Course Title	**COMPUTATIONAL PHYSICS-I**
Course Code	**APHY-353**
Credit Hours	**CH3**
Pre- requisites	**FSc / A-Level (Physics) or equivalent**
Learning outcomes	To give students an understanding of various computational and numerical techniques used in physics.
Contents	**Introduction to Computing and C++ control structures:** A brief introduction to computing languages, Overview of C++, Introduction to data types, C++ program structures: sequence, selection, and repetitions, Control statements: If, If-else, switch, Loop structures: for, while, and do-while, **Functions and Arrays in C++:** User-defined functions, Arrays and multidimensional arrays, **Laboratory Practice:** Writing programs for the above programming modules, writing code for problems relating to mathematics and physics, **Programming Techniques in Physics:** Practical applications to basic physics problems, Problems in general physics: projectile motion, freely falling objects, SHM, electricity, electric circuit analysis, oscillating systems, electrostatics, basic quantum mechanics, electronics, etc. **Numerical Methods:** Solution of linear algebraic equations, Introduction to random numbers, Sorting of numbers, Root finding and non-linear sets of equations, Statistical description of data, Partial differential equations, **Differential Equations, Numerical Integration and applications:** Euler-Newton method for solving differential equations, Simple iterative method, Newton's Raphson method, Bisection method, Secant Method, Euler's method, Runge Kutta method, Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Simple applications of random numbers, Solution of linear algebraic equations, Ordinary differential equations.
Teaching-learning Strategies	Classroom teaching / Lecturing
Assignments- Types and Number	Problem sheet: 3-4
Assessment and Examinations	Mid-Term Assessment: 35% Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc. Final Term Assessment: 40%
Text Books	1. Computational Physics (2006) [2nd Edition] - Nicholas J. Giordano, Hisao Nakanishi, Pearson prentic hall. 2. Richard Fitzpatrick, 2011, Introduction to Computational Physics, University of Texas. 3. Paul L. Devries and Javier E. Hasbun, 2010, A First Course in Computational Physics, John Willey and Sons. N.Y.. 4. How to program C++ by Robert Lafore. 5. Schaum's Outlines Programming with C++. Second Edition, John R. Hubbard. PhD. 6. Discovering Modern C++: An Intensive Course for Scientists, Engineers, and Programmers, 1st edition, Published by Addison-Wesley Professional, 2016. 7. Introduction to MATLAB 7/8 for Engineers, by William J. Palm III. Mc Graw Hill. 8. Physics, Volume (1-2) 5th Edition by David Halliday.