London South Bank University | School of Engineering

Module Guide

Distributed Computer Systems

BIF-6-DCS

Moodle site: 15/16, Distributed Computer Systems (BIF_6_DCS_1516)

School of Engineering

2015-16

Level 6

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1. MODULE DETAILS

Module Title:	Distributed Computer Systems
Module Level:	6
Module Reference Number:	BIF-6-DCS
Credit Value:	20
Student Study Hours:	200
Contact Hours:	52
Private Study Hours:	142
Pre-requisite Learning (If applicable):	BIF-5-SSE or equivalent
Co-requisite Modules (If applicable):	none
Course(s):	Core: BSc Computing Optional: BSc Business Information Technology BSc Business Intelligence BSc Computer Systems Management BSc Information Technology BSc Multimedia Computing BSc Web Development
Year and Semester	2013-14, semester 1
Module Coordinator:	Clive Hayton
MC Contact Details (Tel, Email, Room)	FW103 (N113), clive.hayton@lsbu.ac.uk, 020 7815 7511
Teaching Team & Contact Details (If applicable):	
Subject Area:	Systems and Software Engineering
Summary of Assessment Method:	The module will be assessed via a combination of coursework (60%) and examination (40%). The coursework will typically be divided into a series of assessments.
External Examiner appointed for module:	Professor Nik Bessis

2. SHORT DESCRIPTION

Not only business and commerce, but also our everyday lives depend increasingly on distributed systems linking computers and other devices, from mobile phones to ambient systems, together in a seamless and transparent way. The components of such systems are usually geographically distributed. This module develops the concept of message-passing concurrency and provides a comprehensive source of material on the principles and practice of distributed computer systems.

3. AIMS OF THE MODULE

This module aims to give you a broad understanding of distributed and networked systems including the scalability, security, fault tolerance and performance of such systems. It also provides you with the ability of evaluating and operating distributed computer systems, together with the ability of specialization for building software for distributed environments.

4. LEARNING OUTCOMES

4.1   Knowledge and Understanding
On completing this module, you will be able to:
- Demonstrate an understanding of the issues associated with the provision of safe, secure, reliable and robust information systems over networks and the internet

4.2   Intellectual Skills
You will be able to:
- Analyse, critically evaluate and synthesise information from a number of sources

4.3   Practical Skills
You will be able to:
- Analyse, develop and evaluate distributed Information systems

4.4   Transferable Skills
You will be able to:
- Write reports that are supported by academic reading and argument and make presentations to peers and lecturers

5. ASSESSMENT OF THE MODULE

The assessment will be by coursework (60%) and examination (40%).   The coursework is a report and presentation on an aspect of Distributed Computer Systems.
Possible topics:
- time and global states
- coordination and agreement
- transactions and concurrency control
- distributed transactions
- replication
- mobile computing
- ubiquitous computing
- distributed multimedia systems
- formal models of concurrency, for example, CSP, CCS, π-calculus, Petri nets, etc.
- real time scheduling
- clocks and synchronisation
- case studies:
  - peer-to-peer systems
  - multimedia systems
  - cloud systems

6. FEEDBACK

You will be given feedback and a mark on your presentation within 1 week of the presentation.   The report will be due at the end of week 11 and you will get a mark and feedback at the first meeting after the Christmas break.

7. INTRODUCTION TO STUDYING THE MODULE

7.1 Overview of the Main Content
- Hardware and software concepts, types of distributed systems
- Communication in distributed systems
- Switching, Classless Inter-Domain Routing
- Middleware, distributed objects, RPC and RMI
- Group communication
- Naming
- Synchronisation: clocks, mutual exclusion and elections
- Transactions
- Deadlocks
- Consistency and replication, distributed shared memory
- Security
- Distributed file systems, cloud computing
- Fault tolerance

7.2 Overview of Types of Classes
The module involves a combination of traditional lectures, tutorials and laboratory sessions. New concepts taught during the weekly lectures will typically provide the basis for paper-based, problem-solving. The practical, laboratory exercises will be briefly introduced and then you will be able to explore. The module website will contain specific resources for each of the topics covered, including links to Library resources. The practical exercises are designed to be capable of completion on any standard PC with Internet connection.

7.3 Importance of Student Self-Managed Learning Time
The work that you put into this module outside the timetabled hours should amount to around 10 hours per week. The column under the heading 'suggested self-managed work' in the table in section 8 makes suggestions as to what you might be doing. You will also have to manage the time for your research for the assignment. You might put more than 10 hours per week and get a good mark. If you put in less than 10 hours you risk losing interest in the topic, missing out on a valuable topic and getting a poor mark.

7.4 Employability
There are skill shortages in information and communication technologies in general and in the design and operation of large distributed systems in particular. The successful completion of the module will help you to be able to take up positions as System Administrator or Software Developer for Distributed Environments.

8. THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

The table below gives an indication of the planned lectures and practical work for each week:

lecture: indicates the topic and the reading, from the core text and other sources, you should do in addition to attending the lecture

practical: indicate the work done in the practical/lab sessions. In the early weeks the practical work will concentrate on analysing, designing and implementing concurrent and distributed systems using Java as the example. In one of the weeks after week 7 you will be expected to make a presentation about the topic you are researching for your assignment. There will be 4-5 individual presentations of 20-25 minutes per week.

suggested self-managed work: indicates some of the work you might do in the 10 hours per week you should be studying the module. As this time is self-managed, this is neither complete

nor prescriptive. You will almost certainly identify work you should do in addition to the suggestions

reading: indicates the core reading you need to do **before** the lecture in the following week.

week	lecture	practical	suggested self-managed work	reading
1 2/10	Distributed Systems: Definitions, Challenges and Models [Coulouris 2012, cc 1&2], [Coulouris 2005, cc 1&2], [Tanenbaum 2007, cc 1&2]	Threads and shared variables [Garg 2004, cc 1&2]	Exercises from [Garg 2004, cc 1&2], [Coulouris 2012, cc 1&2], [Coulouris 2005, cc 1&2]	[Coulouris 2012, c 3], [Coulouris 2005, c 3, [Garg 2004, c 3]
2 9/10	Networks and the Internet [Coulouris 2012] c 3, [Coulouris 2005] c 3, [T 2012] c 1	Mutual exclusion [Garg 2004] c 3	Exercises from [Garg 2004] c 3, [Coulouris 2012] c 3, [Coulouris 2005] c 3	[Coulouris 2012] c 4, [Coulouris 2005] c 6, [Garg 2004] c 3
3 16/10	Communication [Coulouris 2012] c 4, [Coulouris 2005] c 4, [Tanenbaum 2007] c 4	Consistency conditions [Garg 2004] c 4	Exercises from [Garg 2004] c 3, [Coulouris 2012] c 4, [Coulouris 2005] c 4	[Coulouris 2012] c 5, [Coulouris 2005] c 5, [Garg 2004] c 4
4 23/10	Remote Message Invocation [Coulouris 2012] c 5, [Coulouris 2005] c 5, [Tanenbaum 2007] c 4	Synchronisation 2 [Garg 2004] cc 5	Exercises from [Garg 2004] c 4, [Coulouris 2012] c 5, [Coulouris 2005] c 5	[Coulouris 2012] c 6, [Coulouris 2005] c 5, [Garg 2004] c 5
	Research topic agreed – 23 October 2015			
5 30/10	Indirect Communication [Coulouris 2012] c 6, [Coulouris 2005] c 5, [Tanenbaum 2007] c 4	Distributed Programming 1 [Garg 2004] c 6	Exercises from [Garg 2004] c 5, [Coulouris 2012] c 6, [Coulouris 2005] c 5	[Coulouris 2012] c 7, [Coulouris 2005] c 6, [Garg 2004] c 6
6 6/11	Security [Coulouris 2012] c 11, [Coulouris 2005] c 7, [Tanenbaum 2007] c 9	Synchronisation 1 [Garg 2004] c 3	Exercises from [Coulouris 2012] c 11, [Coulouris 2005] c 7	[Coulouris 2012] c 12, [Coulouris 2005] c 8
7 13/11	OS Support [Coulouris 2012] c 7, [Coulouris 2005] c 6	Distributed Programming 2 [Garg 2004] c 6	Exercises from [Garg 2004] c 6, [Coulouris 2012] c 7, [Coulouris 2005] c 6	[Coulouris 2012] c 8, [Coulouris 2005] c 5, [Garg 2004] c 6
8 20/11	Distributed Objects [Coulouris 2012] c 8, [Coulouris 2005] c 5, [Tanenbaum 2007] c 10	Presentations	Exercises from [Garg 2004] c 6, [Coulouris 2012] c 8, [Coulouris 2005] c 5	[Coulouris 2012] c 9, [Coulouris 2005] c 19, [Garg 2004] c 6
9 27/11	Web Services [Coulouris 2012] c 9, [Coulouris 2005] c 19, [Tanenbaum 2007] c 12	Presentations	Exercises from [Garg 2004] c 6, [Coulouris 2012] c 9, [Coulouris 2005] c 19	[Coulouris 2012] c 10, [Coulouris 2005] c 10
10 4/12	Peer-to-peer [Coulouris 2012] c 10, [Coulouris 2005] c 10	Presentations	Exercises from [Coulouris 2012] c 10, [Coulouris 2005] c 10	[Coulouris 2012] c 11, [Coulouris 2005] c 7
11 11/12	Distributed File Systems [Coulouris 2012] c 12, [Coulouris 2005] c 8, [Tanenbaum 2007] c 11	Presentations	Exercises from [Coulouris 2012] c 12, [Coulouris 2005] c 8	[Coulouris 2012] c 13, [Coulouris 2005] c 9

week	lecture	practical	suggested self-managed work	reading
12 18/12	Name Services [Coulouris 2012] c 13, [Coulouris 2005] c 9, [Tanenbaum 2007] c 5	Presentations	Exercises from [Coulouris 2012] c 13, [Coulouris 2005] c 9	[Coulouris 2012] cc 1-13, [Coulouris 2005] cc 1-10,19
Submission of Research Report – <u>18 December 2015</u>				
13 8/12	Revision	Revision	Exercises from [Coulouris 2012] or [Coulouris 2005]	[Coulouris 2012] cc 1-13, [Coulouris 2005] cc 1-10,19

9.   STUDENT EVALUATION

Report for module leader   **2014/15 BUS Semester 1**

Module name: Distributed Computer Systems

		← SELECT MODULE FROM LIST

Module code: BIF_6_DCS
Level: 6
Students registered: 25

Q	Evaluation to the extent that the students agreed with the following:	Agree / Strongly Agree	Disagree / Disagree strongly	Response of N/A
		SA ≥ 25% of MEQs returned	DS ≥ 25% of MEQs returned	
Q1	Overall, my experience of this module was good	100%	0%	0%
Q2	The module guide supplied me with all core information needed	75%	0%	0%
Q3	The Virtual Learning Environment was useful	100%	0%	0%
Q4	Other materials were useful	75%	0%	0%
	Q2-Q4 Average - Module Materials	**83%**	**0%**	**0%**
Q5	Lectures were of a good quality	100%	0%	0%
Q6	Small Group Sessions (seminars/tutorials etc.) were of a good quality	75%	0%	0%
Q7	Other sessions (if used) were of a good quality (workshops, laboratory work etc.)	75%	0%	25%
Q8	Module staff were accessible outside formal scheduled teaching times	75%	0%	25%
	Q5-Q8 Average - Quality of Teaching	**81%**	**0%**	**13%**
Q9	The assessment load for the module was appropriate to the content	100%	0%	0%
Q10	Assessment was varied and useful	100%	0%	0%
Q11	I received feedback by the specified return date	75%	0%	25%
Q12	The feedback was useful	75%	0%	25%
	Q9-Q12 Average - Assessment	**88%**	**0%**	**13%**
Q13	Teaching rooms were clean and comfortable	100%	0%	0%
Q14	IT resources for teaching and learning were useful	75%	0%	0%
Q15	Other learning resources (books, journals) were useful	50%	0%	25%
	Q13-Q15 Average- Infrastructure and Environment	**75%**	**0%**	**8%**
Q16	Career and/or professional links were made explicit in this module	100%	0%	0%
Q17	This module included sufficient preparation for the assessment	100%	0%	0%
Q1	Materials on the reading list were readily available to me	75%	0%	0%

8				
Q1 9	The library met my expectation in terms of resources for this module	100%	0%	0%
	Q16-Q19 Average - School Specific Questions	**94%**	**0%**	**0%**

10. LEARNING RESOURCES

10.1 Core Materials

Coulouris, G., Dollimore, J., Kindberg, T. and Blair, G. (2012) *Distributed Systems—Concepts and Design*. (5 ed.) Addison-Wesley

> available as an e-book from the university library

Garg, V. (2004) *Concurrent and Distributed Computing in Java*. Wiley InterScience

> available as an e-book from the university library

Book Website at www.cdk5.net

10.2 Optional Materials

Elliott, G. and Phillips, N. (2004) *Mobile Commerce and Wireless Computing Systems*. Addison Wesley

Hwang, K., Fox, G.C. and Dongarra, J.J. (2013) *Distributed and Cloud Computing*. Waltham MA: Elsevier (Margan Kaufmann)

Kshemkalyani, A.D and Singhal, M. (2013) *Distributed Computing: Principles, Algorithms, and Systems*. Cambridge UK: Cambridge University Press

Tanenbaum, A. S. and Van Steen, M. (2007) *Distributed Systems—Principles and Paradigms*. (2e) Prentice Hall

> available as an e-book from the university library

Tanenbaum, A. S. (2010) *Computer Networks.* (5 ed.) Pearson, 2010

> available as an e-book from the university library

Verela, C. (2013) *Programming Distributed Computer Systems: A Foundational Approach*, Cambridge MA: The MIT Press

You will also be expected to refer to journal and conference papers