(C)ITM 600 – Data Communication Network Design

COURSE OUTLINE FOR 2024-2025

Prerequisite(s): CITM301
Antirequisite(s): NA

Faculty/Contract Lecturer Information

- ● **Faculty/Contract Lecturer Name:**
- ● **Office Location:**
- ● **Office Hours:**
- ● **Phone:**
- ● **Course Website:**
- ● **Email Address:**

Email Policy

Students are expected to monitor and retrieve messages and information sent through D2L and TMU email on a frequent and consistent basis. In accordance with the Policy on TMU Student E-mail Accounts (Policy 157), Toronto Metropolitan University (TMU) requires that any electronic communication by students to TMU faculty or staff be sent from their official university email account. Communications sent from other accounts may be disregarded.

Course Description

This course will provide students with an understanding of how telecommunications networks are designed and deployed to support e-commerce, multimedia, and web-centric business applications. Network planning concepts, network analysis, network design tools, and techniques are introduced. The objective of this course is to understand the design and analysis of data communications networks through the introduction of case studies and practical network design methodologies. Also, an understanding of the application, deployment, and benefits of industry-standard architectures, including TCP/IP, VoIP, SONET, Gigabit Ethernet, 3G, and other emerging standards, will be provided.

Course Details

Teaching Methods

If you are registered in an in-person or a virtual classroom, instruction will take place at scheduled hours, following the approach outlined in D2L Brightspace. If you are registered in a Chang School Distance Education course, please follow the schedule, course outline and learning modules as outlined in D2L Brightspace.

The primary learning methods in this course are readings from the textbook and course modules, assignments, simulations, group work, learning from external resources, self-assessment, discussions, and examinations based on the taught modules, assignments, etc. Students need to be self-motivated and self-directed with strong time-management skills. The course will incorporate the following teaching/learning methods:

Readings: Weekly readings will be assigned from the book chapters, posted materials, and external resources. It will be the student's responsibility to complete the readings, make appropriate notes, and learn the material from the text and any other course material provided by the instructor.

Individual Assignments and Quizzes: Students are expected to complete any assignments or quizzes during the weeks in which they are assigned. There are four individual assignments and one group assignment. The assignments will be posted on Saturdays and due on the following Sunday unless otherwise stated by the instructor. The quizzes at the end of the modules are for self-assessment purposes and will not be graded.

Group Assignment: The last assignment will be a group assignment with an in-depth design scenario. Four to six students will form a group to complete the assignment. The instructor will make the detailed instruction of the group assignment.

D2L Forums and Case Studies: The course will use various discussion threads through D2L to engage the students actively. The D2L discussion area provides the opportunity for web-based discussions. Particularly, scenario-based case study questions will be posted as a basis for the discussions. Students must respond to the questions and provide feedback to their peers' responses. The instructor will create ten discussion threads. Each week, a discussion thread will be available on Saturday, and the students need to respond to the thread the following Sunday. In addition, students may post their ideas and host their discussion threads.

Network Tools and Utilities: The students will use a variety of hands-on labs to reinforce their learning about how various components of a computer network are connected to provide services. The labs and experiments will use freely available simulation tools

such as Cisco Packet Tracer, Wireshark, and Riverbed Modeler. Links to download these tools will also be provided to the students.

Q&A Sessions: Students can set up appointments to meet the instructor. The meeting can be done using Zoom.

Note: All assessments in this course, regardless of its delivery format, will be held in-person on campus. This applies to in-person, virtual, and online courses, including sections/courses delivered through the Chang School.

Course Materials

Textbook and Other Learning Materials:

Title: Top-Down Network Design (3rd Edition)
Author: Priscilla Oppenheimer
Publisher: Cisco Press / Price: $76.60
ISBN: 978-1587202834

Optional:
Title: Cloud Computing Simplified: The Thoughts on Cloud Way
Redbook Code: The IBM Redbooks™ publication designated REDP-5179-00, released on February 16, 2015
Publisher: IBM Corporation (IBM Redbooks program) in 2015

Title: Mastering Bitcoin: Programming the Open Blockchain (3rd Edition)
Author: Andreas M. Antonopoulos and David A. Harding
Publisher: O'Reilly Media, 2023
ISBN: 978-1098150099

Course Learning Outcomes

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

1. Apply best practices for network security and management strategies
2. Explain the basics of blockchain architecture and IoT devices
3. Participate in and contribute to the development of a physical network design that includes selecting technologies and devices
4. Apply and analyze the characteristics and performances of a given network through various network analysis tools
5. Participate in simulations that will allow them to test and analyze the characteristics and performances of a given network
6. Analyze business and technical goals within the given constraints of an existing network and the characteristics of its traffic

7. Recommend various protocols to be used in network design and implementation
8. Design a suitable logical IP network that includes addressing and numbering schemes, switching and routing protocols for a given set of constraints and requirements.

Academic Integrity

Academic integrity is integral to your learning, the credibility of your degree or certification, and the integrity of the university as a whole. Senate Policy 60: Academic Integrity defines academic misconduct, provides a non-exhaustive list of examples of behaviours that may be considered as academic misconduct, and explains how academic misconduct concerns are evaluated and decided. The entirety of the policy applies in this course. As well, please note that submitting work created in whole or in part by artificial intelligence tools unless expressly permitted by the faculty/contract lecturer, is considered a violation of Policy 60.

Generative AI Course Policy, Plagiarism Detection, and Virtual Proctoring

Generative AI Course Policy

Use of Generative AI (e.g. ChatGPT, Grammarly, Perplexity, DeepL Translator) to develop or assist with any ideas or material submitted for coursework is expressly prohibited in this course. Use of Generative AI in this manner will be considered a breach of Policy 60.

Turnitin or another originality detection software

Turnitin is a plagiarism prevention and detection service to which TMU subscribes. It is a tool to assist faculty/contract lecturers in determining the similarity between students' work and the work of other students who have submitted papers to the site (at any university), internet sources, and a wide range of books, journals and other publications. While it does not contain all possible sources, it gives faculty/contract lecturers some assurance that students' work is their own. No decisions are made by the service; it generates an "originality report," which faculty/contract lecturers must evaluate to judge if something is plagiarized.

Students agree by taking this course that their written work will be subject to submission for textual similarity review to Turnitin. Instructors can opt to have student's papers included in the Turnitin database or not. Use of the Turnitin service is subject to the terms-of-use agreement posted on the Turnitin website. Students who do not want their work submitted to this plagiarism detection service must, by the end of the second week of class, consult with their faculty/contract lecturer to make alternate arrangements. Students who choose not to have their papers screened for textual similarity review by turnitin may be required to submit additional work with their research essay. For example:

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- an annotated bibliography of each source used in your paper; and/or
- the first few pages of each cited source used in your paper

Even when an faculty/contract lecturer has not indicated that a plagiarism detection service will be used, or when a student has opted out of the plagiarism detection service, if the faculty/contract lecturer has reason to suspect that an individual piece of work has been plagiarized, the faculty/contract lecturer is permitted to submit that work in a non-identifying way to any plagiarism detection service.

Copyright

The course materials provided to you are copyrighted, and may not be shared without my express written permission. Do not share these materials (e.g. course outline, lecture slides, assignment instructions) with others and do not post them on the internet during the course, or at any time after. If you do so, Policy 60 will apply.

Academic Integrity Resources

To learn more about Policy 60 and how to avoid academic misconduct, please review and take advantage of these resources:
- Policy 60: Academic Integrity: www.torontomu.ca/senate/policies/academic-integrity-policy-60/
- Academic Integrity Office website: www.torontomu.ca/academicintegrity
- "Academic Integrity in Space" game: https://games.de.torontomu.ca/aio/#/
- "Academic Integrity in Cyberspace!" game: https://www.torontomu.ca/aic/#/
- Student Life and Learning Support: www.torontomu.ca/student-life-and-learning/learning-support

Topics and Course Schedule

Week	Topic	Readings
1	**Identifying your Customer's Needs and Goals** • Structured Network Design Process • Network Design and Implementation Cycle • Open System Interconnection Reference Model • Analyzing Business Goals • Analyzing Technical Goals	Priscilla Oppenheimer: Chapter 1 & 2
2	**Characterizing the Existing Internetwork and Network Traffic** • Development of a Network Map • Characterizing Network Addressing and Wiring • Network Health Monitoring • Network Traffic Flow and Behaviour Characterization • Characterizing Traffic Load and Quality-of-Service Requirements	Priscilla Oppenheimer: Chapter 3 & 4
3	**Designing a Network Topology** • Basic Network Topologies • Flat Network Topologies • Hierarchical Network Topologies • Virtual Local Area Network • VLAN Trunking and Link aggregation • Spanning Tree Protocol and Hot Standby Router Protocol (HSRP) • Virtual Private Networking • Secure Network Design Topologies	Priscilla Oppenheimer: Chapter 5
4	**Designing Models for Addressing and Numbering** • IPv4 and IPv6 Addressing • Guidelines to assign Network Layer Addresses • Dynamic Host Configuration Protocol • Network Address Translation • Hierarchical Model for Assigning IP Addresses • Classless Interdomain Routing and Classful Routing • Route Summarization and Discontiguous Subnets • IPv6 Address Types • Network Naming and the Domain Name System	Priscilla Oppenheimer: Chapter 6
5	**Cloud Computing and IoT Devices** • Basics of Cloud Computing and Virtualization • Cloud Deployment Models • Cloud Computing Delivery Models and Reference Architecture • Relationship between Cloud and Big Data • Software-Defined Networking • Internet of Things and Cloud • IoT as a Network of Networks • IoT Edge Computing • Importance and Applications of IoT devices	IBM Redbook

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6	**Selecting Switching Protocols** ● Switching and the OSI Layers ● Cut-through and store-and-forward switching modes ● Transparent Bridging ● Spanning tree PortFast ● UplinkFast and BackboneFast ● Link Detection and LoopGuard ● Dynamic Trunk Protocol ● VLAN Trunking Protocol	Priscilla Oppenheimer: Chapter 7
7	**Selecting Routing Protocols** ● Distance-Vector Routing Protocols ● Link-State Routing Protocols ● Routing Protocol Metrics ● Interior vs. Exterior Routing Protocols ● Classful vs. Classless Routing Protocols ● Dynamic vs. Static and Default Routing ● IP Routing: RIP, EIGRP, OSPF, IS-IS, and BGP	Priscilla Oppenheimer: Chapter 7
8	**Fundamentals of Blockchain** ● Origin of Blockchain and how Blockchain works ● Blockchain and Cryptocurrency ● Blocks in a Blockchain and The Genesis Block ● Bitcoin and its structure ● Bitcoin Wallets ● Transactions and Consensus Algorithms ● Blockchain Applications	Andreas M. Antonopoulos: Chapter 2 & 11
9	**Network Management and Machine Learning** ● Network Management Design ● Proactive Network Management ● Fault Management ● Configuration Management ● Accounting Management ● Performance Management ● Security Management ● Network Management Protocol: SNMP ● Machine Learning	Lecture Notes & Priscilla Oppenheimer: Chapter 9
10	**Developing Network Security Strategies** ● Networking Security Design Steps ● Physical Security ● Authentication, Authorization, Accounting ● Symmetric Key Encryption ● Hash Functions ● Public/Private Key Encryption ● Proxy Servers, Firewalls and Packet Filters ● Intrusion Detection and Prevention System ● Honeypots ● Modularizing Security Design	Priscilla Oppenheimer: Chapter 8

11	**VoIP, and Technologies and Devices for an Enterprise/Campus Network** ● An overview of VoIP ● Benefits of VoIP ● VoIP components ● SIP technology ● LAN Cabling Plant Design ● Ethernet Technology ● Selecting Internetworking Devices for a Campus Network Design ● Remote-Access Technologies ● WAN Technologies	Lecture Notes & Priscilla Oppenheimer: Chapter 10
12	**Final Exam Review**	

Evaluation

The grade for this course is composed of the mark received for each of the following components:

Evaluation Component	Due Date	Percentage of Final Grade	Anticipated Return Date
Discussion Board	Ongoing throughout the course	10%	At the end of the term
Assignments	Weeks 4,6, 8, 10	20%	Weeks 5, 7, 9, 11
Group Project	Week 12	5%	Week 13
Midterm Exam	Week 7	20%	Week 8
Final Exam	TBD	45%	TBD
Final Grade		100%	
Note: Students must achieve a course grade of at least 50% to pass this course. At least 20% of the grade based on individual work will be returned to students prior to the last date to drop a course in good academic standing. For Fall 2025, this is Friday November 14, 2025. For Winter 2026, this is Friday March 27, 2026.			

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University Policies

You are reminded that you are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website. Please refer to the Course Outline Appendix for more detail.

Important Resources Available at Toronto Metropolitan University

- The University Libraries provide research workshops and individual consultation appointments. There is a drop-in Research Help desk on the second floor of the library, and students can use the Library's virtual research help service to speak with a librarian, or book an appointment to meet in person or online.
- 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, always require documentation. Students must notify their faculty/contract lecturer once a request for academic consideration is submitted. See Senate Policy 167: Academic Consideration.
  Longer absences are not addressed through Policy 167 and should be discussed with your Chair/Director/Program to be advised on next steps.
- 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.
- FAQs Academic Considerations and Appeals
- Information on Copyright for Faculty and students.
- Information on Academic Integrity for Faculty and students.

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Accessibility

- At Toronto Metropolitan University, we are committed to ensuring that all courses are accessible to everyone and to removing barriers that may prevent some individuals from enrolling in courses.
- All technologies and tools used in this course are accessible.
- Students who discover an accessibility barrier with any of the course materials or technologies should contact their faculty/contract lecturer.
- As outlined in [Policy 159: Academic Accommodation of Students with Disabilities](#), students are required to proactively consult with AAS, the faculty/contract lecturer, Department or Faculty, as soon as feasible, including prior to enrolling in a course or program, on any concerns they may have about their ability to meet the essential academic requirements of a course/program.

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.](#)
- Learn about [Policy 159: Academic Accommodation of Students with Disabilities](#)

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 osvse@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's Wellbeing Central website.

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