

THE UNIVERSITY OF  
WESTERN ONTARIO  
DEPARTMENT OF  
COMPUTER SCIENCE

## CS4472B Software Specification, Testing and Quality Assurance

### Course Outline--- Winter 2022

#### 1. General Course Information

##### Course Information

**Course Number and Title:** CS4472B – Software Specification, Testing and Quality Assurance

**Lectures:** Tuesday 19:00 – 22:00 TC-309 (On-line until Jan. 30, pending further instructions from the University)

##### Instructor's Office Hours:

Kostas Kontogiannis Office Hours: Thursday 17:00 – 19:00 On-line (Zoom)

##### TAs Office Hours:

Konstantinos Tsiounis Office Hours: Monday 10:00 – 12:00 On-line (Zoom)

##### Prerequisite Requirements

- Prerequisite(s): Computer Science 3307A/B/Y
- Students are assumed to be familiar with the Java programming language

*Note: 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.*

Our classes will combine instruction on current technologies, and software engineering methods with collaborative note development and discussion of course topics.

Copies of lecture notes will be available on the course web site. They are not a substitute for attending lectures.

#### 2. Instructor's Information

Prof. Kostas Kontogiannis, P.Eng.

Email: [kostas@csd.uwo.ca](mailto:kostas@csd.uwo.ca)

Office MC-375

Tel. (ext. 84244)

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. Course discussion through the course's OWL Forum. Please do not send emails to the personal accounts of the instructor or the TAs unless it is an absolutely urgent or personal matter.

### 3. Course Description/Syllabus

One of the most important phases of the software life-cycle is Testing. Software Testing does not occur in a vacuum. It aims to ensure that the system meets its functional and non-functional requirements. In this respect, it is driven by the system's specifications. Software Testing is applied at various levels. In the most granular level, Software Testing aims to verify that individual units (i.e. a class or a method) work properly. This is referred to as Unit Testing. Once individual units work, then the next level is to verify that the units work properly together. This is referred to as Integration Testing. Once all units work together, the system has to be tested that works properly end-to-end, and its does not enter an illegal or non-specified state. This is referred to as Functional Testing. In addition to these testing levels, there are testing approaches that are based on models (i.e. model-driven testing), and approaches that relate to object-oriented systems (Object-Oriented testing). But Software Testing is only one part of Quality Assurance. Assuming that testing is conducted properly, we have to evaluate the overall reliability of the software system, and measure some key metrics as to estimate within a certain degree of confidence, the quality level of the end system.

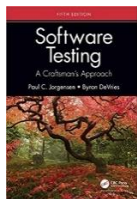
In this course, we will examine some key UML2 specification elements, namely sequence diagrams and state (activity) diagrams, and then we will discuss techniques for Unit, Integration, and Functional Testing. In the course we will use the Junit5 framework for hands-on training on Software Testing. In this course, we will also discuss reliability growth models, and software metrics that predict quality, effort, and cost.

The following list of topics may be covered, depending on time and the dynamics of the semester.

Basic principles of software testing	Life-Cycle based testing
UML2 sequence and activity diagrams	Object-Oriented testing
Unit testing	Software metrics
Integration testing	Software reliability growth models
Functional and acceptance testing	Effort and cost estimation
JUnit	Software technical reviews
Model-driven testing	Build test automation

### 4. Course Materials

The textbook is titled



*Software Testing: A Craftsman's Approach*, Fifth Edition Hardcover – Oct 18 2013  
by Paul C. Jorgensen (Author), ISBN-13: 978-0367358495,  
ISBN-10: 0367358492

A useful link regarding ordering the book can be found at  
<https://lb.ca/cgi-bin/cgiwrap/additem.bbx?/Z107910/I9780367358495>

We will be using OWL to host the course content. *Eclipse* will be used for software development, *Junit5* as a software testing framework, *Jira* will be used for group collaboration, and *BitBucket* for source code version control.

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

All course material will be posted on OWL: <http://owl.uwo.ca>

If students need assistance, 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.

The strategy to study for this course is to read the lecture notes, watch the videos (optional but encouraged), attend the classes, keep notes in the class, and read the textbook and the supporting material in the hyperlinks posted after each class unit.

The plan is for the course to be delivered synchronously on-line until Jan. 30, 2022, and then in-person pending approval from the University. Any changes to this plan to fit the University guidelines will be communicated with announcement via OWL. The lecture notes for the class are posted on OWL in Power Point format.

In addition to the electronic copy of the book, the Bookstore will offer the following general services for the Fall term.

- Online ordering of physical (paper) books through the Bookstore website. Items can be shipped to students directly (online order at bookstore webpage) if they are learning remotely.
- Students buying books on campus will have the option of some form of curbside pickup
- Obtaining commercial electronic books, to be sold through the Western Bookstore website
- Converting Custom Course Materials (textbooks or lab manuals) to an electronic format. The e-books will be accessible only via the Bookstore's online platform. Students will not be able to download the content for offline access.

If you have any questions or want to place an order, contact Rachel Sandieson, Course Materials Manager ([rsandies@uwo.ca](mailto:rsandies@uwo.ca)). Information on how to access the on-line version of the book will be also posted on OWL.

## 5. Methods of Evaluation

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### Individual

- |                                      |                                 |
|--------------------------------------|---------------------------------|
| --- Midterm (Tuesday, March 1, 2022) | 20% Scheduled by the instructor |
| --- Final Exam (date TBD)            | 35% Scheduled by the Registrar  |

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### Team Assignments

- |                                |     |                      |
|--------------------------------|-----|----------------------|
| --- Unit Testing 1             | 15% | (Thursday, Feb. 10)  |
| --- Unit Testing 2             | 15% | (Thursday, March 10) |
| --- System Testing/Reliability | 15% | (Thursday, April 3)  |

*All deliverables are due by 23:59:59 on their specified due dates. Due dates are subject to change.*

The Midterm will be covering the material up to the previous week the exam is held. We expect that we will have covered by that time Chapters 1-8 from the textbook plus Sequence and Activity Diagrams of UML. Other details of the material to be covered in the Midterm will also be announced in the class. The final exam will be scheduled by the Registrar's office, and it will be posted on the Web and announced in the class. The final exam will cover the whole material of the class (Week-1 to Week-12). The textbook and the lecture notes will be a valuable part of the material covered in the course. The attendance and study of the material and the active participation in conducting the assignments are the best strategies for succeeding in this course.

Make up dates for the Midterm will be Tuesday March 8, 2022. Make up dates for the final exam will be announced. Please note that there must be a valid documented reason for missing the Midterm or the final exam, according to the policies outlined below in this document (see Absences section).

If, for any reason, the schedule given above cannot be adhered to, the marks will be prorated as follows:

- The individual components are worth a total of 55%. If any individual components must be cancelled, the remaining individual deliverable weights will be prorated to add up to 55%.
- The project components are worth a total of 45%. If any project components must be cancelled, the remaining project deliverable weights will be prorated to add up to 45%.

Each student will receive a mark for the project, which makes up 45% of their final grade in the course.

- Normally, the individual's combined project mark will be computed directly from the team marks for the team tasks. However, the instructors reserve the right to adjust an individual's mark – raising or lowering it – based on project participation, project presentation, meeting minutes, and the TAs' or instructor's knowledge of a student's attendance and participation in the course and/or mastery of the course material.
- Students are expected to complete a reasonable, fair, and equitable portion of their team project. Failing to do so may result in a significant deduction of the final mark allocated to the project at the discretion of the instructor.
- It is the student's responsibility to ensure that he/she is working to a satisfactory level. A student should consult with his/her TA or instructor if concerns or questions arise.

### **Accommodated Evaluations**

Alternate considerations provided for excused absences (i.e. SRA, SMC, non- medical reasons) are:

- In case of a missed midterm exam, a make-up midterm exam will be offered within a week of the normal scheduled exam.
- In case of a missed make-up midterm exam, the final exam will account for the cumulative mark of the midterm and the final (i.e. 55%).
- In case of an excused inability of one or more members to complete a project deliverable by the given deadline, the whole deliverable will be given an extension of 48 hours from the initial reported absence, and no further extensions will be granted.

### **Exams**

- We are planning to conduct the midterm and the final exams in-person. In case of extenuating circumstances a remote proctoring service such as ProctorTrack may be used for conducting tests and examinations (midterm, final). In that case, 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. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

In the case of remote proctoring, you will be required to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link: <https://www.proctortrack.com/tech-requirements/>

- If we have to revert using Zoom for exam invigilation in this course, you will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session using Zoom will not be recorded\*. (\*Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination).
- There will be a one and a half hour long midterm exam in this course worth of 20%. The date will be confirmed and posted on the courses Website on OWL. Details on the midterm exam will be posted on OWL.
- A 3-hour, closed-book final exam will be held at the end of the course, during the final exam period. The final exam will be worth 35% of the total mark. Details on the final exam will be posted on OWL. Please see related statements in the **Academic Policies** section below.
- Each student must achieve a grade of at least 40% on the final exam in order to be given a passing grade in the course.
- Students must bring their UWO identification to the exam.
- The final exams are scheduled by the Office of the Registrar during the final exam period. Details will be provided when they are available. Students are advised not to make travel plans until they have consulted the final exam schedule.
- As an important note, submissions will be subject of a similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

### **Conduct**

The teaching staff reserve the right to deduct marks from the students course grade based on misuse or inappropriate conduct of any collaborative tools used in class. The tools and the forums are for collaboration only. Personal or judgmental statements targeting individuals are not acceptable. It is your responsibility to protect any private information of yours in these collaborative environments.

### **Statements concerning Online Etiquette**

Components of this course will involve online interactions (e.g. office hours). To ensure the best experience for both you and your classmates, please honor the following rules of etiquette:

- “Arrive” to any scheduled on-line meetings on time
- Use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- To minimize background noise, mute your microphone until you are invited to speak, unless directed otherwise
- In order to give us optimum bandwidth and web quality, turn off your video camera unless you are invited to speak
- Please be prepared to turn your video camera off at the instructor’s request if the internet connection becomes unstable
- Unless invited by your instructor, do not share your screen in the meeting

The course instructor or the TA will act as moderator for the meeting and will deal with any questions from participants. To participate please consider the following:

- If you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question.
- Please remember to unmute your microphone and turn on your video camera before speaking.
- Self-identify when speaking.

- Please remember to mute your mic and turn off your video camera after speaking (unless directed otherwise).

### **General considerations of “netiquette”:**

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, the TAs, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Use proper grammar and spelling. Cite the ideas of others appropriately.

Note that disruptive behavior of any type during online meetings, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

### **Team Project**

- Students are required to work cooperatively in teams to design and implement their project.
- **You will be given the opportunity to form your own team. The deadline to do so is Friday, January 21. After this date the instructors will decide on the composition of the teams. The instructors’ decisions are final. The instructors will attempt to make sure that each team has 4 members.**
- Students are required to initiate contact and collaborate closely with their teammates.
- If specified by the project description, the project code must run on the specified environment for acceptance testing purposes, but team members can develop it on their own systems. The project code must be implemented in the Java programming language.
- Late project will be accepted for up to two days after the due date, with weekends counting as a single day. The assignments are due on Thursday 11:55 pm. Submissions by Friday 11:55 pm will incur a penalty of 8% and submission later than Friday 11:55 pm and before Sunday 11:55 pm will incur a penalty of 20% in total. No submissions are accepted after Sunday 11:55 pm.
- No late submissions for quizzes, midterm, and final are accepted.

### **Meetings and Minutes**

- During the course of the project, teams are required to have weekly meetings to discuss progress and plan for the future.
- Each team is required to write minutes of each meeting, listing the attendance, what the topics of discussion in the meeting were, any decisions that were made, and which team members were assigned which tasks. These minutes must be submitted with the project report in each deliverable and will provide input to be used for the overall assessment of the project.

## **6. Ground Rules**

### **Masking Guidelines**

Students will be expected to wear triple layer, non-medical, paper masks at all times in the classroom as per University policy and public health directives. Students who are unable to wear a mask must seek formal accommodation through Western Accessible Education, and present medical documentation. Students are not permitted to eat or drink while in class to ensure masks stay in place. Students will be able to eat and drink outside of the classroom during scheduled breaks.

Students unwilling to wear a mask as stipulated by Western policy and public health directives will be referred to the Dean, and such actions will be considered a violation of the student Code of Conduct.

### **Course Absences due to Daily COVID Screening Questionnaire**

Missed assessments (e.g., presentations, essays, quizzes, tests, midterms, etc.) require formal academic considerations (typically self-reported absences and/or academic counselling). Methods for dealing with missed work and course content are at the discretion of the instructor(s). Students should be aware that some learning outcomes cannot be easily made up and may need to be completed in a subsequent year. Your instructor will provide you with further information as to how this applies within this course. Students who demonstrate a pattern of routinely missing coursework due to self-reported COVID symptoms, and therefore do not demonstrate mastery of the learning outcomes of the course, will not receive credit for the course.

### **Contingency plan for an in-person class pivoting to 100% online learning**

As per the University policy, the course will be delivered **on-line synchronously** until January 30, 2022 and in-person after this date. In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online synchronously (i.e., at the times indicated in the timetable). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor. In the event that online learning is required, a stable internet connection with working microphone and webcam will be required. As has been the case in the past, the decision to pivot to online learning will be made by Western, and not individual instructors or departments (excepting temporary online instruction in the event of instructor illness).

### **Other Important Points**

- Western has both a vaccine and a mask mandate.
- Students must complete the symptom checklist every day. Students who are found to be on campus who have not completed the symptom checklist or have failed the daily symptom check will be referred for investigation under the Student Code of Conduct.
- Students are expected to carry their student cards to campus each day in anticipation of spot checks by Building Ambassadors.
- Students not wearing masks will be asked to leave the classroom. Students with accommodations approved by Accessible Education must make arrangements with the instructor before coming to class, lab, practicum or clinical site.
- Eating and drinking is prohibited in the classroom to facilitate proper mask wearing. Individuals found to have attended class without appropriate vaccination, or who are found to have engaged in fraud related to the vaccination policy, will face academic sanctions up to and including expulsion.
- Students who are not fully vaccinated by October 12th and who are not granted an exemption under the policy will be issued a trespass order. Enforcement of this trespass order will be carried out by campus police, and will be accompanied by academic sanctions, including expulsion.
- Please be respectful of your classmates and your instructors as we navigate re-entry.

## **7. Student Absences**

### **Academic Consideration for Student Absences**

Students who experience an extenuating circumstance (illness, injury or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

- (i) Submitting a Self-Reported Absence (SRA) form provided that the conditions for submission are met. To be eligible for a Self-Reported Absence:
  - an absence must be no more than 48 hours
  - the assessments must be worth no more than 30% of the student's final grade
  - no more than two SRAs may be submitted during the Fall/Winter term
- (ii) For medical absences, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to the Academic Counselling office of their Faculty of Registration.
- (iii) Submitting appropriate documentation for non-medical absences to the Academic Counselling office in their Faculty of Registration.

Note that in all cases, students are required to contact their instructors within 24 hours of the end of the period covered, unless otherwise instructed in the course outline.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_illness.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf)

and for the Student Medical Certificate (SMC), see:

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

### **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>.

### **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](#)).



## 8. Accommodation and Accessibility

### Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD), 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](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf),

## 9. 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](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 his/her official university address is attended to in a timely manner. Instructions on electronic devices allowed during the midterm and final exams will be posted prior to the exams on the course's website on OWL.

**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](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

All required deliverables 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 case of a 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>.

## 10. 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/>.

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 (519) 661-2147 if you have any questions regarding accommodations. 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/>.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.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.

Students who are in emotional/mental distress should refer to Mental Health@Western (<http://www.health.uwo.ca/mentalhealth>) for a complete list of options about how to obtain help. Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.

This course is supported by the Science Student Donation Fund. If you are a BSc or BMSc student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Counselling site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the Chair of the Department or email the Science Students' Council at [ssc@uwo.ca](mailto:ssc@uwo.ca).