



Carleton
UNIVERSITY

Department of
**Systems and
Computer Engineering**

SYSC 4700

Telecommunications Engineering

Calendar description

Telecommunications as a national and international infrastructure. Systems view of network architecture: transmission, access, switching, multiplexing, signaling, and teletraffic. Network planning, management, security and control. Role of government, regulation and competition. Current telecommunications network evolution.

Includes: Experiential Learning Activity.

Lectures three hours a week, laboratory/problem analysis three hours alternate weeks.

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

Prerequisites

Fourth-year status in Electrical, Computer Systems or Communications Engineering, and (SYSC 3501 or SYSC 3503).

Prior knowledge

Students should have knowledge of:

- Linear systems with input-output characterization (SYSC 3600/2500, SYSC 3501/3503).
- Frequency domain analysis (SYSC 3600/2500).
- Elementary digital communications (SYSC 3501/3503).
- Fundamentals of networking.

Course objectives

The modern telecommunications network is based on a broad spectrum of engineering principles for its design, evolution, operation and management. This course surveys these broad topics from a telecommunications industry perspective. We are fortunate in having a number of experts from the telecommunications industry, and the federal government, as well as from Carleton University to give the lectures.

The scope of this course is broader than almost any other course you have taken. The course aims to give you the big picture. The course may help in job interviews as well.

List of topics

- History of Telecommunications
- Network Management

- Packet Networking
- Transmission of Information
- Global Telecommunications Standards
- Transmission Media
- Broadband Access Technologies – xDSL & FTTx
- Voice over IP
- Introduction to Data Analytics and Machine Learning in Communications
- Cellular Communications & Networks
- Wireless LAN / WiFi
- Cryptography
- Containers
- Multiprotocol Label Switching (MPLS) Services
- Internet Technology & Cloud Computing Overviews
- Quantum Computing
- Non-Terrestrial Networks
- Network Function Virtualization (NFV)
- Software Defined Networks (SDN)

Learning outcomes

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

- Discuss the history of telecommunication especially the evolution from 1G to 5G and beyond.
- Understand different types of transmission media, their characteristics and bandwidth requirements for different technologies.
- Understand the link budget analysis, calculate the required transmission power for a given bandwidth and bit error rate.
- Have familiarity with different topics such as Voice over IP, patenting, cryptography, machine learning, cellular communication, telecommunication standards, wireless networks, packet networking, cloud computing, multiprotocol label switching (MPLS), software defined networks (SDN), etc.

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: Applied: Communication networks	
3.1: Investigation: Applied: Complex problem assessment	
4.7: Design: Applied: Evaluation based on engineering principles	

5.4: Use of Engineering Tools: Developed: Information from relevant publications	
7.2: Communication Skills: Developed: Professional documents: writing, design notes, drawings, attributions, and references	

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)