City University of Hong Kong
Course Syllabus

offered by College/School/Department of Electrical Engineering
with effect from Semester B in 2019/2020

Part I Course Overview

Course Title:	Computational Engineering Analysis
Course Code:	EE2108
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	B2
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	For Normative 4-year Degree Students Only MA1200 Calculus and Basic Linear Algebra I or MA1300 Enhanced Calculus and Linear Algebra I
Precursors: *(Course Code and Title)*	For Normative 4-year Degree Students Only MA1201 Calculus and Basic Linear Algebra II or MA1301 Enhanced Calculus and Linear Algebra II
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The course aims to provide the concept of what numeric methods are and how they relate to engineering problem solving. Students will learn how to formulate numerical models, select appropriate numerical methods, and implement the methods using computer programming language, such as Python, MATLAB, *etc*.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Identify the needs in applying numerical methods for solving engineering and mathematical modelling problems		√	√	
2.	Analyze different types of errors in numerical computation		√	√	
3.	Develop computer programs to solve numerical problems		√	√	
** If weighting is assigned to CILOs, they should add up to 100%.*		100%			

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	Hours/week (if applicable)				
		1	2	3		
Lecture (2-hrs) and tutorial (1-hr)	Explain key concepts in numerical methods and practice with various examples	√	√	√		3-hour/week
Programming Laboratory	Hands-on exercise on solving numerical problem with computer programming language			√		Six 2-hour sessions

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3					
Continuous Assessment: 50%								
Tests (min.: 2)	√	√	√				30%	
#Assignments (min.: 3)	√	√	√				10%	
Lab Exercises/Reports	√	√	√				10%	
Examination: 50% (duration: 2hrs , if applicable)								
Examination	√	√	√				50%	
** The weightings should add up to 100%.*							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work and 30% in the examination. Also, 75% laboratory attendance rate must be obtained.

may include homework, tutorial exercise, project/mini-project, presentation

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels

6. Constructive Alignment with Major Outcomes

MILO	How the course contribute to the specific MILO(s)
1	The application of mathematics, science and engineering is key to the understanding and implementation of numerical methods using computer programming in solving practical engineering problems.
5	Numerical methods are applied in formulating and solving engineering problems.
10	One computer programming language is introduced in this course as a necessary numerical tool for engineering applications.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Introduction
Overview of numerical analysis, programming fundamentals, data visualization, error analysis

Root Searching Techniques
Bracketing methods, open methods

Linear Systems
Matrix algebra, Gauss elimination, LU factorization, Gauss-Seidel method

Curve Fitting
Least-squares data fitting, polynomial interpolation, splines

Differentiation and Integration
Numerical differentiation, Trapezoidal rule, Simpson's rules, Romberg integration

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Jaan Kiusalaas, *Numerical Methods in Engineering with Python 3*, Cambridge University Press

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Amos Gilat, *Numerical Methods for Engineers and Scientists*, Wiley
2.	Titus A. Beu, *Introduction to Numerical Programming: A Practical Guide for Scientists and Engineers Using Python and C/C++*, CRC Press
3.	Mark Summerfield, *Programming in Python 3: A Complete Introduction to the Python Language*, Addison-Wesley
4.	Gerald W. Recktenwald, *Numerical Methods with MATLAB: Implementations and Applications*, Prentice Hall