Western Science

Department of Computer Science

Software Tools and System Programming CS-2211A Course Outline

1. Course Information

Course title: Software Tools and System Programming
Course code: COMPSCI 2211A
Academic term: Fall 2024
Lectures schedule

Section: Instructor	Day and Time	Location
Section 001: Gad Gad, M.Sc.	• Tuesday: 11:30 AM - 12:30 PM • Thursday: 10:30 AM - 12:30 PM	[redacted]
Section 002: Gad Gad, M.Sc.	• Tuesday: 8:30 AM - 9:30 AM • Friday: 9:30 AM - 11:30 AM	[redacted]

Labs schedule

- There will be 12 equal weight labs.
- Going to the Lab is not mandatory, you can go to the lab if you have questions to the TAs.
- You get the lab mark when you submit the lab solution on the course website.
- Lab descriptions will be posted on the course website.
- There are 19 lab slots as shown below. Check your schedule to know which slot you are registered for.

Section	Day and Time	Location
Lab 003	Friday: 12:30 PM - 1:30 PM	[redacted]
Lab 004	Thursday: 1:30 PM - 2:30 PM	
Lab 005	Thursday: 4:30 PM - 5:30 PM	
Lab 006	Wednesday: 12:30 PM - 1:30 PM	
Lab 007	Wednesday: 1:30 PM - 2:30 PM	
Lab 008	Friday: 1:30 PM - 2:30 PM	
Lab 009	Thursday: 3:30 PM - 4:30 PM	
Lab 010	Wednesday: 5:30 PM - 6:30 PM	
Lab 011	Thursday: 5:30 PM - 6:30 PM	
Lab 012	Wednesday: 2:30 PM - 3:30 PM	
Lab 013	Wednesday: 3:30 PM - 4:30 PM	
Lab 014	Thursday: 12:30 PM - 1:30 PM	
Lab 015	Wednesday: 4:30 PM - 5:30 PM	
Lab 016	Thursday: 2:30 PM - 3:30 PM	
Lab 017	Tuesday: 5:30 PM - 6:30 PM	

Lab 018	Friday: 2:30 PM - 3:30 PM	
Lab 019	Thursday: 11:30 AM - 12:30 PM	
Lab 020	Friday: 3:30 PM - 4:30 PM	
Lab 021	Thursday: 6:30 PM - 7:30 PM	

List of Prerequisites
[Either] Computer Science 1027a/b, 1037a/b, or 2101a/b with a grade of at least 65%
[Or] Integrated Science 1001X with a grade of at least 60%.

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may 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.

2. Instructor Information

Instructors	**Email**	**Office**	**Office Hours**
Section 001: Gad Gad, M.Sc.	ggad@uwo.ca	[redacted]	Friday: 12 – 1:30 pm In-person or MS-teams
Section 002: Gad Gad, M.Sc.	ggad@uwo.ca	[redacted]	Friday: 1:30 – 3 pm In-person or MS-teams
TA – to be announced			

Students must use their Western (@uwo.ca) email addresses when contacting instructors/TAs.

3. Course Syllabus, Schedule, Delivery Mode

Course Description

This course provides an introduction to software tools and systems level programming. Topics include: understanding how programs run (compilation, linking, and loading), an introduction to a complex operating system (UNIX), scripting languages, and the C programming language. As time permits, other topics will be chosen from: system calls, memory management, libraries, multi-component program organization and builds, version control, debuggers and profilers.

Course Topics

The course will address as many of the following topics as time will allow:

1. **UNIX Fundamentals**: UNIX vs. Windows; logging on; files and directories; path names, and directory and file structure; editors; shells; I/O redirection; UNIX concurrency (processes); utilities; file permissions and security; regular expressions; shell programming.
2. **C programming**: compiling, linking and loading; data types and operators; control structures; formatted I/O; file I/O; connections between I/O and the underlying operating system; function calls; structs; enumerations; arrays; pointers (pointer operations, pointers and arrays, arrays of pointers, pointers to functions); memory management; linked lists and other dynamically allocated data structures; strings; calling C from UNIX; general libraries; standard libraries and headers; the C preprocessor; C program organization.
3. **UNIX Tools**: building and managing multi-component programs; the make utility; version control and configuration management; debuggers; code performance and profiling.

Course-Level Learning Outcomes

Upon completion of this course, a student will be able to:

- **Understand Program Execution and UNIX Fundamentals**: Students will be able to explain how programs run by understanding compilation, linking, and loading processes, and demonstrate proficiency in using UNIX operating system tools
- **Proficiency in C Programming**: Students will develop the ability to write, compile, and debug C programs, utilizing data types, control structures, pointers, etc.
- **Develop and Debug Multi-Component Software**: Students will be able to build, manage, and debug multi-component software applications using UNIX tools and the C programming language,
- **Utilize Libraries in C Programming**: Students will demonstrate the ability to incorporate and use general and standard libraries in C programming.

Delivery Mode

The course will be delivered in person. Office hours are online (in Zoom/MS Teams) and require prior appointment/scheduling.

Course Website

The CS2211A website is accessible through OWL at https://westernu.brightspace.com/d2l/home. Class and assignment information will be posted on this website on a fairly regular basis. You are responsible for reading this information frequently.

Table of contents (Tentative Schedule)

The course will address as many of the following topics as time will allow:

Week	**Lectures (3 hours per week)**	**Lab (1 hour per week)**	**Assignments**
Week 1 (Sept 5 – Sept 6)	Topic 0: Course introduction Topic 1: Introduction to operating systems and Unix Topic 2: Introduction to C		
Week 2 (Sept 9 – Sept 13)	Topic 3: Unix basics Topic 4: Files and directories	Lab 1	
Week 3 (Sept 16 – Sept 20)	Topic 5: File security and permissions. Topic 5-b: SFTP & Tar Topic 6: C fundamentals Topic 7: Formatted IO	Lab 2	Assignment 1 released (Sept. 20th)
Week 4 (Sept 23 – Sept 27)	Topic 8: Flow control in C Topic 9: Data types in C Topic 10: Arrays Topic 11: Function calls in C	Lab 3	
Week 5 (Sept 30 – Oct 4)	Topic 12: Pointers in C Topic 13: Pointers and Arrays	Lab 4	Assignment 1 deadline (Oct. 1st) Assignment 2 released (Oct. 1st)

Week 6 (Oct 7 – Oct 11)	Topic 14: Strings in C Topic 15: Program organization in C	Lab 5	Assignment 2 deadline (Oct. 10th) Assignment 3 released (Oct. 10th)
- Reading week (Oct 12 – Oct 20). No lectures/labs			
Week 7 (Oct 21 – Oct 25) Midterm is held on October 25th (not in lecture)	Topic 16: Structure types in C Topic 17: Memory allocations : Midterm revision	Lab 6	Assignment 3 deadline (Oct. 25th) Assignment 4 released (Oct. 25th)
Week 8 (Oct 28 – Nov 1)	Topic 18: The preprocessor Topic 19: Writing large programs Topic 20: Regular expressions	Lab 7	
Week 9 (Nov 4 – Nov 8)	Topic 21: Unix command I/O and redirection Topic 22: Processes and job control	Lab 8	
Week 10 (Nov 11 – Nov 15)	Topic 23: Shell environment Topic 24: Shell programming	Lab 9	Assignment 4 deadline (Nov. 11th) Assignment 5 released (Nov. 11th)
Week 11 (Nov 18 – Nov 22)	Topic 25: Declarations Topic 26: Compiler directives in C Topic 27: Error handling Topic 28: Debugging	Lab 10	-
Week 12 (Nov 25 – Nov 29)	Topic 29: The standard library in C	Lab 11	Assignment 5 deadline (Nov. 29th)
Week 13 (Dec 2 – Dec 6)	Final exam revision	Lab 12	-

Key Sessional Dates:

Classes begin: September 5, 2024
Fall Reading Week: October 12 – 20
Classes end: December 6, 2024;
Exam period: December 9 – 22, 2024;

4. Course Materials

Recommended Textbooks

- S. Das, Your UNIX/Linux: The Ultimate Guide. McGraw-Hill: 3rd edition, 2013.
- K.N. King, C Programming: A Modern Approach. Norton: 2nd edition, 2008.

All course material will be posted to OWL: https://westernu.brightspace.com/

Students are responsible for checking the course OWL site (https://westernu.brightspace.com/) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements

Stable Internet connection, computer with working microphone and/or webcam, other hardware or software specifications, to join office hours.

5. Methods Of Evaluation

Grading Scheme And Assessment Dates

The overall course grade will be calculated as listed below:

Assignments (5)	35%
Labs (10, out of 12)	10%
Midterm Test	20%
Final Exam	35%

To be eligible to receive a passing grade in the course, your combined midterm and final exam grade must be at least45%. Otherwise, the maximum overall mark you can receive is 45%.

Assignments

Due Dates (Tentative)

	Assigned date (tentative)	**Due date (tentative)**	**Grade Weight**
Assignment #1	September 20, 2024	October 1, 2024	5%
Assignment #2	October 1, 2024	October 10, 2024	5%
Assignment #3	October 10, 2024	October 25, 2024	5%
Assignment #4	October 25, 2024	November 11, 2024	10%
Assignment #5	November 11, 2024	November 29, 2024	10%
			Total = 35%

Please refer to the release and due dates for each assignment on the course website on OWL.

About The Assignments

- Assignment descriptions will be posted on the course website by the dates listed above.
- Any changes, updates, and clarifications to assignments will also be posted on the website. It is your responsibility to monitor these pages closely.
- Assignments may involve programming in C, the use of UNIX operating system utilities, programming using shell scripts, and concept questions (non-programming) related to the lecture material.
- To be eligible for full marks, individual C assignments must run under UNIX on the departmental computing equipment. You may develop assignments on your home computer, but you must allow for the amount of time it will take to get the final product working on Computer Science's machines.
- All assignments are individual assignments. You may discuss approaches to problems among yourselves; however, the actual details of the work (assignment coding, answers to concept questions, etc.) must be your individual effort. Assignments that are judged to be the result of academic dishonesty will, for the student's first offense, be given a mark of zero.

Submission Of Assignments

- Your assignment solutions are expected to be your own individual work, not the products of group effort. On occasion, you may be allowed to make use of code from an outside source, such as your textbook. Check with your instructor if you are uncertain about the places in which you can use code written by another person.
- Assignments will be submitted electronically. Details will be given on the course website and/or in the assignment descriptions. We reserve the right to use similarity detection software to detect possible cheating cases.
- Assignments are due by 11:55pm on the due date. The time stamp on the electronic submission will be used to determine any late penalty.

Late Assignment Policy

Late assignments will be accepted for up to three days after the due date, with weekends (Saturday and Sunday) counting as a single day; the late penalty is 10% of the available marks per day. Lateness is based on the time stamp on the electronic submission, not on the time it was printed or last modified.

See the "Evaluation Scheme for Missed Assessments" section below for information about how missed assignments are handled.

Assignment Marking

- Assignments are marked by the Teaching Assistant(s), who follow marking schemes provided by instructors.
- When assignment marking has been completed, you will be informed via the course website.
- A request for adjustment of an assignment mark must be made within 2 weeks of the date on which it was first available. Beyond that date, regrading will not be considered. You should direct such request in the first instance to your TA, and then to the course instructor if the discussion with the TA is not satisfactory.
- Assignment marks will be available via course website periodically throughout the term. It is your responsibility to check that your marks have been recorded correctly.

Assignment Backups

It is your responsibility to keep up-to-date backups of assignment files in case of system crashes or inadvertently erased files. Retain disk copies of all material submitted, as well as the actual graded assignment, to guard against the possibility of lost assignments or errors in recording marks. It is not safe to discard these materials until you are satisfied that your final mark for the course has been computed properly.

Tutoring

The role of tutoring is to help students understand course material. Tutors should not write assignments or tests for the students who hire them. Submitting an assignment that contains material written by a tutor is an academic offense. Having employed the same tutor as another student is not a legitimate defense against an accusation of collusion, should two students' hand in assignments judged similar beyond the possibility of coincidence.

Examinations

There will be a Midterm test and a final exam. The following is the tentative exam schedule (subject to change):

Midterm: Duration is 2 hours held on Friday October 25th

- Section 001: Midterm held in room NCB101 from 7 pm to 9 pm.
- Section 002: Midterm held in rooms UCC37, UCC41, UCC56, and UCC146 from 3 pm to 5 pm

Final: Duration is 3 hours held during the December exam period; exact time to be announced.

See the "Evaluation Scheme for Missed Assessments" section below for information about how missed coursework are evaluated.

Computing Facilities

Each student will be given an account on the Computer Science Department senior undergraduate computing facility, GAUL. GAUL accounts are automatically created, normally within 24 hours, after enrollment and the username/password would be the same as your UWO email account. If a student is able to log into his/her UWO email, but is unable to log into the GAUL systems after 3 days of enrollment, please submit a ticket. with Science Technology Services at https://helpdesk.sci.uwo.ca. In accepting the GAUL account, a student agrees to abide by the computer science department's Rules of Ethical Conduct. Access to GAUL is REQUIRED to complete this course. You are welcome to work on assignments and labs on your own Unix/Linux environment if you wish but everything you submit must work on GAUL.

General Information About Missed Coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:
https://registrar.uwo.ca/academics/academic_considerations/
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm Exam (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme For Missed Assessments

Missing Lectures

Student are encouraged to attend all the lectures, actively take notes, and engage by asking questions. However, lecture attendance is optional.

Missing An Assignment

If a student misses the deadline of an assignment, they may still submit it without an academic consideration within 3 days, with a penalty of 10% of the total marks of the assignment per late day. If you need more time to submit an assignment, follow the university procedure for Academic Accommodation. If accommodation is approved by your Dean's office, the instructor and the student will negotiate a new deadline.

Missing The Midterm Test

There will be no makeup midterm test. If you miss the midterm test for any reason, follow the university procedure for Academic Accommodation. If accommodation is approved by your Dean's office, your final exam mark will be reweighted to include the weight of the midterm test, in this case, the final exam will be worth 55% of the overall course marks. You must notify the course instructor within a week of the missed midterm test, and documentation must be received by your Dean's office within 2 weeks of the missed test.

Missing The Final Exam

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

Essential Learning Requirements

Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade.
To be eligible to receive a passing grade in the course, your combined midterm test and final exam grade must be at least45%. Otherwise, the maximum overall mark you can receive is 45%.

6. Additional Statements

Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

https://www.edi.uwo.ca.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf

Academic Policies

The website for Registrar Services is https://www.registrar.uwo.ca/.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

No electronic devices (including phones, scientific calculators, etc.) are permitted on the final exam.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in 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).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

In the event of health lock-down, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

https://remoteproctoring.uwo.ca

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic-related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.

Additional student-run support services are offered by the USC, https://westernusc.ca/services/.