achoffSemester	I
Course	Multi-Disciplinary
Paper Code	M1PH230111T
Paper Title	Foundations of Empirical Sciences
No. of Credits	3
Theory / Practical / Composite	Theory (Computer aided)
Minimum No. of preparatory hours per week a student has to devote	3
Number of Modules	1
Syllabus	**<u>Foundations of Empirical Sciences</u> [36L]** Units and dimensions: Length, mass, time, charge, temperature, electric current etc. [4] Ideas about time, length and Energy scales: Order of magnitudes and the art of estimation: application to problems in quantum physics. [6] Techniques: Reading Graphs, Understanding errors in experimental results. Using the iterative method to find roots of nonlinear equations and elementary data statistics using a handheld calculator. [12] Mathematical modeling: Notion of infinitesimals and L' Hospital's rules, Approximations: Taylor series and related approximation techniques. Significant figures, Truncation error and round off error. Linear Modeling of Physical systems. *The notion of partial derivatives, symmetry of second derivatives, handling of multiple integrals, differentiating under integral sign (simple applications only).* [14]

Learning Outcomes	(1) Understand and able to apply the ideas related to scales and order of magnitudes.
	(2) Able to understand graphical representation of data and functions and extract information from them.
	(3) Pick up notions essential for the differential models with two or variables.
	(4) Use the notions to derive benefit from any disciplines of study or research which thrive on experiments and data.

Reading/Reference Lists	Reference Books:
	1. Principles of Physics. Walker, Halliday & Resnick. Tenth edition. Wiley.
	2. G.L. Squires - Statistics / William Navidi - Statistics
	3. G.B. Thomas -- Thomas' Calculus
	4. James Stewart -- Calculus
	5. Shilov -- Plotting Graphs

Evaluation	Theory: CIA: 15 (10 + 3/assgn + 2/attn.) Semester Exam:	Practical (if applicable) CA: Semester Exam:

Paper Structure for Theory Semester Exam	15 Marks from 3 marks questions (5 out of 7) 20 Marks from 10 marks questions (2 out of 3)