Subject Description Form

Subject Code	COMP318
Subject Title	Systems Simulation
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: COMP201, COMP211 (Nil for 61025) Co-requisite: Nil Exclusion: COMP308
Objectives	• To provide students with basic knowledge of modern computer simulation methods and languages • To enable students to apply computer simulation techniques to simulate the operations of various kinds of real-world facilities or processes
Intended Learning Outcomes	Upon completion of the subject, students will be able to: *Professional/academic knowledge and skills* (a) acquire the ability to think and reason in a creative and critical manner when applying IT technology to different information processing areas, such as business, industry and public sectors; (b) acquire the skills that include analytic modelling and simulation so that appropriate solution alternatives in problem solving and application development can be soundly determined by a process of guided evaluation; (c) know how to use simulation packages and tools that are immediately applicable in business and industry; *Attributes for all-roundedness* (d) solve problem with an analytic and critical view; (e) learn to collect performance data independently and analyze them empirically so that the dynamics of the target system can be deciphered. **Alignment of Programme Outcomes:** Programme Outcome 1: It makes the student learn to present results, which are produced from the assignment project(s) that verify what they have learned in class. The quality of the report(s) measures how the student(s) has mastered the techniques they learned. Programme Outcome 2: It helps student(s) grasp what factors would affect

system correctness and stability.

Programme Outcome 4: It helps students polish their critical thinking through the process of analyzing the project/programming results.

Programme Outcome 6: The laboratory exercises and project assignments help students' problem solving skills, which they have to improve to keep abreast with time – lifelong learning.

Programme Outcome 7: The group project inculcates team spirit.

Subject Synopsis/ Indicative Syllabus

Topic	Duration of Lectures
1. Computer simulation Applications of computer simulation; continuous model, discrete model, and combined model.	2.5
2. Modeling and analysis techniques for simulation Models versus simulation models; replication; sequential batching; autocorrelation; regenerative methods.	7.5
3. Simulation of deterministic and random processes Random number generator; generation of random variates for various distributions, e.g. exponential, triangular, Zipfian, Gaussian; inverse transform method; acceptance-rejection method; discrete event simulation concepts; event scheduling; list processing and time advance algorithms; trace-driven simulation; verification and validation.	10
4. Computer simulation languages and software Entity-oriented language, e.g. GPSS; process-oriented/event-oriented language, e.g. Simscript; embedded language, e.g. CSIM; simulation software, e.g. Petri-net.	10
5. Problem solving and case studies Simulation experiments; problem solving in realistic applications; case studies, e.g. system performance simulation, network simulator, and flight simulator.	5
Total	**35**

Laboratory Experiments and other Practical Work:

Topic (indicative only)	Duration of Laboratory
1. Set up the link to a time-Petri-net package.	1
2. Draw Petri-nets for different systems for logical analysis.	1
3. Program the firing sequence for system constraints analysis.	1
4. Evaluate Petri-nets that model real-life systems (e.g. a TCP channel).	2

	Total | **5**
Teaching/Learning Methodology	The methodology consists of three main parts other that lectures: i) understand and rehearse – understanding is deepened through repeated class, tutorial and take-home exercise; basically the students are drilled in important topics by resolving them alone and then in open discussions. ii) associate – at this level effective learning is easily achieved by associating with hand-on experience; for this reason the theories are practiced in laboratory exercises and group projects in which students can discuss and learn from one another with a team spirit. iii) test and examine – this reinforces the rehearsal in the learning process so that short-term items can become long-term memory.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. Assignments	10%	✓	✓	✓	✓	✓	
2. Lab exercises				✓	✓	✓	
3. Project	30%	✓	✓	✓	✓	✓	
4. Mid-term	15%	✓	✓	✓		✓	
5. Examination	45%	✓	✓	✓	✓	✓	
Total	100 %						

The assessment methods are appropriate to produce the expected outcome because they together represent an effective rehearsal process, in light of cognitive science, that transfers knowledge in the short-term memory into the long-term memory.

Student Study Effort Required		
	Class contact:	
	▪ Lecture	35 Hrs.
	▪ Tutorial/Lab	14 Hrs.
	Other student study effort:	
	▪ Assigned reading	10 Hrs.
	▪ Take-home exercise	10 Hrs.

	Total student study effort	69 Hrs.
Reading List and References	1. Banks, J., Carson, J., Nelson, B. and Nicol, D., *Discrete-Event System Simulation*, 5th Edition, Prentice-Hall, 2010 2. Walpoleand, R.E. and Myers, R.H., Probability and Statistics for Engineers and Scientists, 8th Edition, Prentice Hall, 2007	