Math 4992 Capstone Project in Applied Mathematics

Syllabus – Fall 2025

Professor

Prof. Jeff Chasnov

Rm. 3456; Phone 2358 7448; machas@ust.hk

Office hours: by appointment

Lecturer

Dr. Albert Ku

Rm. 3419; Phone 2358 8571; maybku@ust.hk

Office hours: Thursdays, 12noon-1pm

Course Description

Credits: 3 units; Topic: Numerical methods and computational fluid dynamics

Exclusions: MATH 4991, MATH 4993, MATH 4994, MATH 4999

Prerequisites: MATH 3312 (Numerical Analysis)

Student Learning Resources

Coursera online courses:

Numerical Methods for Engineers

Mathematics for Engineers: The Capstone Course

Intended Learning Outcomes

Upon successful completion of this course, students should

1. Develop an understanding of the core ideas and concepts of numerical methods for applied mathematics
2. Develop an understanding of the challenges in computational fluid dynamics
3. Recognize the power of abstraction and generalization, carry out mathematical work with independent judgement;
4. Apply rigorous, analytical and numeric approach to analyze and solve problems using concepts of linear algebra, differential equations, vector calculus, and numerical analysis;
5. Demonstrate skills in reading, interpreting and communicating mathematical content which are integrated into other disciplines or appear in everyday life;

Assessment Scheme		Assessing Course ILOs
Numerical Methods for Engineers	60%	1, 2, 3, 4
The Capstone Course	40%	1, 2, 3, 4

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Week 1-2: Numerical Methods: Scientific Computing
Week 3: Numerical Methods: Root Finding
Week 4: Numerical Methods: Matrix Algebra
Week 5: Numerical Methods: Quadrature and Interpolation
Week 6: Numerical Methods: Ordinary Differential Equations
Week 7-8: Numerical Methods: Partial Differential Equations
Week 9: Capstone Course: Governing Equations
Week 10-11: Capstone Course: Steady Flows
Week 12-13: Capstone Course: Unsteady Flows
Week 14: Exit interviews