Subject Description Form

Subject Code	COMP 5325
Subject Title	Distributed Computing
Credit Value	3
Level	5
Pre-requisite/ Exclusion	Nil
Objectives	To provide in-depth study in the area of distributed computing on models, architectures, algorithms and techniques and to allow the student to: 1. acquire fundamental knowledge in distributed computing; 2. learn about advanced distributed computing concepts; 3. understand limitations and appreciate innovative solutions; 4. apply the knowledge in distributed application development and problem solving.
Intended Learning Outcomes	After completing the subject, students should be able to: a) understand, appreciate and apply parallel and distributed algorithms in problem solving; b) learn advanced techniques and the application in practical systems; c) evaluate the impact and performance of network topology on parallel / distributed algorithm formulation; and d) gain hands-on experience with those programming techniques.
Subject Synopsis/ Indicative Syllabus	• **Overview and background of distributed computing** Motivations; applications; distributed systems and architecture; computational model; causal dependency; physical versus logical clock; vector clock; distributed snapshot; remote procedure call; client-server interaction; broadcast versus multicast. • **Synchronization and coordination** Distributed synchronization; clock synchronization; mutual exclusion; quorum consensus; leader election; other synchronization problems; deadlock prevention; deadlock detection; load balancing; process migration; fault-tolerance; synchronous and asynchronous checkpointing; recovery. • **Shared data access** Atomic data access; transactions; concurrency control; atomic commitment; distributed file systems; stateful versus stateless server; replicated data management; primary copy approach;

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<tr><td></td><td>distributed shared memory.

• Distributed programming
TCP/IP and sockets; POSIX threads; API; distributed operating systems.

• Selected topics on distributed computing
Advanced or current topics on distributed computing; examples include MPI, DCE, Java applet and servelet, Internet computing, mobile computing.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>class activities including - lecture, tutorial, lab, workshop seminar where applicable</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific Assessment Methods/Tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>Assignments, Tests & Projects</td><td>55</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Final Examination</td><td>45</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td colspan="4"></td></tr>
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<tr><td rowspan="5">Student study effort expected</td><td colspan="2">Class Contact:</td></tr>
<tr><td>Class activities (lecture, tutorial, lab)</td><td>39 hours</td></tr>
<tr><td colspan="2">Other student study effort:</td></tr>
<tr><td>Assignments, Quizzes, Projects, Exams</td><td>65 hours</td></tr>
<tr><td>Total student study effort</td><td>104 hours</td></tr>
<tr><td>Reading list and references</td><td>(1) Coulouris, G.F., Dollimore, J. and Kindberg, T., 2011, Distributed Systems: Concepts and Design, 5th Edition, Addison-Wesley.

(2) Singhal, M. and Shivaratri, N.G., 1994, Advanced Concepts in Operating Systems, McGraw Hill.

(3) Chow, R. and Johnson, T., 1997, Distributed Operating Systems and Algorithms, Addison-Wesley.

(4) Goscinski, A., 1991, Distributed Operating Systems: The Logical Design, Addison-Wesley.

(5) Mullender, S., ed., 1993, Distributed Systems, Second Edition, Addison-Wesley.</td></tr>
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