<table>
<tr><td>Course Code</td><td colspan="6">ADU5307</td></tr>
<tr><td>Level</td><td colspan="6">05</td></tr>
<tr><td>Course Title</td><td colspan="6">Numerical Methods</td></tr>
<tr><td>Credit value</td><td colspan="6">3</td></tr>
<tr><td>Core/Optional</td><td colspan="6">Optional</td></tr>
<tr><td>Prerequisites</td><td colspan="6">ADU3302(Pass/valid OCAM/CR)</td></tr>
<tr><td rowspan="2">Hourly breakdown</td><td colspan="2">Theory</td><td>Practical hours</td><td>Independent Learning</td><td>Assessments</td><td>Total hrs</td></tr>
<tr><td>Sessionsx2 =25x2 = 50hrs</td><td>DS hrs=4x3=12 hrs</td><td>-</td><td>▪ Sessions x3 =25x3=75hrs<br>▪ Online /Audio-visual materials and other learning resources-11 hrs</td><td>▪ Continuous Assessments (CA) -2hrs</td><td>150hrs</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">1. Introduce the basic techniques for the efficient numerical solution of problems in science and engineering.<br>2. Topics spanned root finding, interpolation, differentiation, integration, solution of differential equations.</td></tr>
<tr><td>PLOs addressed by course</td><td colspan="6">PLO1: Knowledge: Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree.<br>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.<br>PLO5: Creativity and Problem Solving: Identify and analyze problems using quantitative and/or qualitative approaches using scientific methodology to provide valid conclusions.<br>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.<br>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.</td></tr>
<tr><td>Course Learning Outcomes (CLO)</td><td colspan="6">At the completion of this course student will be able to<br>CLO1: State the basic concepts of Numerical methods. (PLO1)<br>CLO2: Formulate the problem for various situations. (PLO 1,3,5,8,9)<br>CLO3: Apply method of Bisection, False position, Simple iterative, Newton-Raphson and Generalized Newton's to find roots of an equation. (PLO 1,3,5,8,9)<br>CLO4: Apply Gregory – Newton forward and backward, Gauss's forward and backward, Stirling's, Bessel's, Laplace-Everett's, Newton's general, Lagrange's, Hermite's and cubic spline formulae for interpolation. (PLO 1,3,5,8,9)<br>CLO5: Find the derivative at a given point using Hermite's, Newton's forward, backward, central difference formulae and, Lagrange's, and Newton's Divided difference formulae. (PLO 1,3,5,8,9)).<br>CLO6: Evaluate integrals using trapezoidal rule and Simpson's rule.( (PLO 1,3,5,8,9)<br>CLO7: Find the solution of first order differential equations by Taylor series, Picard's, Euler's, Modified Euler's, Runge –Kutta, Milne's Predictor-Corrector and Adam-Bashforth Predictor-Corrector method. (PLO 1,3,5,8,9)<br>CLO8: Obtain the solution of simultaneous first-order differential equations by Taylor series method and Runge – Kutta method (PLO 1,3,5,8,9).<br>CLO9: Find the solution of second order differential equations by Taylor series method and Runge –Kutta Method. (PLO 1,3,5,8,9)).</td></tr>
<tr><td>Content (Main topics, sub topics)</td><td colspan="6">Errors in computations; Bisection method for the solution of single equations; simple iterative method; Newton Raphson method; solution of polynomial equations by Honer's method; linear interpolation; Lagrange. Interpolation and errors; interpolation by Newton's formulae; difference tables & numerical differentiation; numerical integrations using Trapezoidal rule and Simpson rule; accuracy of numerical integration; numerical solution of first order ordinary differential equations using Euler and Taylor series method; second order and fourth order Runge-Kutta methods, Predictor-Corrector methods.</td></tr>
<tr><td>Teaching Learning methods (TL)</td><td colspan="6">Self-Learning/Independent learning of Self-study<br>▪ Instructional Material (IL)<br>▪ Online Activities (OL)<br>▪ Reference Work (RF)<br><br>Compulsory contact sessions<br>▪ Assessments (AS) and Feedback – MCQs (MCQ);Structured Essay (SEQ); Essay Questions (ES);<br><br>Non-compulsory contact sessions<br>▪ Day Schools (DS)</td></tr>
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| **Assessment strategy** | Overall Continuous Assessment Mark (OCAM): 40% | Final Assessment (FA):60% |
| | Details: Continuous Assessment1 (CAT1): -1hr<br>Continuous Assessment2 (CAT2): -1hr<br>OCAM=60%Maximum(CAT1, CAT2) +<br>40%Minimum(CAT1, CAT2) | Final Evaluation -Theory: 100%-2hrs |
| **Recommended Readings:** | • Burden, R (2015). *Numerical Analysis (10th Edition),* Cengage learnings.<br>• Thangaraj, P (2008). *Computer Oriented Numerical Methods (1st Edition),* PHI Learning Private Limited.<br>• Prasad, D (2011). *An Introduction to Numerical Analysis (3rd Edition)*, Narosa Publishing House, India. | |