Title (Units): **COMP4086 Selected Topics in Theoretical Computer Science (3,3,0)**

Course Aims: This course provides students with an opportunity to gain an in-depth understanding on the theories, problems and issues on a selected topic of theoretical computer science. The topic could be a specific area of algorithmic problems (e.g., graph algorithms, computational geometry, combinatorial optimization, etc.), or a particular algorithm design paradigm (e.g., randomized algorithms, parallel algorithms, etc.).

Prerequisite: COMP3005 Design and Analysis of Algorithms

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

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Analyze algorithms in the selected topic
2	Identify applications of the selected topic
3	Apply algorithms learned in the selected topic to related problems
	Professional Skill
4	Formally solve complex problems related to the selected topic
5	Apply software tools related to the selected topic (e.g., CAD/CAM software in computational geometry)
	Attitude
6	Articulate the importance of rigorous solutions to the problems related to the selected topic

Calendar Description: This course provides an in-depth study on a selected topic of theoretical computer science. The topic to be covered may vary from semester to semester, and is to be determined by the instructor. The topic could be a specific area of algorithmic problems (e.g., graph algorithms, combinatorial optimization, etc.), or a particular algorithm design paradigm (e.g., randomized algorithms, parallel algorithms, etc.).

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1-4, 6	Students will learn concepts on theory of computations in lectures and tutorials
5	Students will gain some hand-on experience on software tools in some lab-like tutorials
1-4	Students will practise the formal methods used in long take-home assignments and examinations

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Continuous Assessment	50%	1-6	Continuous assessments are designed to measure how well students have learned the fundamentals and major concepts of the selected topic.
2	Examination	50%	1-4	Final examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be analysis and skills based to assess students' ability in the selected topic.

Assessment Rubrics:

	Excellent (A)	Good (B)	Satisfactory (C)	Marginal Pass (D)	Fail (F)
Formal methods	Demonstrate a thorough understanding on analyzing and applying the formal methods covered	Demonstrate a good understanding on analyzing and applying the formal methods covered	Demonstrate a considerable understanding on analyzing and applying the formal methods covered	Demonstrate a minimal understanding on analyzing and applying the formal methods covered	Unable to demonstrate an understanding on analyzing and applying the formal methods covered
Problem solving skills	Can effectively and correctly apply formal methods to solve a given problem	Can correctly apply formal methods to solve a given problem	Can apply formal methods to solve a given problem with some degree of effectiveness	Can apply formal methods to solve a substantial part of a given problem	Cannot apply formal methods to solve a given problem
Software tools	Able to use software tool(s) to solve a formal problem with a high degree of effectiveness	Able to use software tool(s) to solve a formal problem with a considerable degree of effectiveness	Able to use software tool(s) to solve a formal problem with some degree of effectiveness	Able to use software tool(s) to solve a formal problem with a moderate degree of effectiveness	Unable to use software tool(s) to solve a formal problem

Course Content and CILOs Mapping:

Content		CILO No.
I	At least one topic in Theoretical Computer Science	1-6

References:

- Textbooks, research notes and readings, survey and background papers, case studies, specialized papers, and manuscripts on the selected topic of study.

Course Content:

Topic

I. At least one topic in Theoretical Computer Science
   - Computational Complexity
   - Computational Geometry
   - Graph Algorithms
   - Combinatorial Optimization
   - Randomized Algorithms
   - Parallel Algorithms
   - Approximation Algorithms
   - Other topics in Theoretical Computer Science