數學系課程核心教材內容

課程名稱：(中文) 數值線性代數				開課單位	應數碩博班
(英文) Numerical Linear Algebra				課程代碼	2105521
學分數	3	必/選修	選修	開課年級	一

教學目標：This course details the mathematical theory behind numerical algorithms of solution of linear systems and eigenvalue problems. Students learn these algorithms through computer programming.

課程概述：matrix factorizations, direct and iterative methods for linear systems, linear least-squares problems, eigenvalue problems,

先修科目或先備能力：Linear Algebra and some programming experience

建議參考書目	1. Kindcaid & Cheney, *Numerical Analysis: Mathematics of Scientific Computing*, 3rd ed., Brooks Cole, 2002 2. Trefethen & Bau, *Numerical Linear Algebra*, SIAM, 1997 3. Golub & Van Loan, *Matrix Computation*, 3rd ed., Johns Hopkins University Press,1996 4. Demmel, *Applied Numerical Linear Algebra*, SIAM, 1997 5. Watkins, *Fundamentals of Matrix Computations*, Wiley, 1991.

課程大綱

單元主題	內容綱要	上課週數
Direct Methods for Linear Systems	matrix algebra, Gaussian elimination, LU and Cholesky factorization, pivoting, norm and error analysis	3-4
Iterative Methods for Linear System	Jacobi method, Gauss-Seidel method, SOR, Chebyshev acceleration, steepest descent and conjugate gradient method, PCG*	3-4
Least-Squares Solution to Linear Systems	overdetermined/underdetermined systems, Gram-Schmidt process, OR factorization, SVD*	2-4
Eigenvalue Problems	power method, inverse Iteration, single-shift QR iteration, double-shift QR iteration, Sturm sequences and the bisection method*	3-4
Applications*	Boundary Value problems: Finite-Differences*	2

*: optional