

## MATH 230 (L2): Introduction to Numerical Methods

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**Office hour:** Tue 1400-1500 or by appointment;

**Class schedule:** Tue. and Thu. 1700-1750; **Venue:** 2502

**Teaching Assistants:** Jun Luo ([maluojun@ust.hk](mailto:maluojun@ust.hk)); Kin Ping Chan ([ckpaa@ust.hk](mailto:ckpaa@ust.hk))

### **TA sessions:**

T2a, Thur., 1800-1850, rm 3598 (Chan)

T2b, Wed., 1900-1950, rm 1511 (Luo)

T2c, Wed., 1800-1850, rm 1511 (Luo)

### **Textbook:**

Numerical Analysis, 8th ed., by Burden, R.L. and Faires J. D., Thomson Brooks/Cole.

### **Grading:**

Midterm: 30%, LTC 5pm-630pm, March 25, 2010

Final: 70%, all materials taught in the whole semester will be tested, including those already tested in the midterm exam. But focus will be on those topics not covered in the midterm exam. (Exams are closed books and notes, and no formula sheets are provided. However, you are allowed to bring one 3in x 5in note card (front and back) to write whatever you think helpful or necessary. Calculators approved by Hong Kong Examinations and Assessment Authority (香港考試及評核局) are allowed. Use 5-digit rounding arithmetic in all calculations.)

Assignments: 0%, assigned and graded, but not marked. Solutions will be provided.

### **Topics:**

#### **Introduction to computational world** (Chapter 1)

#### **Root Finding** (Chapter 2)

- Bisection method (2.1)
- Fixed-point iteration (2.2)
- Newton's method, Secant method (2.3)

#### **Interpolation** (Chapter 3)

- Interpolation and the Lagrange (interpolating) polynomial (3.1)
- Divided differences and Newton's interpolation divided-difference formula (3.2)

#### **Least Squares Data Fitting** (chapter 8)

- Least squares data fitting: data fitting, modes, normal equation (8.1)

#### **Numerical Differentiation and Integration** (Chapter 4)

- Numerical differentiation: forward, backward, and central finite differences (4.1)
- Elements of numerical integration (4.3)
- Composite rules (4.4)
- Gaussian quadrature: Gaussian node points, weights (4.7)

#### **Solution of Ordinary Differential Equations** (Chapter 5)

- Euler's method (5.2)

#### **Solving Linear Systems** (Chapters 6 & 7)

- Gauss elimination: multipliers, Gauss elimination, back substitution, pivoting (6.1-6.2)
- LU factorization: LU, forward substitution (6.5)
- Iterative methods--matrix splitting, Jacobi method, Gauss-Seidel method, SOR method (7.3)