axes; Symmetry, Concavity and convexity, Points of inflection, Tangents at origin, Multiple points, Position and nature of double points; Tracing of Cartesian, polar and parametric curves.	15

IV	**Functions of Several Variables, Double and Triple Integrals:** Limit, continuity of two variable and first order partial derivatives, higher order partial derivatives, Change of variables, Euler's theorem for homogeneous functions, Taylor's theorem, Total differentiation and Jacobians. Double integration over rectangular and nonrectangular regions, Double integrals in polar co-ordinates, Triple integral over a parallelepiped and solid regions, Change of order of integration in double integral.	15

Part C - Learning Resource
Text Books, Reference Books, Other Resources

1. Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.
2. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.
3. Wieslaw Krawcewicz & Bindhyachal Rai (2003). Calculus with Maple Labs. Narosa.
4. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd.
5. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education.
6. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited.
7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage.
8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd. edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd.
9. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs