Course Outline – Fall 2023
CS 3305A: Operating Systems

1. General Course Information

Course Information

CS 3305A: Operating Systems
Lectures: **Monday: 4:30pm – 5:30pm**; **Wednesday: 3:30pm – 5:30pm** [in-person lectures]
Location: Talbot College - 141 (**TC-141**)

Prerequisites

Either (<u>Computer Science 2208A/B</u> and <u>2211A/B</u>) or (<u>Computer Science 2101A/B</u> and <u>2208A/B</u>) or (<u>Computer Science 2210A/B</u>, <u>2211A/B</u>, <u>ECE 3375A/B</u>, and registration in the fourth year of a BESc program in Computer Engineering or Mechatronic Systems Engineering).

Unless you have either the requisites for this course or written special permission from your Dean 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

Name: **Dr. Anwar Haque**
Office Location: Middlesex College – 415 (**MC - 415**)
Phone Number: 519-661-2111 Ext. 87428
E-Mail: **ahaque32@uwo.ca**

Office Hours (Instructor): **Monday and Wednesday: 10:30am-11:30am** [Zoom link will be announced on OWL].

Office hours (Teaching Assistants - TA): TA names, hours, and Zoom links will be announced on OWL.

Students must use their **Western (@uwo.ca)** email addresses when contacting their course instructor and TAs.

3.   Course Description, schedule, and Delivery Mode

This course presents fundamental concepts related to the design and implementation of operating systems. Topics include introduction to the computer operating system, basic operating system structure, process fundamental, inter-process communication, signal, system calls, process

scheduling, process and thread synchronization and concurrency, memory basics, memory management, file systems and storage servers, and if time permits a few "hot" topics.

Course Schedule: A detailed course schedule is provided below in Table 1.

Table 1: CS3305A Fall 2023 Course Schedule

Lec #	Date	Topics	Comments
1	**Mon – Sept 11**	Course Intro / Overview Intro to Operating Systems	
2	**Wed – Sept 13**	Process – I	
	Wed – Sept 13	Assignment #1 Available (Parent and Child processes)	
3	**Mon – Sept 18**	Process - II	
	Mon – Sept 18	QUIZ #1 [1.25%] Quiz [OWL]: starts Sept 18th 6pm – ends Sept 24th 11:55pm	Lecture 1-3
4	**Wed – Sept 20**	Process – III	
5	**Mon – Sept 25**	Process – IV	
	Mon – Sept 25	QUIZ #2 [1.25%] Quiz [OWL]: starts Sept 25th 11:55pm – ends Oct 1st 11:55pm	Lecture 4-5
	Mon – Sept 25	Assignment #2 Available (Inter-processes communications)	
6	**Wed – Sept 27**	(1) Signal (2) Systems Calls	
	Wed – Sept 27	Assignment #1 is due [5%] Submission deadline: Sept 27, 11:55pm	
7	**Mon – Oct 2**	(1) Multiprogramming (2) Intro to Threads	
	Mon – Oct 2	QUIZ #3 [1.25%] Quiz [OWL]: starts Oct 2nd 11:55pm – ends Oct 5th 11:55pm	Lecture 6-7
8	**Wed – Oct 4**	CPU Scheduling – I	
	Wed – Oct 4	Assignment #3 Available (Process vs Threads)	
	Mon – Oct 9	No Class – Happy Thanksgiving!!	
9	**Wed – Oct 11**	CPU Scheduling – II	
	Wed – Oct 11	QUIZ #4 [1.25%] Quiz [OWL]: starts Oct 11th 6pm – ends Oct 15th 11:55pm	Lecture 8-9
	Wed – Oct 11	Assignment #2 is due [5%] Submission deadline: Oct 11, 11:55pm	

10	Mon – Oct 16	CPU Scheduling – III	
	Mon – Oct 16	Assignment #4 Available (CPU Scheduling Algorithm)	
	Mon – Oct 16	QUIZ #5 [1.25%] Quiz [OWL]: starts Oct 16th 6pm – ends Oct 17th 6:00pm	Lecture 10
	Wed – Oct 18	**MIDTERM [15%]** In-person exam (1 Hour 30 minutes)	Lecture 1 – 10
11	Mon – Oct 23	Multiprocessor	
	Tue – Oct 24	Assignment #3 is due [5%] Submission deadline: Oct 24th 11:55pm	
12	Wed – Oct 25	Process Synchronization I	
	Wed – Oct 25	Assignment #5 Available (mutual exclusion / semaphore / critical section techniques)	
	Mon – Oct 30	Reading week – no class	
	Wed – Nov 1	Reading week – no class	
13	Mon – Nov 6	Process Synchronization II	
	Mon – Nov 6	QUIZ #6 [1.25%] Quiz [OWL]: starts Nov 6th 6pm – ends Nov 12th 11:55pm	Lecture 11-13
	Mon – Nov 6	Assignment #4 is due [7%] Submission deadline: Nov 6th 11:55pm	
14	Wed – Nov 8	Process Synchronization III	
15	Mon – Nov 13	Main Memory Basics	
	Mon – Nov 13	QUIZ #7 [1.25%] Quiz [OWL]: starts Nov 13th 6pm – ends Nov 19th 11:55pm	Lecture 14 – 15
16	Wed – Nov 15	Memory Management I	
17	Mon – Nov 20	Memory Management II	
	Mon – Nov 20	QUIZ #8 [1.25%] Quiz [OWL]: starts Nov 20th 6pm – ends Nov 26th 11:55pm	Lecture 16 – 17
18	Wed – Nov 22	Memory Management III	
19	Mon – Nov 27	Memory Management IV Storage Systems I	
	Mon – Nov 27	QUIZ #9 [1.25%] Quiz [OWL]: starts Nov 27th 6pm – ends Dec 3rd 11:55pm	Lecture 18 – 19
20	Wed – Nov 29	Storage Systems II	

	Fri – Dec 1	Assignment #5 is due [8%] Submission deadline: Dec 1st 11:55pm	
21	**Mon – Dec 4**	File Systems I	
	Mon – Dec 4	QUIZ #10 [1.25%] Quiz [OWL]: starts Dec 4th 6pm – ends Dec 7th 11:55pm	Lecture 20 – 22
22	**Wed – Dec 6**	File Systems II Course Review Discussion	
	TBA	**FINAL EXAM** In-person exam (3 Hours)	Lecture 9 – 22

Course Delivery Mode: The delivery mode of this course will be in-person. Lecture materials/slides will be made available on OWL prior to each lecture. The instructor's and TA office hours will be offered over Zoom. Quizzes will be conducted via OWL's Test and Quizzes. Midterm and Final exams will be in-person. Assignments submissions will be via OWL's Assignments.

Important Sessional Dates:
>   Thanksgiving (no class): **October 9**, 2023
>   Reading Week (no class): **October 30 - November 5**, 2023
>   Classes end: **December 7**, 2023

Contingency plan: Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

4.   Course Materials

Suggested Textbook: Following book is recommended for this course:

- A. Silberschatz, P. Galvin, and G. Gagne *Operating System Concepts (Tenth Edition)*, John Wiley & Sons. Inc, May 2018; ISBN: 978-1119456339

Lecture Notes: Lectures notes will be made available on OWL.

Students should check OWL (https://owl.uwo.ca) on a regular basis for news and updates. OWL will be the primary method by which information will be disseminated to all students in the class. Students are responsible for checking the course site on OWL regular basis.

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

5.   Methods of Evaluation

There are Assignments and Exam components (Quizzes, Midterm, and Final exam) that will be used to determine a student's mark in the course:

- A final exam worth **45%** of the overall mark.
- One midterm exam worth **15%** of the overall mark.
- Ten Quizzes worth **10%** of the overall mark (**the best 8 out of 10 Quizzes** will be considered).
- Five programming assignments worth **30%** of the overall mark.

The following rules are designed to ensure that students meet certain minimum standards:

- To be eligible to pass the course, a student must receive **at least 40%** in the exam components (i.e., 40% of 70) and **at least 40%** in the assignments (i.e., 40% of 30).

- To be eligible to receive an overall grade of **60%** or higher in the course, a student must receive **at least 50%** in the exam component (i.e., 50% of 70) and at least 50% in the assignments (i.e., 50% of 30).

- **Quizzes / Tests / Exams**

  There is an in-person final exam that is scheduled by the Registrar. There is one in-person midterm (exam date: **Wednesday Oct 18, 2023**). There will be a total of ten quizzes, and the best 8 out of 10 quizzes will be considered. For the Quizzes, Owl's *tests and quizzes* will be used. Please refer to Table 1 for the quiz/midterm schedule.

  Accommodated Evaluations
  There will be no makeup for the Quizzes or the Midterm Exam. If you miss the Quiz or the Midterm Exam, follow the procedure for Academic Accommodation detailed in Section 6 below. If accommodation is approved by your Dean's office, your Final Exam mark will be reweighted to include the weight of the Quiz and Midterm Exam.

- **Assignments**

  - Students must submit **five** assignments (worth **30%** of the final mark) through OWL systems (details will be available on OWL). Submission instructions will be provided for each assignment. A detailed course schedule is provided in Table 1 (Section 3) of this document, where a list of topics covered on each assignment is provided.

  - To be eligible for marks, assignments must run on the departmental computing equipment (details will be available on OWL). Assignments that work on your own computer but not on departmental equipment will not be eligible for marks.

  - Assignments will be made available on OWL, and the students will be notified accordingly. Students are responsible for checking OWL on a regular basis.

Assignments Due dates: Assignment 1 (**Sept 27**), Assignment 2 (**Oct 11**), Assignment 3 (**Oct 24**), Assignment 4 (**Nov 6**), and Assignment 5 (**Dec 1**). All assignments are due by midnight (electronically) of the due date. Late assignments may be handed in, but will be accepted for up to two days after the due date, with **a penalty of 20%** a day. Weekend will be counted as a single day.

Assignment Late Coupons: Each student is given 2 "late coupons". Each coupon can be thought of as a potential one-day assignment extension. It is entirely up to you to decide when to use your coupons; more than one coupon may be used per assignment. You will hand in the coupon(s) together with the assignment (you must mention this on OWL when you submit your assignment), and the number of coupons you use will be recorded. The rules for late coupons are the following:
- Coupons are not transferable to another student.
- Once a coupon has been used, you cannot "take it back" to use for another assignment instead.
- Coupons cannot be redeemed retroactively. (If an assignment has been marked, a coupon cannot later be used to reduce the late penalty.)
- Unused coupons are not redeemable for extra marks.
- Using a late coupon does not change the final date on which an assignment will be accepted. Whether or not coupons are used, the assignment must be handed in within 2 days of the original due date.

Every effort will be made to have assignments marked and handed back **within ten business days** of the hand-in date, preferably sooner.

6. Student Absences

Assessments worth less than 10% of the overall course grade:
For quizzes, if you miss up to two quizzes, you will not lose any marks, as the best eight quizzes out of 10 will be considered. If you miss more than two quizzes due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible.

For assignments, late assignments may be handed in, but will be accepted for up to two days after the due date, with a penalty of 20% a day. Weekend will be counted as a single day. In addition, you have 2 late coupons that will automatically give leniency with due dates. If you require additional time with assignments (after your late coupons run out) due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible.

Assessments worth 10% or more of the overall course grade:
If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible.

For further information, please consult the University's medical illness policy at https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration.pdf

The Student Medical Certificate is available at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

Note: missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

7. Accommodation and Accessibility

Religious Accommodation
When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at: https://multiculturalcalendar.com/ecal/index.php?s=c-univwo

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.

8. Academic Policies

The website for Registrarial Services is http://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.

Midterm and Final exams will be **closed book / closed notes** exams and **No electronic devices** will be permitted except **regular calculator**.

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: http://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 a pandemic lock-down and in-person exam restrictions, the tests and examinations in this course may be conducted using a remote proctoring service. Under such circumstances, 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.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling 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 the Student Development Centre (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/.