Course Synopses:

<table>
<tr><td>Course Code</td><td colspan="3">PHU 4303</td><td>Level</td><td>4</td></tr>
<tr><td>Course Title</td><td colspan="5">Mathematical Methods for Physics</td></tr>
<tr><td>Credit value</td><td colspan="5">03</td></tr>
<tr><td>Core/Optional</td><td colspan="5">Core</td></tr>
<tr><td>Prerequisites</td><td colspan="5">None</td></tr>
<tr><td>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></td><td>24 Sessions X 2 = 48 hrs</td><td>4 DS x 3 hrs = 12 hrs</td><td>Lab /field x other hrs = 0 hrs</td><td>▪ 24 Sessions (x 3) = 72 hrs
▪ Online learning resources= 15 hrs</td><td>Continuous Assessments (1 hr) x 2 = 2 hrs</td><td>149</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">Provide knowledge and skill required to analyse a problem, convert it to a mathematical model, solve it using suitable tools and to interpret the results.</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 BSc degree.
PLO2 Practical Knowledge and Application - Acquire competency in practical skills and the necessary knowledge to appropriately use these skills.
PLO3: Communication - Communicate reliably, efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society.
PLO4: Individual Work, Team Work and Leadership - Function effectively as an individual, and as a team member, sharing work and experiences, leading and managing assigned tasks to completion on time, demonstrating leadership to address situations in diverse and multi-disciplinary environments in day to day life.
PLO5: Creativity and Problem Solving - Identify problems and argue out and analyze such problems using qualitative and/or quantitative practical approaches in scientific methodology to provide valid conclusions.
PLO6: Adaptability and Flexibility - Develop appropriate strategies to adapt to changing environments.
PLO7: Information and Communication Technology Literate: Effectively use ICT skills for numerical and statistical analysis keeping up to date with knowledge and skills.</td></tr>
<tr><td>Course Learning Outcomes (CLO)</td><td colspan="6">At the completion of this course student will be able to:
CLO 1 : Convert problems (Specially in the field of physics) to suitable mathematical models (PLO 1, PLO 2)
CLO 2 Solve the mathematical model /question using appropriate tools like ODE, Numerical methods…etc (PLO 1, PLO 2, PLO 5, PLO 6)
CLO 3 Interpret the results of the model to make conclusions. (PLO3, PLO4)
CLO 4 Communicate the conclusion in logically (PLO3,PLO7)
CLO 5 Develop analytical and logical thinking (PLO5, PLO 6)</td></tr>
<tr><td>Content (Main topics, sub topics)</td><td colspan="6">Important Properties & Facts, History of mathematics, Number Systems, Arithmetic Properties and Facts, Combinations, Permutations, Binomial Expansion, Trigonometry, Sequences, Arithmetic Sequences, Geometric Sequences, Infinite Sequences, Fibonacci Sequence, Applications, Series, Arithmetic Series, Geometric Series, Infinite Series & Convergence, Applications, Matrices, Size of a Matrix, Transpose of a Matrix, Special Matrices, Matrix Addition and Subtraction, Matrix Multiplication, Determinant of a Matrix, Applications, Eigen Values and Eigen vectors, Finding Eigen Values, Calculating 2x2 Eigen values, Calculating 3x3 Eigen values, Eigen vectors, Applications, Vectors, Vector Decomposition, Vector Addition & Subtraction, Multiply by a Scalar, Vector Multiplication, Cross Product, Applications, Differentiation, Limits, Common Derivatives, Chain Rule, Implicit Differentiation, Higher Order Derivatives, Applications of Differentiation, Gradient of a Curve, Stationary Points, Applications, Integration, Indefinite Integrals., Method of Substitution, Integration by Parts, Definite Integrals, Integrating a Piecewise Functions, Applications of Integration, Area Under a Curve, Area Between Two Curves, Average Value, Applications in Physics, Partial Differentiation, Calculating Partial Derivatives, Formal Definition, Total Derivative, Vector Calculus I, Differentiating a Vector with respect to a Scalar, Del Operator, Gradient (grad), Vector Calculus II, Divergence, Curl, Applications of vector calculus, First Order Ordinary Differential Equations, First order Ordinary Differential Equations, Separable Differential Equations, Exact Differential Equations, Second Order Ordinary Differential Equations, Characteristic Equation, Solving the ODE, Real & Distinct Roots, Repeated Roots, Complex Roots, Applications, Fourier Series, Periodic Signals, Superposition Principle, Fourier Series vs Fourier Transformation, Understanding Fourier Series Equation, Calculating Fourier Series Coefficients, Odd, Even functions & Fourier Coefficients, Fourier Series Applications, Statistics, Statistical Parameters, Standard Deviation and Variation, Covariance and Correlation, Histogram, Probability, Definitions, Properties of Probability, Mutually Exclusive Events, Independent and Dependent Events, Bayes Theorem, Numerical Methods, Finding roots, Understanding numerical methods, Bisection Method, Newton Raphson Method, Points to Consider, Numerical Integration, Trapezoidal rule, Simpsons rule, Runge Kutta method, Complex numbers, Complex Algebra, Modulus & Argument, Multiplication, Division, Applications in Physics</td></tr>
<tr><td>Teaching Learning methods (TL)</td><td colspan="6">• Self-Learning/Independent learning of Self-study
  • Instructional Material (IL)
  • Online Activities (OL)
  • Reference Work (RE)
• Non-compulsory contact sessions
  • Day Schools (DS)
• Group Learning (GL)</td></tr>
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Assessment strategy	Overall Continuous Assessment Mark (OCAM): 40%	Final Assessment: 60%
	Details: 60 % of Best CA 40 % of the second best (1 hr each)	Final Evaluation Theory: 100 (2 hrs) %
	Overall mark = 40 % OCAM +6 0 % Final Examination	
Recommended Readings:	1. K.F. Riley, M.P. Hobson And S. J. Bence, *Mathematical Methods For Physics And Engineering*. (3rd Ed.) Cambridge Press 2. George B. Arfken, *Mathematical Methods For Physicists*, (7th Ed.) , Elesevier Publication. 3. Mary L. Boas, *Mathematical Methods In The Physical Sciences*, (3rd Ed.), Wiley Publications	