Carleton University Department of Systems and Computer Engineering *Computer Communications*

SYSC 4602

Course Outline

Instructor

Professor C. Huang Room 4486ME Tel: 520-2600 ext. 5730 Email: <u>huang@sce.carleton.ca</u> http://www.sce.carleton.ca/faculty/huang.html

Office Hours

TBD

TA Information TBD

Calendar Information

Layered network architectures, TCP/IP suite, circuit switching, packet switching. Physical media, data transmission, multiplexing. Data link controls, MAC protocols, random access, polling, IEEE 802 standards. Bridges, switched Ethernet, VLANs. Routing algorithms, Internet routing protocols, datagram networks, virtual circuit networks. Transport protocols.

Course Number SYSC 4602

Course Title Computer Communications

Calendar Description

http://calendar.carleton.ca/undergrad/courses/SYSC/

Prerequisites

Students who take this course should have some basic knowledge on probability and statistics.

SYSC 2510 or STAT 2605 or STAT 3502 (may be taken concurrently), and third-year status in Biomedical and Electrical, Electrical, Communications, Computer Systems, Software, or Sustainable and Renewable Energy Engineering.

Students who have not satisfied the prerequisites for this course must either withdraw from the course or obtain a prerequisite waiver by visiting the Engineering Undergraduate Academic Support Office.

Course Objectives

The course is an entry-level course on computer communications. Students will learn the basic concepts, protocols, architectures, performance evaluation techniques about computer communications. By investigating the issues in computer communications and how these issues have been addressed, students will develop a systematic understanding of computer communication systems and the tradeoffs made in massive and complex engineering projects.

Learning Outcomes

Fall 2019

Carleton University Department of Systems and Computer Engineering

SYSC 4602

Computer Communications

Fall 2019

Course Outline

- 1. Know the concepts of circuit switching, packet switching, virtual circuit network, and datagram network
- 2. Know the layered structure and functions of each layer
- 3. Understand how to calculate different types of delay in packet switching network
- 4. Know properties of different types of physical media
- 5. Know different multiplexing techniques
- **6.** Understand how error detection and correction work and how to estimate error detection probability
- 7. Know how point-to-point links work
- **8.** Know how different types of LANs work
- 9. Understand how to calculate performances of LANs
- **10.** Understand how to find shortest paths using routing algorithms
- **11.** Know different routing protocols
- **12.** Know how TCP/IP works
- **13.** Understand how to use Traceroute, Wireshark to get information about a network

Graduate Attributes (GA's)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes at the time of graduation. Activities related to the learning outcomes listed above are measured throughout the course and are part of the department's continual improvement process. Graduate attribute measurements will not be taken into consideration in determining a student's grade in the course. For more information, please visit: https://engineerscanada.ca/.

		Graduate Attribute	Learning Outcome (s)
1.9.	5 I	Communication networks	1-14
2.3	D	Use of assumptions	3,6,9
3.3	Α	Experimental procedure	2,8,12,13
3.4	D	Data reduction methods and results	2,4,9,10,12,13
5.3	D	Tools for design, experimentation, simulation, visualization, and analysis	2,8,12,13
5.5	D	Limitations of such tools and the assumptions inherent in their use	2,8,12,13

Text: A. S. Tanenbaum and D. J. Wetherall, *Computer Networks*, Prentice Hall, 2011. 5th edition.

References

Computer Networking: A Top-Down Approach Featuring the Internet, Pearson, J. F. Kurose and K. W. Ross, 2017, 7th edition

TCP/IP Illustrated, Vol. 1, W. R. Stevens, Addison-Wesley, 1994

Computer Networks: A Systems Approach, L. L. Peterson and B. S. Davie, Morgan Kaufmann, 4th Edition, 2007

SYSC 4602

Course Outline

Fall 2019

Data and Computer Communications, W. Stallings, Prentice Hall, 9th Edition, 2011

http://www.ietf.org

Marking Scheme

Participation	15%
Labs	10%
Midterm 1	15%
Midterm 2	15%
Final Exam	45%

Final Exam: *Is for the evaluation purposes only and will not be returned to the student.* You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the final grades have been made available.

Deadline Policy

Late assignments will not be accepted. All assignments shall be submitted online.

Class Schedule

13:05am-14:25pm, Tuesday and Thursday.

Laboratory

L1O: 8:35am -11:25am, Friday L1E: 8:35am -11:25am, Monday L2E: 8:35am -11:25am, Friday

Checking Marks

Lists of term marks will be posted on dates to be announced. It is each student's responsibility to check that marks are correct or report any errors by the specified deadline.

Review Week

Accreditation of our Engineering programs requires that classes and laboratories, tutorials, or problem analysis sessions continue to run through the review period of the fall term. For 2019, the last day of normally scheduled classes falls on December 6, 2019.

Course Schedule

0) Course arrangements, scope etc. Communication networks and services. Telephone networks and computer networks.

Carleton University Department of Systems and Computer Engineering *Computer Communications*

Fall 2019

Course Outline

- 1) Types of delay, protocols, services, and layering. OSI model and TCP/IP architecture. Lab 1
- 2) Physical media, multiplexing, access networks. Issue Ass.1
- 3) Data link controls, error detection, PPP. Lab hours: Tutorial 1
- MAC, random access, Aloha, CSMA, CSMA/CD, scheduling. Issue Ass. 2. Midterm 1
- 5) LAN protocols, Ethernet, WiFi Lab hours: Tutorial 2 and Lab 2
- 6) Bridges, Switches.

SYSC 4602

- 7) VLAN and data center networks. Lab hours: Tutorial 3 and Lab 3.
- 8) Network layer, datagram vs. virtual circuit networks, MPLS. Issue Ass 3. Midterm 2
- 9) IP, ARP, DHCP, CIDR, ICMP. Lab hours: Tutorial 4 and Lab 4.
- 10) Routing in packet networks. Issue Ass. 4.
- 11) Internet routing protocols, RIP, OSPF, BGP. Lab hours: Tutorial 5 and Lab 5
- 12) TCP/UDP overview. Term marks will be posted. Request for correction of errors must be received before Final Exam.

General Regulations

Attendance: Students are expected to attend all lectures and lab periods. The University requires students to have a conflict-free timetable. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 2.1.3, Course Selection and Registration and Section 2.1.7, Deregistration.*

Health and Safety: Every student should have a copy of our Health and Safety Manual. A PDF copy of this manual is available online: <u>http://sce.carleton.ca/courses/health-and-safety.pdf</u>

Deferred Term Work : Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3.0) working days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in

2019-08-20

Carleton University Department of Systems and Computer Engineering *Computer Communications*

SYSC 4602

Course Outline

the academic schedule. For more information, see the current Undergraduate Calendar, Academic Regulations of the University, Section 4.4, Deferred Term Work.

Appeal of Grades : The processes for dealing with questions or concerns regarding grades assigned during the term and final grades is described in the *Undergraduate Calendar*, *Academic Regulations of the University, Section 3.3.4, Informal Appeal of Grade and Section 3.3.5, Formal Appeal of Grade.*

Academic Integrity: Students should be aware of their obligations with regards to academic integrity. Please review the information about academic integrity at: https://carleton.ca/registrar/academic-integrity/. This site also contains a link to the complete Academic Integrity Policy that was approved by the University's Senate.

Plagiarism: Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated.

Academic Accommodation: You may need special arrangements to meet your academic obligations during the term. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <u>http://www.carleton.ca/equity/</u> For an accommodation request, the processes are as follows:

- Pregnancy or Religious obligation: Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see <u>https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf</u>
- Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your *Letter of Accommodation* at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (*if applicable*).
- **Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/sexual-violence-support/.
- Accommodation for Student Activities: Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student

Carleton University Department of Systems and Computer Engineering

partment of Systems and Computer Engineer Computer Communications

SYSC 4602

Fall 2019

Course Outline

participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see <u>https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf</u>

Copyright on Course Materials: The materials created for this course (including the course outline and any slides, posted notes, labs, project, assignments, quizzes, exams and solutions) are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the author(s).