

Course Code	ADU3302					
Level	03					
Course Title	Differential Equations					
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
	25x2 = 50 hours	4x3=12 Day School hours	N/A	25x3 = 75 Learning using the online module: 11 hours	CA = 2 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	<p>PLO1: Knowledge: Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree.</p> <p>PLO2: Practical Knowledge and Application. Demonstrate the competency to use the knowledge and practical skills appropriately.</p> <p>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.</p> <p>PLO5: Creativity and Problem Solving: Identify and analyze problems using quantitative and/or qualitative approaches using scientific methodology to provide valid conclusions.</p> <p>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.</p> <p>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.</p>					
Course Learning Outcomes (CLO)	<p>At the completion of this course student will be able to</p> <p>CLO1: determine the order, degree of a given ODE and to categorize the equation is linear or nonlinear (PLO1).</p> <p>CLO2: solve variable separable equations and use suitable substitutions to convert differential equations to variable separable type (PLO1, PLO4 and PLO5).</p> <p>CLO3: determine the given ODE is homogeneous or not and to solve exact differential equations with or without integrating factors appropriately (PLO1, PLO2, PLO4, PLO5).</p> <p>CLO4: apply concepts of first order ODEs to formulate and solve problems in mechanics, biology, population dynamics, physics and finance and to interpret the solution according to the problem underlying (PLO1, PLO2, PLO4, PLO5, PLO8, PLO9)</p> <p>CLO5: solve second order homogeneous linear ODEs (PLO1, PLO2 and PLO4).</p> <p>CLO6: apply method of undetermined coefficients and D-operators to solve non-homogeneous linear ODEs (PLO1, PLO2 and PLO5).</p> <p>CLO7: determine regular and irregular singular points of an ODE and to obtain power series solutions in regular singular points (PLO1, PLO2 and PLO5).</p> <p>CLO8: solve first and second order linear difference equations and apply the knowledge to formulate real world problems using difference equations, solve them and interpret the solutions (PLO1, PLO2, PLO4, PLO5, PLO8, PLO9)</p>					
Content (Main topics, sub topics)	Introduction to ordinary differential equations, Variable Separable equations, Homogeneous equations, Partial Derivatives, Exact Differential equations, Integrating factors, First order linear equation & Bernoulli's equation, Two special types of second order equations, Problems in mechanics, physics, biology and population dynamics, finance and economics, Introduction to linear ordinary differential equations, Second order linear homogeneous differential equations with constant coefficients, Linear non-homogeneous differential equations, Finding Integrals-Method of undetermined coefficients, Finding Particular Integrals- D-operator method, Series solutions in ordinary points, Series solutions in Regular Singular points, Legendre Polynomials & Bessel Functions, Second order linear homogeneous difference equations with constant coefficients					
Teaching Learning methods (TL)	<p>Self-Learning/Independent learning of Self-study</p> <ul style="list-style-type: none"> ▪ Instructional Material (IL) ▪ Online Activities (OL) ▪ Reference Work (RF) <p>Compulsory contact sessions</p> <ul style="list-style-type: none"> ▪ Assessments (AS) and Feedback – MCQs (MCQ); Structured Essay (SEQ); Essay Questions (ES); 					

	Non-compulsory contact sessions <ul style="list-style-type: none"> ▪ Day Schools (DS)
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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:	<ul style="list-style-type: none"> • Martin Hermann and Masoud Saravi. (2014). <i>A First Course in Ordinary Differential Equations</i>, Springer. • Morris Tenebaum and Harry Pollard. (1985). <i>Ordinary Differential Equations: An elementary text book for students of Mathematics, Engineering, and the Sciences (1st Edition)</i>. Dover Publications, New York. • Leduc Steven A. (1995). <i>Differential Equations (1st Edition)</i>. Cliffs Notes. • Bali N.P. (2005). <i>Differential Equations</i>, Firewall Media. 	