

London South Bank University

Module Guide

Computer Networks

ENG_5_536

<http://vle.lsbu.ac.uk/>

School of Engineering

2015-16

Level 5

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1. MODULE DETAILS

Module Title:	Computer Networking
Module Level:	5
Module Reference Number:	EEC_5_986
Credit Value:	20
Student Study Hours:	200 hours
Contact Hours:	52 hours
Private Study Hours:	148 hours
Pre-requisite Learning (If applicable):	Intro to communication systems and networks (L5)
Co-requisite Modules (If applicable):	None
Course(s):	BEng Computer systems and networks Full-Time (2388) Part-time (2419)
Year and Semester	Year 2 BEng
Module Coordinator:	Mr. Juquan Mao (ext.7600) juquan.mao@lsbu.ac.uk Room: T-816
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Teaching Team & Contact Details (If applicable):	Mr. Juquan Mao (details as above) Dr Zhanfang Zhao, zhaoza@lsbu.ac.uk , T410 ext: 6340
Subject Area:	Computer systems and networks
Summary of Assessment Method:	Exam + Coursework

2. SHORT DESCRIPTION

This guide tells you how the teaching will be structured, and how you will be assessed. Its main purpose is to enable you to organise your own time and efforts to get the most out of the module. Preparation and reading are essential to making progress and there will be little time for teacher leading revision, until the end of the module. Particularly in your assignment, there is a need to keep up and accumulate the new skills and knowledge that you will need eventually to produce your network infrastructure design assignment. Please note that you are required to maintain a log-book for all your research, analysis and planning activities in this module.

This module concentrates on teaching students networking principles in top three layers of the Internet's five-layer architecture in a top-down manner, by beginning at application layer towards network layer. With top-down approach, students are exposed to network applications at a very early stage, which enables them not only examine how popular applications and protocols work but also explore how to create their own network applications. Fundament network concepts are taught by using the internet's architecture and protocols as well as other network architectures.

3. AIMS OF THE MODULE

To teach students network fundamental principles, identify fundamental networking issues and studies approaches towards addressing these issues

4. LEARNING OUTCOMES

On successful completion of the Module, students will be expected to:

- Select, explain and apply hardware and software that make up the internet and computer networks. Examine the structure of the global internet and understand the role of each layer. Identify two basic approaches for transporting data through packet switching and circuit switching. Evaluate the network performance according to examine delay, throughput and packet loss.
- Appreciate the conceptual and the implementation aspects of the network applications, client-server architecture, protocols, socket programming.
- In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery, and algorithms for congestion control and flow control.
- In depth understanding of network layer concepts and protocol design; including virtual circuit and datagram network designs, datagram forwarding, routing algorithms, and network interconnections.

5. ASSESSMENT OF THE MODULE

End of module examination (70%) and Network assignment report and log-book (30%)

6. FEEDBACK

Feedback will be posted on Moodle two weeks after the exam period. Marked coursework with completed feedback forms will be returned to students one week after the July subject area exam board.

7. INTRODUCTION TO STUDYING THE MODULE

For this module lectures will take place in lecture rooms. There will be a two-hour lecture every week and two-hour laboratory session for a total of 12 weeks. There will be a revision session in week 13. In which no formal teaching or laboratory work will happen, students on this module will be expected to prepare their coursework assignments during this time.

7.1 Overview of the Main Content

Lectures/ labs– will be at the rate of 2 hours per week. The contact time distribution is 2-hour lecture and 2-hour laboratory every week. Students are encouraged to carry out further reading of the topics covered in order to enhance and broaden their understanding of the subject matter.

Indicative content

A broad overview of computer networking and the internet

What's is the internet

The network edge: access networks, physical media

The network core: packet switching and circuit switching

A qualitative model for end-to-end throughput and delay

- Delay in packet-switched Network
- Packet loss
- Throughput in computer networks

Layered architecture and the service model

- Layered architecture
- Encapsulation and decapsulation

Application layer 1: conceptual aspects of network applications

- Network application architecture
- Processes communicating
- Transport services available to applications
- application-layer protocols

Application layer 2: implementations of some network applications

- The Web and HTTP
- DNS-the internet's directory services
- Peer-to-peer applications

Socket programming

- Socket programming with UDP
- Socket Programming with TCP

Transport layer 1: principles of reliable of data transfer

- Transport layer services
- Connectionless transport: UDP
- Principles of reliable of Data Transfer
- Connection-Oriented transport: TCP

Transport layer 2: principles of congestion control

- The causes and costs of congestion
- Approaches to congestion control
- Fairless

Network layer 1: addressing and forwarding

- Network service model
- Virtual-circuit and datagram networks
- Forwarding and addressing in the internet

Network layer 2: Routers and routing

- Routers
- Routing algorithms
- Routing in the internet

(Note: All of this material is covered in the Core textbook given later)

7.2 Overview of Types of Classes

The teaching will consist of lectures and tutorial sessions. All the main points of the subject matter will be covered in the lectures. Relevant discussions will be carried out in tutorial sessions. Students will be expected to carry out independent studies to enforce their understanding of the subject.

Laboratory sessions will focus on considering important aspects of networking through a selection of scenarios. Students will be informed about the laboratory arrangements during the first week of teaching. The first week of laboratory session will be used to organise students into groups. Each group will be given a network scenario and will develop a worked solution to this during laboratory session.

7.3 Importance of Student Self-Managed Learning Time

All of the material covered in lectures will be based on the core textbook: Computer Networking: A Top-Down Approach, 6/E (See details in section 10 of this guide). The recommended texts contain all the background material required for the course. Lecture notes will be provided which students should study before attending each session. All these will be made available via Moodle(vle.lsbu.ac.uk).

7.4 Employability

Students who successfully complete this module will be able to work in the area of design and maintenance of computer networks. This includes project management and research roles as well as hands on network management roles. The breadth of coverage of this module prepares the student to work in the design of corporate networks WANs and LANS as well as small scale LANs in offices, schools and libraries. There is also potential to work in large telecoms and multimedia industries where there is an increased demand for efficient use of bandwidth.

8. THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

Teaching will consist of 13 two hour lectures which will be classroom based. Two-hour long laboratory sessions will follow from these. It is intended that laboratory sessions will serve to reinforce lecture material as well as provide a forum for discussions in relations to these. They will also be used to provide guidance for the completion of the assignment.

The following are the lecture topics that will be covered. As a guide each of the topics listed below will be covered in approximately 2-hour lecture. So, it may be clear to you that you will need to spend some additional time on each during self-study mode.

Week 1 : A broad overview of computer networking and the internet
Week 2 : A qualitative model for end-to-end throughput and delay
Week 3 : Layered architecture and the device model, part 1 practice
Week 4 : Application Layer 1-Conceptual aspects of network applications
Week 5: Application Layer 2-Implementations of some network applications
Week 6: Socket programming and application part practice
Week 7: Transport Layer 1- Techniques for solving end-to-end reliable communication issues.
Week 8: Transport Layer 2- Congestion-control techniques
Week 9: Transport part practice
Week10: Network Layer 1- IP addressing and packet forwarding
Week 11: Network Layer 2-Routing protocols
Week 12: Network part practice
Week 13: Revision

9. STUDENT EVALUATION

From last year's end of module report it has been identified that it will be necessary to improve organization of laboratory material so that students do not have to submit all coursework at around the same time. This means that all assessed components for the cohort will need to be considered so that a staggered submission requirement is obtained.

10. LEARNING RESOURCES

Note: all the reading materials can be found in Perry library. The core material is in both printed and digital format.

10.1 Core Materials

You will certainly need to refer to textbooks for basic theory, background and especially the applications in the context of your assignment for this module.

For more detailed analysis of material, you are expected to research other material in self-study mode. This is a level 5 module which is very significant in terms of applications and industrial context; lectures cannot (and will not attempt) to replace the general and background reading that a BEng undergraduate student, is expected to do around key subject areas (the old fashioned description remains true - students go to university to 'read for a degree')

Computer Networking: A Top-Down Approach, James F.Kurose and Keith W. Ross, Pearson 6 edition 2012

10.2 Optional Materials

Computer Networks: A Systems Approach, Larry Paterson and Bruce Davie, Morgan Kaufmann, 2011

Internetworking with TCP/IP: Principles, Protocols and Architecture v.1, Douglas E.comer, Addison Wesley,2000

Computer Networks, Andrew S. Tanenbaum, Pearson,2010

Data communications and networking,Behrouz A. Forouzan, McGraw Hill,2013

Online learning resources:

Webopedia <http://www.webopedia.com/>

Online dictionary for computer and Internet technology

traceroute.org <http://www.traceroute.org>

Traceroute provides routes and packet delays between pairs of hosts in the Internet. This site gives you direct access to hundreds of source hosts from which you can trace routes to arbitrary destination hosts. Choose a country, a source host in that country, and any destination host - then see how the packets weave their way through the Internet.

Cookie Central <http://www.cookiecentral.com>

Everything you ever wanted to know about cookies, including how they infringe on users' privacy.

ISC BIND <http://www.isc.org/products/BIND>

DNS name servers use the Berkeley Internet Name Domain (BIND) software. You can learn about it (and download it) here

Exploring Name Servers <http://www.unhooked.net/cgi-bin/host>

nslookup, host, and dig are client programs available for exploring the contents of name servers in the Internet. Several sites, including the one listed above, allow you to access these programs through a Web browser. All of these programs mimic DNS clients. They send a DNS query message to a name server (which can often be supplied by the user), and they receive a corresponding DNS response. They then extract information (e.g., IP addresses, whether the response is authoritative, etc.) and present the information to the user.

The Internet Corporation for Assigned Names and Numbers <http://www.icann.org>

The Internet Corporation for Assigned Names and Numbers (ICANN) is the non-profit corporation that was formed to assume responsibility for the IP address space allocation, protocol parameter assignment, domain name system management, and root server system management functions previously performed under U.S. Government contract by IANA and other entities.

Cisco <http://www.cisco.com>

Cisco is the leader in router (and other networking) technologies. They have many excellent online tutorials for many networking technologies and products.