# Course Outline (F2023)

## COE768: Computer Networks

### Instructor(s)
Dr. Truman Yang [Coordinator]
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Office Hours: By Appointment

### Calendar Description
This is an introductory course in computer networks. In particular, it concentrates on the Internet technology. It first introduces the OSI and TCP/IP network architecture models. It then studies the implementation principles and design issues at each layer of these models. Lecture topics include: OSI and TCP/IP models, data transmission basics, data-link protocols, local area networks, wide-area networks, Internet structures, TCP/IP protocol suite, and application Layer protocols.
Laboratory work focuses on the implementation of stop-and-wait protocol based on the BSD socket. In addition, students will gain practical experience by building and studying a physical network using network devices such as switches and routers.

### Prerequisites
(COE 538 or ELE 538) and ELE 532

### Antirequisites
None

### Corequisites
None

### Compulsory Text(s):

### Reference Text(s):

### Learning Objectives (Indicators)
At the end of this course, the successful student will be able to:

1. Uses analytical models to predict and control and networking components and processes behaviors. (1b)
2. Uses engineering knowledge to solve real world open-ended engineering problems. Uses the specialized core engineering knowledge in the field of computer networks to understand and design a various types of communication links and networks. (1c)
3. Uses the specialized core engineering knowledge in the field of computer networks to understand and design a various types of communication links and networks. (1d)
4. Generate solutions for complex engineering design problems. (4b)
5. Demonstrates iterative design process in complex engineering projects. (4c)
6. Writes and revises documents using appropriate discipline specific conventions. (7a)
7. Demonstrates confidence in oral communications and explains and interprets results clearly. (7b)

**NOTE:** Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).
### Course Organization

- 3.0 hours of lecture per week for 13 weeks
- 2.0 hours of lab per week for 12 weeks
- 0.0 hours of tutorial per week for 12 weeks

### Teaching Assistants

TBA

### Course Evaluation

#### Theory

<table>
<thead>
<tr>
<th>Exam</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exam</td>
<td>25 %</td>
</tr>
<tr>
<td>Final Exam</td>
<td>45 %</td>
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</tbody>
</table>

#### Laboratory

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Assignments</td>
<td>12 %</td>
</tr>
<tr>
<td>Project</td>
<td>18 %</td>
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</tbody>
</table>

**TOTAL:** 100 %

**Note:** In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both "Theory and Laboratory" components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section above for details on the Theory and Laboratory components (if applicable).

### Examinations

- Midterm exam, week 7, 120 minutes.
- Final exam, during exam period, three hours.

### Other Evaluation Information

- Project demonstration and report
- Lab demonstration
  - All 4 Lab assignments have to be done individually. The project is a group project.
  - Source codes of each lab assignment should be submitted to D2L 24 hours before the beginning of next lab. Late source code submission or late demonstrations will not be accepted and will receive a mark of 0.

### Teaching Methods

- Three hours lecture
- Two hours lab

### Other Information

None

### Course Content

<table>
<thead>
<tr>
<th>Week</th>
<th>Hours</th>
<th>Chapters / Section</th>
<th>Topic, description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>6</td>
<td>Chapter 1, 6.1, 6.2</td>
<td>OSI and TCP/IP layer architecture models. Introduction of TCP and UDP.</td>
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<tr>
<td>Day</td>
<td>Lab</td>
<td>Topics</td>
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<tr>
<td>3</td>
<td>3</td>
<td>Section 3.1: Overview of link layer and framing</td>
<td></td>
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<tr>
<td>4</td>
<td>3</td>
<td>Section 3.2.2, 3.3: Error detection coding and framing</td>
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<tr>
<td>5</td>
<td>3</td>
<td>Section 4.3: Local Area Networks (LANs): CSMA/CD, Ethernet</td>
<td></td>
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<tr>
<td>6</td>
<td>3</td>
<td>Sections 4.4: Wireless LAN, VLAN.</td>
<td></td>
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<tr>
<td>7</td>
<td>2</td>
<td>Midterm Exam</td>
<td></td>
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<tr>
<td>8</td>
<td>3</td>
<td>Section 4.8: LAN Switching and Spanning Tree Protocol</td>
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<tr>
<td>9</td>
<td>3</td>
<td>Section 3.4: Sliding Window Protocols: Go-back-N protocol, Selective Repeat Protocol</td>
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<tr>
<td>10</td>
<td>3</td>
<td>Section 5.1, 5.5.1, 5.5.2, 5.6.1 and 5.6.2: IP: IP diagram format and IP addressing</td>
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<tr>
<td>11</td>
<td>3</td>
<td>Section 5.6.2: Subnetting and supernetting</td>
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<tr>
<td>12</td>
<td>3</td>
<td>Section 5.6.3, 5.6.4, 7.1: IP related protocols: ARP, DNS, IPv6</td>
<td></td>
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<tr>
<td>13</td>
<td>3</td>
<td>Section 6.4.1, 6.5.1-6.5.9: UDP and TCP protocols (optional) and Final review</td>
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</table>

Laboratory(L)/Tutorials(T)/Activity(A) Schedule
<table>
<thead>
<tr>
<th>Week</th>
<th>L/T/A</th>
<th>Description</th>
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</table>
| 2-3  | Lab  | Lab 1: Study of the concepts of Layer Architecture  
|      |      | o Traffic analysis using Wireshark  
|      |      | o Study of network encapsulation |
| 4    | Lab  | Lab 2: Study of the characteristics of server running on TCP  
|      |      | o TCP connection establishment and termination  
|      |      | o Server concurrency  
|      |      | o Socket program structure  
|      |      | Demonstration of Lab 1 |
| 5    | Lab  | Lab 3: File download application based on TCP  
|      |      | Demonstration of Lab 2 |
| 6-7  | Lab  | Lab 4: UDP server implementation  
|      |      | Demonstration of Lab 3 on week 6 |
| 8    | Lab  | Project: Peer-to-Peer application  
|      |      | Demonstration of Lab 4 |
| 9-12 | Lab  | Continuation of the project |
| 13   | Lab  | Demonstration of the project. Submit source code of project to D2L before your demonstration.  
|      |      | Final date to submit the project report: Friday, week 13 |

**University Policies**

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website.

**Important Resources Available at Toronto Metropolitan University**

- The Library provides research workshops and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the Library's virtual research help service to speak with a librarian.
- Student Life and Learning Support offers group-based and individual help with writing, math, study skills, and transition support, as well as resources and checklists to support students as online learners.
- You can submit an Academic Consideration Request when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the Senate website and select the blue radio
button on the top right hand side entitled: Academic Consideration Request (ACR) to submit this request.

For Extenuating Circumstances, Policy 167: Academic Consideration allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, require documentation. Students must notify their instructor once a request for academic consideration is submitted. See Senate Policy 167: Academic Consideration.

- If taking a remote course, familiarize yourself with the tools you will need to use for remote learning. The Remote Learning Guide for students includes guides to completing quizzes or exams in D2L Brightspace, with or without Respondus LockDown Browser and Monitor, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.
- Information on Copyright for Faculty and students.

Accessibility

- Similar to an accessibility statement, use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about Academic Accommodation Support.
- Learn how to register with AAS.

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about Academic Accommodations versus Academic Consideration and how to access each.

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student’s ability to succeed in their coursework. These circumstances are outside of one’s control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- Distress Line: 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- Good2Talk: 24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- Keep.meSAFE: 24/7 access to confidential support through counsellors via My SSP app or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- Centre for Student Development and Counselling: 416-979-5195 or email csdc@torontomu.ca
- Consent Comes First - Office of Sexual Violence Support and Education: 416-919-5000 ext 3596 or email osyse@torontomu.ca
- Medical Centre: call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the Toronto Metropolitan University Mental Health and Wellbeing website.