Semester:	3			
Course Code:	EM2010			
Course Name:	Calculus II			
Credit Value:	2 (Notional hours: 100)			
Prerequisites:	None			
Core/Optional	Core			
Hourly Breakdown	Lecture hrs.	Tutorial hrs.	Assignment hrs.	Independent Learning & Assessment hrs.
	24	6	-	70

Course Aim: To introduce, calculus of functions of several variables, vector valued functions and the use of integral theorems in any orthogonal curvilinear coordinates to solve engineering problems.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to;

- **Sketch** level curves and level surfaces of functions of two and three variables, and sketch their surfaces and solids.
- **Compute** double and triple integrals of scalar functions over any given 2D and 3D regions.
- **Compute** gradient, divergence and curl of a given function using orthogonal. curvilinear coordinates and to solve related problems using cylindrical and spherical coordinates.
- **Evaluate** line, surface and volume integrals of continuous scalar and vector fields over a given domain and apply integral theorems.

Course Content:

- **Functions of several variables:** Sketching level curves and level surfaces of functions of two and three variables, sketching surfaces and volumes, limit, and continuity of functions of two and three variables; Tangent planes, gradient vector and directional derivative, scalar line integrals.
- **Double and Triple Integration:** Definitions of double and triple integrals, double and triple integrals over rectangular domains, double and triple integrals over any general domains; cylindrical and spherical polar coordinates, Jacobian and its properties, applications of double and triple integrals(change of coordinates).
- **Vector Fields and Vector Operators:** Scalar fields and vector fields, gradient, divergence and curl and their geometrical and physical interpretations.
- **Line, Surface and Volume Integrals:** Line integrals of vector valued functions and

path independence of line integrals, simply connected domains and conservative vector fields, surface integrals of scalar fields and vector fields, area and volume elements in terms of orthogonal curvilinear coordinates; Surface integrals with orthogonal curvilinear coordinates,

- **Orthogonal curvilinear coordinates, Surface integrals and Integral Theorems:** Green's Theorem on the plane, Stokes' theorem and divergence theorem, applications of integral theorems in terms of orthogonal curvilinear coordinates.

Teaching /Learning Methods:

Classroom lectures, tutorial discussions and in-class assignments

Assessment Strategy:

Continuous Assessment 40%	Final Assessment 60%		
Details: Tutorials/Assignments/Quizzes 10% Mid Semester Examination 30%	Theory (%) 60%	Practical (%)	Other (%)

Recommended Reading:

- James Stewart, Calculus, 5th edition, (2006), Thomson Brooks/Cole.
- Watson Fulks, Advanced Calculus and Introduction to Analysis, 3rd Edition,(1978), John Wiley & SonsInc.
- E. B. Saff and A. D. Sinder, Fundamentals of Complex Analysis with Applications to Engineering, Science, and Mathematics, 3rd edition,(2014), Pearson Education Ltd.