Title (Units):	**COMP 7150 Numerical Methods for Computer Science Research (3,3,0)**

Course Aims:	To introduce the theories and concepts of numerical methods and how they can be implemented for solving computer science research problems.

Prerequisite:	Research Postgraduate Student Standing

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Explain the theories and concepts of numerical methods.
2	Explain how numerical methods can be applied to solve computer science research problems.
	Skill
3	Develop computer programmes to implement numerical methods for problem solving

Calendar Description:	To introduce the theories and concepts of numerical methods and how they can be implemented for solving computer science research problems.

Teaching and Learning Activities (TLAs):

CILOs	TLAs will include the following:
1-2	Students will learn the theories and concepts of numerical methods and how they can be applied to solve computer science research problems via lectures, programming assignments, and exams.
2-3	Students will gain the practical skills of implementing numerical methods to solve problems.

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Remarks
1	Continuous assessment	30%	1-3	Continuous assessments in the form programming assignments will be used to evaluate how well students have learned the theories and concepts of numerical methods, and how well they can apply them via programming.
2	Examination	70%	1-2	Examination will be used to evaluate the students' overall understanding and proficiency on the theories and concepts of numerical methods.

Assessment Rubrics:

Excellent (A)	• Achieve all three CILOs, demonstrating a thorough understanding and solid knowledge of numerical methods. • Able to apply a variety of numerical methods for solving problems.
Good (B)	• Achieve most of the three CILOs, demonstrating a good understanding and competent knowledge of numerical methods. • Able to apply some appropriate numerical methods for solving problems..
Satisfactory (C)	• Achieve some of the three CILOs, demonstrating a basic level of understanding and knowledge of numerical methods. • Able to provide numerical methods for solving simple problems.
Fail (F)	• Achieve few of the three CILOs, with little understanding of optimization algorithms. • Unable to provide numerical methods for solving simple problems.

Course Intended Learning Outcomes and Weighting:

Content	CILO No.
I. Numerical Methods and Finite Precision Arithmetic	1

II. Linear Systems of Equations	1-3
III. Least Square Problems	1-3
IV. Other Advanced Topics	1-3

References: Walter Gander, Martin J. Gander and Felix Kwok. Scientific Computing – An Introduction Using Maple and Matlab, Springer Verlag, 2014

Steven C. Chapra and Raymond P. Canale. Numerical Methods for Engineers, McGraw-Hill Eudcation, 7th edition, 2014

Amos Giat and Vish Subramaniam. Numerical Methods for Engineers and Scientists, Wiley, 3rd edition, 2013

Uri M. Ascher and Grief Chen. A First Course in Numerical Methods (Computer Science and Engineering), Society for Industrial and Applied Mathematics (SIAM), 5th edition, 2011

Course Content in Outline:

Topic

I.   Numerical Methods and Finite Precision Arithmetic

II.   Linear Systems of Equations
      A. Gaussian Elimination
      B. Cholesky Decomposition
      C. Banded Matrices
      D. Other related topics

III. Least Squares Problems
      A. Linear Least Square (LS) Problems
      B. Singular Value Decomposition
      C. Algorithms Using Orthogonal Matrices
      D. Non-linear LS Problems

IV.   Other Advanced Topics