Calculus (II)		
	Code & No:	MATH 126
	Credits:	3(3,0,1)
	Pre-requisite:	MATH 112
	Co-requisite:	None
	Level:	4

Course Description:

This course includes the following topics:

1) **Integration techniques:** Integration by Parts, Integration of Rational Functions using Partial Fractions, Trigonometric Techniques of Integration, Inverse functions, Improper Integrals, some integral formulae, length of curves.

2) **Infinite series:** Sequences, limit of a sequence, Convergent and Divergent Sequence , Infinite series, Convergence tests, Positive test series, the ratio test, alternating series, absolute convergence series, conditional convergence, cauchy's root test, Power series, radius of convergence, Taylor's, McLaurin's series and some standard expansions

3) **Functions of several variables and Partial Differentiation:** Functions of several variables, some basic rules of partial differentials, Partial derivatives and its applications, chain rule, Total derivative

4) **Multiple Integrals:** Double integration, change of order of integration, Double Integrals in Polar Coordinates, Application of double integration to find volume of solids. Triple Integrals in Cartesian Coordinates and Its applications, Triple Integrals in Cylindrical and Spherical Coordinates

5) **Vectors Calculus**: Introduction of vector valued functions, differentiation and integration of a vector valued functions, scalar and vector point function in Space, dot product, cross product, Directional Derivative, gradient, Geometrical interpretation of gradient, divergence and curl of a vector.

Course Aims:

1. Study various techniques of integrals and some of its applications
2. Study the nature of the sequence and series, expansion of Taylor and McLaurin's series
3. Introduce students to calculus of multivariable functions.
4. Study techniques of double and triple integration and some of its applications
5. Study vector valued functions and its applications, gradient, divergence and curl of a vector

Student Outcomes (SOs):

☒(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

☒(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

☐(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

☐(d) An ability to function effectively on teams to accomplish a common goal

☐(e) An understanding of professional, ethical, legal, security and social issues and responsibilities

☐(f) An ability to communicate effectively with a range of audiences

☐(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society

☐(h) Recognition of the need for and an ability to engage in continuing professional development

☒(i) An ability to use current techniques, skills, and tools necessary for computing practice.

☐(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. [CS]

☐(k) An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]

☐(j) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies. [IT]

☐(k) An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation, and administration of computer-based systems. [IT]

☐(l) An ability to effectively integrate IT-based solutions into the user environment. [IT]

☐(m) An understanding of best practices and standards and their application. [IT]

☐(n) An ability to assist in the creation of an effective project plan. [IT]

Course Learning Outcomes (CLOs):

Upon successful completion of the course, students should be able to:

1. Study various techniques of integration and some of its applications
2. Study to find nature of sequence and infinite series, expansion of Taylor and McLaurin's series
3. Introduce students to multivariable functions and some of its applications
4. Study techniques of multiple integrals and some of its applications
5. Study vector valued function and its applications, gradient, divergence and curl

SOs and CLOs Mapping:

CLO/SO	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CLO1	√	√							√					
CLO2	√	√							√					
CLO3	√	√							√					
CLO4	√	√							√					
CLO5	√	√							√					

No.	Topics	Weeks	Teaching hours
1	**Integration Techniques:** Integration by Parts, Integration of Rational Functions using Partial Fractions, Trigonometric Techniques of Integration, Improper Integrals, length of curves	2	6
2	**Infinite series:** Sequences, limit of a sequence, Convergent and Divergent Sequence, Infinite series, Convergence tests, Positive test series, ratio test, alternating series, absolute convergence series, conditional convergence series, Cauchy's root test, Power series, radius of convergence, Taylor's, McLaurin's series and some standard expansions and their examples	2	6
3	**Functions of several variables and Partial Differentiation:** Functions of several variables, some basic rules of partial differentials, Partial derivatives and its applications, Total derivative, Derivatives of composite and implicit functions, chain rule	3	9
4	**Multiple Integrals:** Double integration, change of order of integration, Double Integrals in Polar Coordinates, Application of double integration to find volume of solids. Triple Integrals in Cartesian Coordinates and Its applications, Triple Integrals in Cylindrical and Spherical Coordinates	3	9
5	**Vectors Calculus**: Introduction of vector valued function, differential and integration of a vector valued function, scalar and vector point function in	4	12

	Space, dot product, cross product, Directional Derivative, gradient, Geometrical interpretation of gradient, divergence and curl of a vector		
	Total	**14**	**42**

Textbook

- Calculus, Early Transcendental Functions, Robert Smith, Roland Minton, ISBN10: 0077235908 ISBN13: 9780077235901, McGraw-Hill Science, 4th Edition, Engineering, 2011

Essential references:

- Higher Engineering Mathematics, B.V. Ramana, ISBN-13: 978-0-07-063419-0 ISBN-10: 0-07-063419-X, Tata McGraw -Hill, Sixth Edition (2008)
- Calculus, Ron Larson & Edwards, Cengage Learning; 10th edition (2013).
- Schaum's Outline of Calculus, Sixth Edition, ISBN-10: 0071508619, McGraw-Hill, 2013