

SUBJECT DESCRIPTION FORM

Subject Title: Internet Infrastructure and Protocols

Subject Code: COMP5311

Credit Value: 3

Pre-requisite: (Subject title and code no, if any) Nil

Recommended background knowledge:

Students are expected to possess knowledge taught in a typical first course on computer networks, including layering architecture, layer-two network protocols, and some higher-layer network protocols.

Mutual Exclusions:

Internetworking Protocols and Software I (COMP526)

Learning Approach:

42 hours of Class activities including - lecture, tutorial, lab, workshop seminar where applicable

Assessment:

Continuous Assessment	30%
Class Project	35%
Test, and Examination	35%

Objectives:

The overall objective of this course is to build up a solid understanding on the networking technologies underpinning the current Internet infrastructure. This course would serve as an important pre-requisite for other more advanced topics, such as network security, network measurement and diagnosis, wireless and mobile networks, and multimedia networking. The teaching approach will be based on in-depth problem-solving and hands-on class projects. Specifically,

1. Understand the TCP/IP technology underpinning Internet;
 2. Understand the original design philosophy of Internet, and the strength and weaknesses of the then designed Internet in today's computing environment;
 3. Explore some most up-to-date development in the Internet technology; and
 4. Acquire knowledge in one specific Internet topic through a group project.
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The Department reserves the right to update the syllabus contents. Please note that the learning approach for the same subject could vary slightly due to different delivery modes.

Learning Outcomes:

After completing the subject, students should be able to:

1. read some articles in a professional computer networking magazine, such as the NetworkWorld and IEEE Network, and ACM netWorker;
 2. use various network diagnosis tools, such as Wireshark, traceroute programs, and various ping and ping-like tools to study network protocols and perform simple diagnosis and troubleshooting; and
 3. take on a self-study on more advanced networking topics that require foundational understanding of the TCP/IP suite.
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Keyword Syllabus:

1. Data-link networks and IP: shared medium and point-to-point networks; the internetworking problem, the hour-glass model, address resolution, IP fragmentation, packet reordering, IP addressing
 2. IP forwarding: longest prefix match algorithms, routing vs switching, IP address lookup, packet classification, IP tunnelling, ICMP
 3. End-to-end issues and protocols: end-to-end argument, end-to-end reliability, TCP and UDP, sliding window protocol, acknowledgment strategies
 4. Control congestion in Internet: TCP slow-start and congestion avoidance, TCP fast retransmit and recovery, fairness, buffer management, packet scheduling, and queue management
 5. Applications protocols, e.g., DNS and HTTP, and their interactions with the lower layers
 6. Internet routing: Internet topology, distance vector, link state, and path vector routing protocols, convergence and routing loops, Routing Information Protocol, Open Shortest Path Protocol, Border Gateway Protocol, Inter-AS relationship
 7. Design philosophy of IP and TCP, and future challenges
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Indicative reading list and references:

1. J. Kurose and K. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, Third Edition, Addison Wesley, 2004.
2. L. Peterson and B. S. Davie, *Computer Networks: A Systems Approach*, Third Edition, Morgan Kaufmann, 2003.
3. R. Perlman, *Interconnection*, Second Edition, Addison Wesley, 2000.
4. S. Keshav, *An Engineering Approach to Computer Networking*, Addison Wesley, 1997.
5. W. R. Stevens, *TCP/IP Illustrated Volume I, The Protocols*, Addison Wesley, 1994.
6. G. Varghese, *Network Algorithmics*, Morgan Kaufmann, 2005.
7. M. Medhi and K. Ramasamy, *Network Routing: Algorithms, Protocols, and Architectures*, Morgan Kaufmann, 2007.
8. J. Stewart III, *BGP4: Inter-Domain Routing in the Internet*, Addison Wesley, 1999.
9. C. Huitema, *Routing in the Internet*, Prentice Hall PTR, Second Edition, 1999.
10. C. Huitema, *IPv6: The New Internet Protocol*, Second Edition, Prentice Hall PTR, 1997.
11. C. E. Perkins, *Mobile IP: Design Principles and Practices*, Addison Wesley, 1998.
12. B. S. Davie and Y. Rekhter, *MPLS: Technology and Applications*, Morgan Kaufmann, 2000.
13. B. Krishnamurthy and J. Rexford, *Web Protocols and Practice*, Addison Wesley, 2001.

Supplementary articles from IEEE/ACM publications