



Carleton
UNIVERSITY

Department of
**Systems and
Computer Engineering**

SYSC 4602

Computer Communications

Calendar description

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.

Includes: Experiential Learning Activity.

Lectures three hours a week, laboratory three hours alternate weeks.

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

Prerequisites

ECOR 2050 or 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.

Precludes additional credit for COMP 3203.

Prior knowledge

Students should have:

- Basic knowledge on probability and statistics.

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.

List of topics

- Communication networks and services
- Telephone networks and computer networks
- Types of delay, protocols, services, and layering
- OSI model and TCP/IP architecture

- Physical media, multiplexing, access networks
- Data link controls, error detection, PPP
- MAC, random access, Aloha, CSMA, CSMA/CD, scheduling
- LAN protocols, Ethernet, WiFi
- Bridges, Switches
- VLAN and data center networks
- Network layer, datagram vs. virtual circuit networks, MPLS
- IP, ARP, DHCP, CIDR, ICMP
- Routing in packet networks
- Internet routing protocols, RIP, OSPF, BGP
- TCP/UDP overview

Learning outcomes

By the end of this course, students should be able to:

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

Graduate Attributes (GAs)

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.S: Knowledge Base: Introduced: Communication networks | 1-14 |
| 2.3: Problem Analysis: Developed: Use of assumptions | 3, 6, 9 |
| 3.3: Investigation: Applied: Experimental procedure | 2, 8, 12, 13 |

| | |
|--|---------------------|
| 3.4: Investigation: Developed: Data reduction methods and results | 2, 4, 9, 10, 12, 13 |
| 5.3: Use of Engineering Tools: Developed: Tools for design, experimentation, simulation, visualization, and analysis | 2, 8, 12, 13 |
| 5.5: Use of Engineering Tools: Developed: Limitations of such tools and the assumptions inherent in their use | 2, 8, 12, 13 |

Accreditation Units (AUs)

For more information about Accreditation Units, please visit:

<https://engineerscanada.ca/>.

The course has a total of 46 AUs, divided into:

- Engineering Science: 60%
- Engineering Design: 40%

Instructor and TA contact

Specific to course offering (tbd)

Textbook (or other resources)

Specific to course offering (tbd)

Evaluation and grading scheme

Specific to course offering (tbd)

Breakdown of course requirements

Specific to course offering (tbd)

Tentative week-by-week breakdown

Specific to course offering (tbd)

General regulations

Specific to course offering (tbd)