**Concordia University**

**Department of Electrical and Computer Engineering**

COEN 366 – Communications Networks and Protocols

Winter 2022

COURSE OUTLINE

**Professor**: Chadi Assi

Professor

**Office**: EV9.179

# Phone: (514) 848-2424 x. 5799

**Email**: [chadi.assi@concordia.ca](mailto:chadi.assi@concordia.ca)

**Office hours:**  Tuesdays/Thursdays 11:30am – 12:30pm

1. **Course Description**

Introduction to computer networks and their communications protocols. This course will follow a top down approach learning methodology. We first start by the application layer, learning the various concepts for designing networking applications. Students will learn socket programming with both UDP and TCP. Students will be exposed to the principles of application later and learn various representative applications, such as HTTP, DNS, etc. Next, the course will cover the transport layer. We start by teaching multiplexing and de-multiplexing, techniques both for datagram and connection oriented sessions. We will explain in details concepts such as reliable data transfer, flow and congestion controls. Then we will explain the details of the TCP protocol. Following the top down methodology, we go down the network layer and discuss addressing, sub-netting, routing and inter-networking, forwarding, and the various concepts and problems related to this layer. We will also expose the students to the emerging paradigm of software defined networks (SDN), talk about OpenFlow, etc. If time permits, we will discuss Layer 2 operation, multiple access, etc.

1. **Course Objectives**

The objective of this course is to enable the student to understand basics of Communications protocols, flow control, error detection and error control techniques. Network topologies including local area networks (LANs) and wide area networks (WANs). Layered architecture standards (OSI and TCP/IP) and protocols. Internetworking. Application and socket programming.

1. **Course Learning Outcomes (CLOs)**

Upon successful completion of the course, students will be able to

1. Be able to do socket programming.
2. Be able to work and configure CISCO routers and switches (covered in the lab)
3. Be able to analyze the performance of various networking protocols
4. Be familiar with various routing protocols, such as OSPF, BGP,etc.
5. Be familiar with networking concepts, such as reliable data transfer, flow and congestion controls.
6. Be able to perform network sub-netting and address assignments.

**Moodle Course website:** All the course materials including lecture slides, exercises, announcements, assignments (description and submission) are posted on moodle site ONLY. Check frequently the website for announcements, course material, assignments, etc.

1. **Course Organization**
   1. **Lectures and Tutorials**

The lectures, tutorials and other relevant materials for COEN 366 will be posted on Moodle.

**Topics Covered (Tentative):**

1. Introduction to Computer networks
2. Application Layer (principles, some apps, socket programming)
3. Transport Layer (Principles of error detection and control , principles of Flow and congestion control, TCP)
4. Network Layer (forwarding, switching, routing, addressing and internetworking, SDN, etc.)
5. (if time permits) Link Layer (Error detection and control, Access methods: deterministic and random, Aloha and S-Aloha, CSMA/CD, Ethernet, STP protocol)
   1. **Textbook**

# Required: “Computer Networking: A Top-Down Approach”, 7th Edition by James Kurose Keith Ross

# Reference “Communication Networks: Fundamental Concepts and Key Architectures” by Alberto Leon-Garcia and Indra Widjaja

1. **Course Evaluation**

Lab assignments + Proj. 30%

Midterm Exam 20%

Final Exam 50%

* 1. **Assignments + Project**

There will be **three** to **four lab** assignments worth up to 15% of your mark. There will also be a project which is worth 15% of your grade.

**Policy on late submissions (these rules will be enforced):**

You have totally 8 hours of grace period of any late submission of assignments. Beyond 8 hours: One day delay will result in 20% mark reduction. Two days delay will result in 40% mark reduction. After that, the assignment will not be accepted.

* 1. **Midterm Exams**

There will be one midterm exam worth 20% of your total grade. The date will be determined in class.

* 1. **Final Exam**

There will be one final exam that is worth 50% of your total grade. The final exam is scheduled by the University. The date and place will be announced later.

1. **Graduate Attributes**

This course emphasizes and develops the following CEAB (Canadian Engineering Accreditation Board) graduate attributes and indicators:

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| --- | --- | --- | --- | --- |
| **Graduate Attribute** | **Indicator** | **Level of knowledge** | **CLO** | **Evaluation Method** |
| A Knowledge-base for Engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program. | KB-3. Knowledge base in a specific domain (ELEC and COEN) | Advanced | all | Assignments, Midterm and Final exams. |
| Problem Analysis: An ability to use appropriate knowledge and skills to identify, analyze, and solve complex engineering problems in order to reach substantiated conclusions. | PA-1. Problem identification and formulation  PA-2. Modelling  PA-3. Problem solving  PA-4. Analysis (uncertainty and incomplete knowledge) | Advanced | all | Assignments, Midterm and Final exams |

1. **Academic Honesty**

Violation of the Academic Code of Conduct in any form will be severely dealt with. This includes copying (even with modifications) of program segments. You must demonstrate independent thought through your submitted work.

Click on the following link for more information:

<http://www.concordia.ca/students/academic-integrity.html>