

EN0710 Computer Networking

Computer Networking Image

The aim of this module is to provide a postgraduate introduction to modern computer communications networks. It provides an opportunity for students to investigate, analyse and evaluate various aspects of computer networking, ranging from the basics of the ISO/OSI 7 layer model to topics of current research: streaming multimedia, sensor networks and peer-to-peer networks, for example.

One of the features of the module is that it encourages students to work directly with primary sources, including ISO standards, RFC's and original research papers.

The module is assessed by coursework assignment which includes a group programming project and a research presentation/report.

1. Module Team

Module Tutor

[Ahmed Bouridane](#)

Lecturer

[Nauman Aslam](#)

2. Teaching Arrangements

Lecture Tue 14.00-16.00, PB 108

Labs Fri 13.00, Ellison Building D003 South

In most teaching weeks, students should attend one 2-hour lecture and one 1-hour lab session per week. You may need to look at your personal timetable to see which lab session you should attend.

3. Synopsis

The aim of this module is to provide a postgraduate introduction to modern computer communications networks.

On completion of this module, students will be able to:

1. Understand, apply and critically discuss fundamental principles in managing the complexity of computer networks, in particular layered, service-oriented and protocol-oriented views of network architecture.

2. Discuss the design principles and implementation of a variety of key networking protocols and algorithms and critically evaluate their effectiveness in a range of practical applications.
3. Apply appropriate theory, practices and tools to the development of networked applications.
4. Discuss applications, protocols or algorithms of current interest to the computer network research community.

4. Teaching Plan

The following is a *provisional* guide to the organisation of the module for this year. These arrangements are subject to change during the course of the module.

Week	W/c	Lecture	Practical	Reading
1	23-Jan	Introduction to the Module. Network Applications, Architecture and Protocols [Slides]	Introduction to the networks lab	[KR07 Chapter 1], [CLA88, LCC+03, SRC84, ZIM80]
2	30-Jan	Network Applications. Transport Layer [Slides]	Socket programming in Java [Lab]	[KR07 Chapters 2 and 3], [CK74, JK88, MOC88, RFC 1350]
3	06-Feb	Network Layer [Slides]	Socket Programming in Java; Designing a networking experiment [Lab]	[KR07 Chapter 4], [DBC+97, PAX97]
4	13-Feb	Advanced topics 1 [Slides]	Network application software development [Assignment Specification Part 2]	[KR07 Chapter 7], [BS04, CT90]
5	20-Feb	Reading week (No session)	Reading week (No session)	Independent study
6	27-Feb	Direct Link Networks [Slides]	Network application software development [Introduction to Wireshark]	[KR07 Chapter 5], [MB76]

7	05-Mar	Packet switching [Slides]	Network application software development	[KR07 Chapter 5], [AW99, RFC 1547]
8	12-Mar	Network Security [Slides]	Network application software development	[KR07 Chapter 8] [DH76, ELL87, RFC 1321]
9	19-Mar	Advanced topics 2 [Slides]	Network application software development	[KR07 Chapter 6]
10	26-Mar	Reading Week (No session)	Reading Week (No session)	Independent study
11	23-Apr	Research Presentations	Research Presentations	Independent study
12	30-Apr	Software Demonstrations	Software Demonstrations	

Note:

In addition to the taught sessions, you are expected to undertake independent and directed learning. On average, you should be spending about 15 hours per week on this module.

5. Assessment

Summative assessment is undertaken via:

1. a [research investigation and presentation](#) assessing learning outcomes 1 and 4 (30%)
 - [Complete list of recommended papers](#)
 - [List of papers allocated to date](#)
2. a group programming project + individual report, assessing learning outcomes 2 and 3 (70%)
 - [Requirements specification](#)
 - [Groups](#)

Formative assessment is provided in the form of a variety of small development or analytical exercises with opportunities for discussion and review.

6. Recommended Reading

You are strongly advised to obtain a copy of one of the first two texts below for your personal use. Try the [Northumbria University campus bookshop](#).

Textbooks

- [KR07] Kurose,J., Ross,K., *Computer Networks: A Top-Down Approach*, Addison Wesley, 2007 [[Amazon](#)]
- [PD07] Peterson,L., Davie,B., *Computer Networks: A Systems Approach*, Morgan Kaufmann, 2007 [[Amazon](#)]

Papers

- [AW99] Awduche,D., *MPLS and Traffic engineering in IP Networks*, IEEE Communications Magazine, pp. 42-47, Dec 1999 [[PDF](#)]
- [BC01] Blumenthal,M., Clark,D., *Rethinking the design of the Internet: The end-to-end arguments vs. the Brave New World*, ACM Trans. on Internet Tech, pp. 70-109, Aug 2001 [[PDF](#)]
- [BS04] Baset,S., Schulzrinne,H., *An Analysis of the Skype Peer-to-Peer Internet Telephony Protocol*, Columbia University Technical Report CUCS-039-04 [[PDF](#)]
- [CLA88] Clark,D., *The Design Philosophy of the DARPA Internet Protocols*, Proceedings of the SIGCOMM'88 Symposium, pp. 106-114, August 1988 [[PDF](#)]
- [CK74] Cerf,V., Kahn,R., *A Protocol for Packet Network Intercommunication*, IEEE Trans. on Communications COM-22(5):637-648, May 1974 [[PDF](#)]
- [CT90] Clark,D., Tennenhouse,D., *Architectural Considerations for a New Generation of Protocols*, Proc. SIGCOMM'90, pp. 200-208, 1990 [[PDF](#)]
- [DBC+97] Degermark, M., Brodnik, A., Carlsson, S., and Pink, S., *Small Forwarding Tables for Fast Routing Lookups*, Proc. SIGCOMM'97, 1997 [[HTML](#)]
- [DH76] Diffie, W., Hellman, M., *New Directions in Cryptography*, IEEE Transactions on Information Theory, 22(6), pp 644-654, Nov 1976 [[PDF](#)]
- [ELL87] Ellis, J., *The Story Of Non-Secret Encryption*, CESG, 1987 [[PDF](#)]
- [JK88] Jacobson, V. and Karels, M., *Congestion Avoidance and Control*, Proc. SIGCOMM'88, 1988 [[PDF](#)]
- [LCC+03] Leiner,B. et al. *A Brief History of the Internet*, Internet Society, 2003 [[HTML](#)]
- [MB76] Metcalf,R., Boggs,D., *Ethernet: Distributed Packet Switching for Local Computer Networks*, Communications of the ACM 19(7):395-403, July 1976 [[PDF](#)]
- [MOC88] Mockapetris,P., Dunlap,K. *Development of the Domain Name System* Proceedings of the SIGCOMM'88 Symposium, pp. 123-133, August 1988 [[PDF](#)]
- [PAX97] Paxson,V., *End-to-End Routing Behavior in the Internet*, IEEE/ACM Transactions on Networking, 5(5):601-615, October 1997 [[PDF](#)]
- [SRC84] Salzer,J., Reed,D., Clark,D., *End-to-End Arguments in System Design*, ACM Trans. on Computer Systems 2(4):277-288, November 1984 [[PDF](#)]
- [ZIM80] Zimmermann,H. *OSI Reference Model - The ISO Model of Architecture for Open Systems Interconnection*, IEEE Trans. on Communications 28(4):425-432, April 1980 [[PDF](#)]

Selected articles from the technical literature, as directed, e.g.

- [IEEE/ACM Transactions on Networking](#)

- IEEE Transactions on Communications
- RFCs, IEEE & IETF standards
- Industry white papers and technical documentation

7. Other resources

- [ACM SIGCOMM](#)
- [IETF](#)
- [Internet Society \(ISOC\)](#)
- [IPTPS](#)
- [ISO/IEC Publicly Available Standards](#)
- [Kurose and Ross Recommended Links](#)
- [Request for Comments \(RFC's\)](#)