

The Changing Internet

Networked Systems (H)

Lecture 1

Course Administration

- Aims, Objectives, Learning Outcomes
- Timetable
- Assessment
- Recommended Reading

Course Coordinator and Materials

- Lecturer and course coordinator
 - Dr Colin Perkins (colin.perkins@glasgow.ac.uk)
 - Office: S101b, Lilybank Gardens
- Course materials on Moodle and <https://csperkins.org/teaching/>



Aims and Objectives

- To introduce fundamental concepts and theory of communications
- To provide a solid understanding of the technology that supports modern networked computer systems
- To give students the ability to evaluate and advise industry on the use and deployment of networked systems
- To introduce low-level network programming, and give students practice with systems programming in C

Intended Learning Outcomes

- By the end of the course, you should be able to:
 - Describe and compare capabilities of various communication technologies and techniques;
 - Know the differences between networks of different scale, and how these affect their design;
 - Understand demands of different applications on quality of service requirements for the underlying communication network;
 - Describe the issues in connecting heterogeneous networks;
 - Describe importance of layering, and the OSI reference model;
 - Demonstrate an understanding of the design and operation of an IP network, such as the Internet, and explain the purpose and function of its various components; and
 - Write simple low-level communication software, showing awareness of good practice for correct and secure programming

Course Structure

Week	Thursday 13:00-15:00 – Labs	Thursday 16:00-18:00 – Group Discussion
1		#1: The Changing Internet
2	#1: Introduction to Network Programming in C	#2: Connection Establishment in a Fragmented Network
3	#2: Connection Establishment	#3: Secure Communications
4	#3: Security and Protocol Ossification	#4: Improving Secure Connection Establishment
5		#5: Reliability and Data Transfer
6	#4: TCP Behaviour and Congestion Control	#6: Lowering Latency
7		#7: Real-time and Interactive Applications
8	#5: Network Topology	#8: Naming and the Tussle for Control
9		#9: Networks and Inter-domain Routing
10		#10: Future Directions

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- Lecture recordings will be made available ahead of time
- Each lecture is accompanied by discussion questions
- Timetabled session from 16:00-18:00 on Thursdays is for discussion – you **must** watch the lecture and think about the discussion questions **before** the timetabled slot

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3	#2: Connection Establishment	#3: Secure Communications
4	#3: Security and Protocol Ossification	<ul style="list-style-type: none"> • Labs materials will be made available in advance, and are to be completed in your own time • Timetabled sessions from 13:00-15:00 on Thursdays are for live support with the lab exercises – try to solve the exercise, and think of questions you might need to ask, before the timetabled support slot
5		
6	#4: TCP Behaviour and Congestion Control	#8: Naming and the Tussle for Control
7		
8	#5: Network Topology	#9: Networks and Inter-domain Routing
9		
10		#10: Future Directions

Assessed Exercise

- The assessed exercise is worth 20% of the marks for this course
 - Available on the day of Lecture 5
 - Deadline on the day of Lecture 7
- Note well:
 - Following the code of assessment, late submissions of assessed exercises will be accepted for up to 5 working days beyond the due date. Such late submissions will receive a two band penalty for each working day, or part thereof, the submission is late. Submissions that are received more than five working days after the due date will be awarded a band of H.
Submissions of assessed exercises that do not follow the instructions given in the handout will be given a two band penalty. These penalties will be strictly enforced.
 - If you are ill, or have other circumstances that may affect your submission, then you may contact the course coordinator **before the deadline** to request an extension, following the usual procedure.

Examination

- The final exam is worth 80% of the marks for this course
- Exam format: answer all three questions
 - The aim is to test your understanding of the material, not just to test your memory of all the details – **explain why, don't just recite what**
 - Note that the University code of assessment (https://www.gla.ac.uk/media/Media_106264_smxx.pdf) states that excellent performance (Grade A) is likely to be characterised by various factors, including:
 - reasoned arguments developing logical conclusions
 - evidence of wide, relevant reading
 - application of learning to new situations and problem solving
 - Material covered in the lectures and lab exercises is examinable (you will not be expected to write code in the exam) – you are also expected to follow the required readings
- Past papers are on Moodle – papers from 2020 onwards are most representative

Required Reading

- You are expected to read one of the following:
 - Peterson and Davie, Computer Networks: A Systems Approach, 5th Edition, Morgan Kaufman, 2011, ISBN 0123851386 (£). The authors make an updated version of this book available for free online at <https://book.systemsapproach.org>
 - Bonaventure, Computer Networking: Principles, Protocols and Practice, free online textbook available at <https://www.computer-networking.info/>
 - Kurose and Ross, Computer Networking: A Top-Down Approach, 8th Edition, Addison-Wesley, 2021, ISBN 978-1292405469 (£)
 - Tanenbaum, Feamster, and Wetherall, Computer Networks, 6th Edition, Prentice Hall, 2021, ISBN 978-1292374062 (£)
- **You are expected to read-along with the lectures – the lectures introduce the core ideas, while the books and linked papers, RFCs, and blog posts provide detail and context**

The Changing Internet

- Review of the Internet architecture
 - Protocols and Layers
 - Physical and Data Link Layers
 - Network Layer and Internet Protocols
 - Transport Layer
 - Higher Layer Protocols
- The Changing Internet