Applied Mathematics

Course Code	ADU3300
Level	03
Course Title	Vector Algebra
Credit value	3
Core/Optional	Core.
Prerequisites	Pass in G.C.E. Advanced Level Combined Mathematics/ Higher Mathematics or Equivalent

Hourly breakdown	Theory		Practical hours	Independent Learning	Assessments	Total hrs
	25×2 = 50 hours	4×3=12 Day School hours	N/A	25×3 = 75 Online Learning : 11 hours	CA = 2 hours	150 hours

Course Aim/s.	To learn the basic concepts of vectors and algebra of vectors to solve problems related to straight lines, planes, circles and other applications in geometry and to use elementary vector calculus to solve real world problems in mechanics.
PLOs addressed by course	**PLO1: Knowledge:** Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree. **PLO2: Practical Knowledge and Application.** Demonstrate the competency to use the knowledge and practical skills appropriately. **PLO4: Individual Work, Team Work and Leadership**: Demonstrate the competency in working independently and in groups in addressing issues in multi-disciplinary environments and completing the tasks on time through collaborative learning while exhibiting leadership. **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: distinguish vectors and scalars and to perform scalar multiplication, addition and subtraction of two or more vectors (PLO1). CLO2: interpret geometrically, the scalar product, the vector product and the scalar tripe product (PLO1, PLO2, and PLO5). CLO3: determine linearly independent and linearly dependent vectors (PLO1, PLO5). CLO4: determine whether given vectors are collinear or coplanar (PLO1, PLO4, PLO5). CLO5: derive the vector equation of a straight-line passes through a given point parallel to a given vector and to derive the vector equation of a straight-line passes through given two points both in parametric and Cartesian forms (PLO1, PLO2, PLO4, PLO5). CLO6: obtain the parametric and Cartesian form of the vector equation of a plane (PLO1, PLO2, and PLO5). CLO7: derive the normal form of the vector equation of a plane (PLO1, PLO2, and PLO5). CLO8: manipulate operations with vector valued functions (PLO1, PLO2, and PLO5). CLO9: find the derivative and integral of vector valued functions and apply these concepts to solve problems in theory of basic mechanics (PLO1, PLO2, PLO4, PLO5, PLO8 and PLO9). CLO10: derive the vector equation of a circle, parabola, ellipse, and hyperbola and sphere (PLO1, PLO2, and PLO5).
Content (Main topics, sub topics)	Scalars, Vectors and Addition of Vectors, Multiplication of Vectors by Scalars, Centroids, Linear Combinations of Vectors, Vectors in Two and three Dimensions in Component Form, The Straight Line, Scalar and Vector product, Geometrical Proofs Using Scalar and Vector Products, Scalar and Vector Triple Product, Parametric Form of the Vector Equation of a Plane, The Normal Form of the Vector Equation of a Plane, Proofs of Well Known Theorems in Plane Geometry, Vector Functions, Differentiation of Vector Functions, Integration of Vector Functions, The Vector Equation of a Circle, Parabola, Ellipse, Hyperbola, and Sphere, Curves in Space
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	Overall Continuous Assessment Mark (OCAM): 40%	Final Assessment (FA): 60%

strategy	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:	- Davis H.F, Snider A.D. (1995). *Introduction to Vector Analysis (7th Edition)*. McGraw-Hill Education. - Narayan S, Mital P.K. (2005). *Vector Algebra (19th Edition)*. S Chand Publishers. - Saran N, Prasad R. (1991). *Elements of Vector Calculus (2016 Edition)*. Pothishala Pvt Ltd. - Turner L.K. (1975). *Adanced Mathematics: Introduction to Vectors and Mechanics (1st Edition)*. Longman Publishers. - Pandey G.S, Sharma R.R. (1988). *Vectors and Geometry (2nd Edition)*. New Age International Publishers. - Gupta R. (2011). *Vector Calculus (4th Edition)*. Laxmi Publications.	