Course Code	ADU4302					
Level	04					
Course Title	Vector Calculus					
Credit value	3					
Core/Optional	Core for Applied Mathematics as major discipline					
Prerequisites	ADU3300 (Pass/valid OCAM/CR)					
Hourly breakdown	**Theory**		**Practical hours**	**Independent Learning**	**Assessments**	**Total hrs**
	Sessionsx2 =25x2 = 50hrs	DS hrs=4x3=12 hrs	-	▪ Sessions x3 =25x3=75hrs ▪ Online /Audio-visual materials and other learning resources-11 hrs	▪ Continuous Assessments (CA) -2hrs	150hrs
Course Aim/s.	This course aims at introducing students to the basic concepts and results in Vector Calculus along with their applications and will provide the pre-requisite knowledge for those aspiring to follow the course in Fluid Mechanics offered in Level 5.					
PLOs addressed by course	**PLO1: Knowledge:** Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree. **PLO3: Communication**: Demonstrate the competency in communicating efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society. **PLO5: Creativity and Problem Solving:** Identify and analyze problems using quantitative and/or qualitative approaches using scientific methodology to provide valid conclusions. **PLO8**: **Vision for Life:** Develop the capacity to project for future through identifying self-directed goals and continuously targeting towards them for self-improvement by undertaking further studies. **PLO9: Lifelong Learning**: Develop the capacity to foresee new trends and their impacts and continuously update knowledge and develop skills willingly to meet those future challenges.					
Course Learning Outcomes (CLO)	At the completion of this course student will be able to CLO1: Find the domain, the range, contour curves and the limit of a function of two variables. (PLO 1,3,5) CLO2: Discuss the continuity, and differentiability of a function of two variables at a given point. (PLO 1,3,5) CLO3: Use partial derivatives to obtain the Taylor polynomials, directional derivatives, gradient, and equations of the tangent plane and normal line at a given point. (PLO 1,3,5) CLO4: Determine and classify the stationary points of a function of two variables with or without constrains. (PLO 1,3,5) CLO5: Evaluate surface integrals and volume integrals using Cartesian, Cylindrical polar and Spherical polar coordinates. (PLO 1,3,5) CLO6: Evaluate line integral, surface integral and volume integral of a vector field. (PLO 1,3,5) CLO7: Determine divergence and curl of a vector field. (PLO 1,3,5,8,9) CLO8: Verify Gauss' Divergence theorem, Stokes' theorem and Green's theorem for a given vector field which is defined over some given region (PLO 1,3,5,8,9)					
Content (Main topics, sub topics)	Functions of more than one variable; domain, range, limit and continuity of functions of two variables, first order partial derivatives; differentiability; contours, some applications of partial derivatives; higher-order partial derivatives and Taylor polynomials; maxima and minima;.vector calculus; scalar and vector fields; differentiating scalar fields; the scalar line integral; the curl of a vector field; multiple integrals; vector field theory; cylindrical and spherical polar coordinates; surface integrals; the divergence of a vector field; gauss' divergence theorem; stokes' theorem.					
Teaching Learning methods (TL)	Self-Learning/Independent learning of Self-study ▪ Instructional Material (IL) ▪ Online Activities (OL) ▪ Reference Work (RF) Compulsory contact sessions ▪ Assessments (AS) and Feedback – MCQs (MCQ);Structured Essay (SEQ); Essay Questions (ES); Non-compulsory contact sessions ▪ Day Schools (DS)					
Assessment strategy	Overall Continuous Assessment Mark (OCAM): 40%			Final Assessment (FA): 60%		
	Details: Continuous Assessment1 (CAT1): -1hr Continuous Assessment2 (CAT2): -1hr OCAM=60%Maximum(CAT1, CAT2) + 40%Minimum(CAT1, CAT2)			Final Evaluation -Theory: 100%-2hrs		
Recommended Readings:	• Spiegel M.R. (1959). *Theory and Problems of Vector Analysis*. Schaum Publishing. • *Stroud K.A, (2005).Vector Analysis.* Industrial Press Inc U.S.A. • Shanthi Narayan ,P.K Mittal. (2003). *Text book of Vector Calculus*. S.Chand Publishers.					