The Hong Kong Polytechnic University

Subject Description Form

Subject Code	AMA4430
Subject Title	Numerical Solution of PDEs
Credit Value	3
Level	4
Pre-requisite	AMA3201 Computational Methods **and** AMA3410 Differential Equations, or AMA3724 Further Mathematical Methods
Exclusion	AMA3231 Numerical Methods and Computing
Objectives	This subject aims to provide students with knowledge in numerical analysis and computational methods to solve partial differential equations numerically, with application in science and engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) understand the numerical methods for solving PDE (b) conduct numerical analysis onto numerical methods and models; (c) solve for numerical solution of PDE to applicational situations (d) master computational tools such as MATLAB or other software for numerical methods
Subject Synopsis/ Indicative Syllabus	Discretization, Consistency, Stability, Convergence, Finite differences methods, Finite element methods, Finite volume methods, Spectral methods.
Teaching/Learning Methodology	The subject will be delivered through lectures and labs. The lecture will be conducted to provide students with the mathematical knowledge and computational methods behind the subject, illustrated by some examples about application. The labs will be conducted in the computer lab allowing students to learn practical skills with the use of computer software or programming.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignments / Quizzes / Projects	20%	✓	✓	✓	✓
2. Tests	20%	✓	✓	✓	
3. Examination	60%	✓	✓	✓	
Total	100 %				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Written quizzes, tests and exam will assess students' understanding in the subject knowledge (ILO a, b, c). Assignment / Projects will include problems which require use of computer. This can assess students' digital literacy for the subject (ILO d).

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Labs	13 Hrs.
Other student study effort:	
▪ Self-study / self-practice	30 Hrs.
▪ Assignments	40 Hrs.
Total student study effort	109 Hrs.

Reading List and References

K. W. Morton, D. F. Mayers, Numerical Solution of Partial Differential Equations, Second Edition, Cambridge University Press 2005

Arieh Iserles, A first course in the numerical Analysis of Differential Equations Second Edition, Cambridge Press 2009

Philippe G. Ciarlet, The Finite element method for Elliptic problems, 1st Edition, N. Holland Pub. 1978

J. W. Thomas, Numerical Partial Differential Equations: Finite Difference Methods Springer 1995