# Department of Physics, The Cochin College Teacher Specific Course Content

**Title of Course of Course:** Foundations of Physics  
**Type of Course:** DSC A **Course Code:** MG1DSCPHY100  
**Course Level:** 100

(Brief description about the course and context of adding teacher specific content)

In the course Foundations of Physics, students are learning Fundamentals of Physics and Mechanics. They are also introduced to Python programming. Sympy is a powerful feature of python where we can solve integrals, differential equations and other mathematical operations symbolically (analytically). These are the operations which the student is going to encounter in future. So, here we introduce this feature to the students applied to problems of Oscillations, we choose oscillations because it is the natural extension of the course containing different situations which can be dealt analytically. Further in order to give the students a visual picture, we introduce them to plotting in Python

# Course Title: Oscillations and Simulations using Sympy

### Introduction to Sympy

* Overview of symbolic computation
* Basic operations in Sympy (symbols, expressions, simplification)
* Solving basic equations with Sympy

### Simple Harmonic Motion (SHM)

* Basic concepts and derivation of SHM equations
* Solving SHM problems using Sympy

### Damped and Forced Harmonic Motion

* Introduction to damping: underdamping, overdamping, and critical damping
* Forced harmonic motion and resonance
* Solving damped and forced oscillation problems using Sympy

### Using Sympy to Solve Problems

* Setting up and solving differential equations in Sympy
* Practical examples and step-by-step problem-solving

### Plotting and Visualization with Matplotlib

* Basic plotting with Matplotlib
* Plotting solutions for SHM, damped, and forced oscillations
* Customizing plots (labels, titles, legends)

Recommended and forwarded to MGU-UGP Academic Committee For MGU-UGP

Department Committee

Course Faculty member:

Faculty Advisor:

Senior Faculty Advisor:

Chairman: