

Subject Description Form

Subject Code	COMP 6702
Subject Title	Advanced Topics in Computation Theory
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Nil.
Objectives	<ul style="list-style-type: none"> • To provide students with in-depth knowledge on the key concepts in computation theory. • To introduce and practice advanced algorithmic techniques necessary for solving sophisticated computer science problems.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p>(a) critically evaluate the literature of computation theory;</p> <p>(b) demonstrate a comprehensive understanding of computation theory;</p> <p>(c) analyze problems in one's research area in the perspective of computation theory.</p>
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. The computation model Turing machine concepts; efficiency; the halting problem; undecidability. 2. An overview of complexity classes 3. NP-completeness the NP class; reductions; NP-completeness; other classes (coNP, EXP, NEXP). 4. Space complexity the PSPACE and NL classes. 5. Randomized computation probabilistic Turing machines; the classes RP, coRP, ZPP, BPP. 6. Complexity of counting the class #P; #P completeness. 7. Interactive proof interactive proof systems; the class IP; probabilistically checkable proof.
Teaching/Learning Methodology	<p>Lectures provide students the main concepts of the topic, together with comprehensive examples for easy understanding.</p> <p>Tutorials offer an opportunity to students for practicing their analysis and problem solving skills.</p> <p>Written assignments will be utilized to help students develop analysis and problem solving skills for computer science problems.</p>

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		
	1. Assignments	60%	✓	✓	✓		
	2. Examination	40%		✓	✓		
Total	100%						
<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Assignments help students understand computation theory concepts, apply them to solve problems, and conduct scholarly research in their problem domain (items a, b, c).</p> <p>The exam is used to assess the students in terms of problem solving skills and writing skills (items b, c).</p>							
Student Study Effort Expected	Class contact:						
	▪ Lecture/Tutorial		39 Hrs.				
	Other student study effort:						
	▪ Self-study		83 Hrs.				
	Total student study effort		122 Hrs.				
Reading List and References	<ol style="list-style-type: none"> 1. C.H. Papadimitriou, Computational Complexity, First Edition, Addison-Wesley, 1994. 2. O. Goldreich, Computational Complexity: A Conceptual Perspective, First Edition, Cambridge University Press, 2008. 3. S. Arora, B. Barak, Computational Complexity: A Modern Approach, First Edition, Cambridge University Press, 2009. 4. M. Sipser, Introduction to the Theory of Computation, 3rd edition, Cengage Learning, 2012. 						