數學系課程核心教材內容

課程名稱：(中文）科學計算 (英文）Foundation of Scientific Computing				開課單位	應數碩博班
				課程代碼	2105532
學分數	3	必/選修	選修	開課年級	一

教學目標：

The course will give a basic understanding in how to use modern computing tools for solving various problems from engineering, mathematics, economics and management, and sciences. The course will provide not only topics in numerical analysis and optimization, but also sufficient skills in MATLAB programming for the students who perceive scientific computing as a useful and natural tool in subsequent courses.

課程概述：numerical algorithms, models and numerical simulation

先修科目或先備能力：Linear Algebra, Differential Equations

建議參考書目	1. Dahlquist and. Bjorck, *Numerical Methods in Scientific Computing vol.I* , SIAM, 2008 2. Cleve Mole, “Numerical Computing with MATLAB”, electronic book, http://www.mathworks.com/moler/chapters.html 3. M. T. Heath, “Scientific computing: an introduction survey,” McGraw-Hill, 2002

課程大綱

單元主題	內容綱要	上課週數
Introduction	● what is scientific computing? ● floating-point arithmetic and round-off error ● approximations, accuracy, convergence	2
Numerical algorithms and Matlab programming	introduction to MATLAB programming together with numerical algorithms such as linear equations and eigenvalues, interpolation and numerical differentiation, root-finding, data fitting, quadratures, etc.	4-6
Models and numerical simulation	● models and governing equations for selected problems ● mathematical formulation, discretization methods ● numerical simulation: advanced matrix solution techniques, nonlinear solvers, optimization techniques, ODE solvers, etc.	6-9

*: optional