Subject Description Form

Subject Code	COMP4441
Subject Title	Enterprise Middleware and Applications
Credit Value	3
Level	4
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: COMP1011
Objectives	The objectives of this subject are to: 1. To present an integrated view of the basic building blocks of a distributed system and how middleware can help developers to more easily satisfy the requirements of building distributed systems and the importance to enterprise systems integration. 2. To provide the foundation knowledge of middleware, with special focus on object-oriented, publish-subscribe and service-oriented middleware. 3. To provide practical perspectives on how these middleware may be applied to enterprise systems and various application domains.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: Professional/academic knowledge and skills (a) understand the basic structure of distributed systems; (b) understand the motivation of using middleware; (c) understand the basic theories underlying the design of middleware; (d) understand the basic concepts of various middleware architectures and their role in facilitating systems integration and distributed computing; (e) learn to make judgment in choosing a suitable middleware for application problems; Attributes for all-roundedness (f) apply the technical knowledge learned to solve real-life practical problems; (g) appreciate and evaluate existing and new technologies.
Subject Synopsis/ Indicative Syllabus	1. **Principles of middleware** Role of middleware in distributed systems; types of middleware; developing distributed systems with middleware. 2. **Middleware Architectures** Cross-platform integration challenges, opportunities and inhibitors; Middleware architecture, technologies and development; Transactional and Messaging middleware; Object-oriented middleware; publish-subscribe

middleware; service-oriented middleware;

3. **Middleware for System Integration**
   Enterprise application integration challenges and the importance of middleware solution; data integration; process integration; service-oriented integration;

4. **Data-oriented Middleware**
   Data and content integration challenges; XML content-based routing; enterprise database middleware from major vendors; emerging web services enabled database middleware;

5. **Middleware for Mobile Computing**
   Issues and challenges of mobile computing and how middleware plays a role; data and computing adaptation; context-aware middleware;

6. **Middleware Performance**
   Performance considerations of various middleware platforms; performance versus agility ; traffic performance; service levels; quality-of-service provision;

Teaching/Learning Methodology	1. Lecture: students learn the technologies and concepts related to middleware. 2. Laboratory session: students implement short programs (with guidance of the tutor) related to the lecture to gain experience in using the technologies and concepts learned.

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	d	e	f	g
Continuous assessment	55%							
Assignments	30%	✓		✓		✓		
Mid-term test	25%	✓	✓	✓	✓	✓	✓	✓
Examination	45%	✓	✓	✓	✓	✓	✓	✓
Total	100 %							

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment includes programming assignments and one mid-term test. For the programming assignments, the students have to design and implement middleware-based systems to solve common problems in distributed systems study. This requires good understanding/application of distributed systems concepts and programming skills/techniques to solve real problems.

The mid-term test and the examination aim at assessing the students' understanding of the concepts related to the theory and practice of middleware and distributed systems.

Student Study Effort Expected	Class contact:	
	▪ Lecture	39 Hrs.
	▪ Tutorial/Lab	0 Hrs.
	Other student study effort:	
	▪ Self-study (e.g., reading reference books/papers), assignments, projects etc	66 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	Reference Books: 1. A. Puder, K. Romer and F. Pilhofer. Distributed Systems Architecture: A Middleware Approach, Morgan Kaufmann, 2006. 2. M. Volter, M. Kircher and U. Zdun. Remoting Patterns: Foundations of Enterprise, Internet and Realtime Distributed Object Middleware, Wiley. 2005. 3. W. Emmerich, Engineering Distributed Objects, Wiley, 2000. 4. IEEE Distributed Systems Online. 5. Articles from journals, magazines, and conference proceedings, including ACM TOCS, IEEE TPDS, IEEE TSE, IEEE TOC, CACM, IEEE Computer, ICDE, DOA.	