

**Western University**  
**Faculty of Engineering**  
**Department of Electrical and Computer Engineering**

**SE 3314B – COMPUTER NETWORKS APPLICATIONS**

**Course Outline 2017-2018**

**Description:** Computer networks and data communication are the fastest growing technologies in our culture today. This is especially true when we are experiencing every year new social networking applications appears and have become quickly very popular. People use the Internet more and more every day. They use the Internet from the time they get up in the morning to the moment they lie down for bed. Therefore, specialists are needed to develop and control the Internet applications or the network applications connected to the Internet.

This course is designed to help students understand the concepts of computer networks in general and the Internet and networks applications in particular. Although the main goal of the course is to teach the concepts of Internet and network applications, it is designed to teach these concepts through the following three dimensions:

- **Technology:** To provide students a technical foundation in data communications and network technology. Topics include: multimedia networking, mobile and wireless data communications, client-server and p2p network applications, network security protocols, and network management.
- **Configuration:** Students will gain hands-on experience in Cisco labs, using state-of-the-art technologies such as NetLab and VMware server. Laboratory activities include creating, installing, configuring and maintaining Cisco-based network systems.
- **Implementation:** The course is designed to extend students' knowledge and practice in design of computer networks applications by focusing on network programming in the context of network protocol implementation (e.g., TCP, UDP, ICMP, RTP, RTSP, and non-standard protocols). Assignments require students to develop GUI and/or Web based client-server and peer-to-peer applications.

**Instructor:** Dr. Abdelkader Ouda, Ph.D., P.Eng.  
TEB 359, 519-661-2111 ext. 81299, [aouda@uwo.ca](mailto:aouda@uwo.ca)  
Consultation hours: Thursday, 10:30 am – 12:30 pm.

**Academic Calendar Copy:**

**Contact Hours:** 3 lecture hours per week and 2 laboratory hours per week.

**Prerequisites:** ECE 4436 A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

**CEAB Academic Units:** Engineering Science 75%, Engineering Design 25%.

**Textbook:** Behrouz A. Forouzan, Data communications and networking, McGraw Hill, 5th Edition, 978-0-07337622-6, 2013.

**Other Required References:** Course notes and supplementary material will be available at the Course Web site.

### General Learning Objectives (CEAB Graduate Attributes)

Knowledge Base		Use of Engineering Tools	3/3	Impact on Society and the Environment	
Problem Analysis	2/3	Individual and Team Work		Ethics and Equity	
Investigation		Communication Skills		Economics and Project Management	
Design	2/2	Professionalism		Life-Long Learning	

Notation:  $x/y$ , where  $x$  is the cognitive level (1: Remember, 2: Understand, 3: Apply) at which the attribute is assessed and  $y$  is the academic level (1: Beginner, 2: Intermediate, 3: Advanced) at which the attribute is assessed.

### Topics and Specific Learning Objectives

#### 1. Wireless and Mobile Networks:

At the end of this section, students will be able to:

- a. Describe the general issues behind wireless LANs and be able to compare it to that in wired networks.
- b. Describe the major characteristics of the wireless networks and the way access is controlled in these types of networks.
- c. Explain the Bluetooth technology as a personal area network (PAN), including the architecture, the addressing mechanism, and the packet format.
- d. Explain the WiMAX, and the services provided by this network.
- e. Explain cellular telephone networks, and the general operations of these networks.

#### 2. Network Programming:

At the end of this section, students will be able to:

- a. Discuss network programming with object-oriented programming languages like C# and Java in addition to scripting languages and frameworks like JavaScript, Node.js, Express.js, and Ember.js that they bring to network programming.
- b. Design and develop original programs that demonstrate key concepts of network programming. This is an essential component of the course assignments.
- c. Apply socket programming and Graphical User Interface (GUI) in network applications that provide significant network capability as required to fulfill assignment objectives and deliverables.

#### 3. Standard Client-Server Protocols:

At the end of this section, students will be able to:

- a. Describe the World Wide Web, the Hyper Text Transfer Protocol as it is the most common client-server application used in relation to the World Wide Web.
- b. Explain the File Transfer Protocol, which is the standard protocol provided by TCP/IP for copying a file from one host to another.
- c. Explain electronic mail, including the two protocols: SMTP and POP.
- d. Explain Secure Shell, which can be used to secure network applications.
- e. Define the Domain Name System, which acts as the directory system in the Internet.

#### **4. Multimedia Networking:**

At the end of this section, students will be able to:

- a. Understand the general idea behind compression. This includes both loss less and lossy compression.
- b. Define the elements of multimedia: text, image, video, and audio, and then understand how these elements are represented, encoded, and compressed.
- c. Explain the features and characteristics of the multimedia categories in the Internet: streaming stored audio/video, streaming live audio/video, and real-time interactive audio/video.
- d. Understand the real-time interactive protocols RTP and RTSP.
- e. Understand the signalling and the voice over IP protocols: SIP and H.323.

#### **5. Peer-to-Peer networks:**

At the end of this section, students will be able to:

- a. Explain the peer-to-peer paradigm, including the general idea behind P2P networks, and the distributed hash table (DHT) as a mathematical concept for routing in a P2P network.
- b. Understand and describe Chord as one of the P2P networks that uses DHT, including the identifier space, finger tables.
- c. Understand and describe Pastry, another DHT-based P2P network, including the usage of the routing tables and leaf sets to answer queries.
- d. Understand and describe Kademlia, another DHT-based P2P network, including the XOR identifications and operations.
- e. Understand BitTorrent, a popular P2P network used for file sharing.

#### **6. Network Security Protocols:**

At the end of this section, students will be able to:

- a. Understand generic security protocols in order to better understand the fundamental issues involved in the design of real-world security protocols.
- b. Understand several real-world security protocols including SSL, IPSec, and Kerberos.
- c. Distinguish different ways to authenticate and establish a session key over a network.
- d. Explain how to achieve perfect forward secrecy, and the benefits (and potential drawbacks) of using timestamps.

#### **7. Network Management:**

At the end of this section, students will be able to:

- a. Define the concept of network management and identify the general areas of network management: configuration, fault, performance, security, and accounting.
- b. Define Simple Network Management Protocol (SNMP) as a framework for managing devices in an internet using the TCP/IP protocol suite.

## Evaluation

Course Component	Weight
Homework Assignments. (3 Programming assignments)	30%
Laboratory works. (5 laboratories works)	20%
Final Examination	50%

To obtain a passing grade in the course, a mark of 50% or more must be achieved on the following course components: the final examination, the homework assignments, and the laboratory works. Any component mark < 50% will result in a final course grade of 48% or less. The final examination is a closed book for three hours and will be taken place during the regular examination period.

**Late Submission Policy:** Assignments and laboratories works will be penalized by 4% of the available marks per day for late submission. Assignments submitted more than 3 days late will not be accepted.

**Assignment Submission Locker:** located on the second floor of TEB.

**Use of English:** In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

**Attendance:** All classes, laboratories, and tutorials are mandatory unless otherwise stated. Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the department, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

**Absence Due to Illness or Other Circumstances:** Students should immediately consult with the instructor or department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached “Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled”). The student should seek advice from the instructor or department Chair regarding how best to deal with the problem. Failure to notify the instructor or department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf)

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_religious.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf)

**Cheating and Plagiarism:** Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

**Use of Electronic Devices:** Students may use laptops, tablet computers, or smart phones only to access the course OWL site during lectures and tutorials. Use of nonprogrammable calculators only is permitted during quizzes and examinations. No other electronic devices may be used at any time during lectures, tutorials, or examinations.

**Policy on Repeating All Components of a Course:** Students who are required to repeat an Engineering course must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment, or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted by the student for grading in subsequent years.

**Internet and Electronic Mail:** Students are responsible for regularly checking their Western e-mail and the course web site (<https://owl.uwo.ca/portal/>) and making themselves aware of any information that is posted about the course.

**Accessibility:** Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

**Support Services:** Office of the Registrar, <http://www.registrar.uwo.ca/>  
Student Development Centre, <http://www.sdc.uwo.ca/>  
Engineering Undergraduate Services, <http://www.eng.uwo.ca/undergraduate/>  
USC Student Support Services, <http://westernusc.ca/services/>

Students who are in emotional/mental distress should refer to Mental Health @ Western, [http://www.health.uwo.ca/mental\\_health/](http://www.health.uwo.ca/mental_health/), for a complete list of options about how to obtain help.

**INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED**

IF, ON MEDICAL OR COMPASSIONATE GROUNDS, YOU ARE UNABLE TO WRITE TERM TESTS OR FINAL EXAMINATIONS OR COMPLETE COURSE WORK BY THE DUE DATE, YOU SHOULD FOLLOW THE INSTRUCTIONS LISTED BELOW. YOU SHOULD UNDERSTAND THAT ACADEMIC RELIEF WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC RELIEF WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. PLEASE READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2017 UWO ACADEMIC CALENDAR).

**A. GENERAL REGULATIONS & PROCEDURES**

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or exam that is worth MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097. Otherwise, you will report to your department office to request relief.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your Department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

**B. TERM TESTS**

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request relief. Otherwise, you will report to your department office to request relief.
3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

**C. FINAL EXAMINATIONS**

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

**N.B. It is the student's responsibility to check the date, time and location of the Special Examination.**

**D. LATE ASSIGNMENTS**

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4.
  - i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
  - ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

## E. SHORT ABSENCES

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

## F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or Ms. Karen Murray in the Undergraduate Services Office, if you are in first year.

## G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

**In Case of Serious Illness of a Family Member:** Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

**In Case of a Death:** Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

**For Other Extenuating Circumstances:** If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

**Note:** Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

## H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

**Calendar References:** Check these regulations in your 2017 Western Academic Calendar available at [www.westerncalendar.uwo.ca](http://www.westerncalendar.uwo.ca).

Absences Due to Illness: <http://westerncalendar.uwo.ca/2017/pg117.html>

Academic Accommodations for Students with Disabilities: <http://westerncalendar.uwo.ca/2017/pg118.html>

Academic Accommodations for Religious or Holy Days: <http://westerncalendar.uwo.ca/2017/pg119.html>

Course Withdrawals: <http://westerncalendar.uwo.ca/2017/pg157.html>

Examinations: <http://westerncalendar.uwo.ca/2017/pg129.html>

Scheduling of Term Assignments: <http://westerncalendar.uwo.ca/2017/pg135.html>

Scholastic Offences: <http://www.westerncalendar.uwo.ca/2017/pg111.html>

Student Medical Certificate: [http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

Engineering Academic Regulations: <http://www.westerncalendar.uwo.ca/2017/pg1442.html>

**Note:** These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

### **Drop Deadlines:**

First term half course (i.e. "A" or "F"):	November 5, 2017
Full courses and full-year half courses (i.e. "E", "Y" or no suffix):	November 30, 2017
Second term half or second term full course (i.e. "B" or "G"):	March 7, 2017

### **Contact Information:**

Undergraduate Services Office:	SEB 2097	Telephone: (519) 661-2130	E-mail: <a href="mailto:engugrad@uwo.ca">engugrad@uwo.ca</a>
Dept. of Chemical and Biochemical Engineering & Green Process Engineering:	TEB 477	Telephone: (519) 661-2131	E-mail: <a href="mailto:cbeugrad@uwo.ca">cbeugrad@uwo.ca</a>
Dept. of Civil and Environmental Engineering:	SEB 3005	Telephone: (519) 661-2139	E-mail: <a href="mailto:civil@uwo.ca">civil@uwo.ca</a>
Dept. of Electrical and Computer Engineering, Software Engineering & Mechatronics Engineering:	TEB 279	Telephone: (519) 661-3758	E-mail: <a href="mailto:eceugrad@uwo.ca">eceugrad@uwo.ca</a>
Dept. of Mechanical and Materials Engineering:	SEB 3002	Telephone: (519) 661-4122	E-mail: <a href="mailto:mmeundergraduate@uwo.ca">mmeundergraduate@uwo.ca</a>