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### SENG 426 – Software Quality Engineering

Term – Summer 2019 (201905)

#### Instructor

Dr. Issa Traore  
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E-mail: itraore@ece.uvic.ca

#### Office Hours

Days: Monday, Thursday  
Time: 11:30am-12:30pm  
Location: EOW 415

#### Course Objectives

- Introduce fundamental notions of software quality and the techniques used to build and check quality in software systems.
- Introduce the notion of enterprise computing and industrial software, and their quality constraints
- Quantitative assessment of software quality through quality attributes and metrics
- Advanced quality control techniques through in-depth coverage of critical software attributes, including functional testing, reliability testing, security testing, and performance testing
- Apply the principles of modern software engineering practices, such as DevOps and Site Reliability Engineering (SRE)

#### Learning Outcomes

By the end of this course, students should have a good grasp of:

- software quality metrics and models
- functional software testing techniques
- software reliability analysis models and techniques
- software performance testing techniques
- software security testing techniques
- DevOps and SRE practices, with an emphasis on automation, continuous delivery and deployment

#### Syllabus

The following syllabus is subject to the time available and may change during the term. Some of the topics may not be covered.

##### *Chapter 1. Outline of Software Quality Engineering*

Discuss the characteristics of industrial and mission-critical software systems. Define the notion of software quality, and emphasize the importance of building quality software systems. Give an overview of quality attributes and related quality control techniques.

##### *Chapter 2: Introduction to DevOps*

Discussion of the limits of the traditional approach to service management. Definition and rationale for DevOps. Overview of practice and tools for DevOps. Core tenets and practices of DevOps.

### *Chapter 3. System Testing Techniques*

Introduce application system testing and general functional testing strategy. Testing based on extended use case model. Introduction of a number of techniques to quantify, classify and analyze discovered defects.

### *Chapter 4: Software Quality Metrics*

Presentation of quality management models; Use of quality models and data for in-process quality management and to guide software testing. Service level definition and measurement. Availability metrics.

### *Chapter 5. Software Performance Testing*

Introduction of software performance criteria and metrics. Performance test planning and targets. Software performance testing process, approach, and tools.

### *Chapter 6. Software Security Bugs*

Review of top software security weaknesses and vulnerabilities through concrete examples. Understanding and use of software security defect repositories: common weakness enumeration (CWE) and common vulnerability enumeration (CVE).

### *Chapter 7. Software Security Testing*

Notions and practice of threat modeling. Notions of security verification. Security code review. Software security testing processes, methods and tools.

### *Chapter 8: Software Reliability Engineering*

Notions of software reliability and reliability growth. Overview of software reliability growth models (SGRM). Software Reliability modeling and metrics. Application of reliability & availability concepts and models in the context of large scale enterprise software systems. Present Reliability block diagrams; concurrent systems (series/parallel) reliability.

### *Chapter 9: Software Performance Modeling*

Present advanced software performance engineering techniques, models, and tactics.

**A-Section(s):** A01 / CRN 30755  
A02 / CRN 30756

B01 Mon 4:30-6:20 pm  
B02 Thu 11:30am – 1:20 pm  
Location: B 238  
TA: Mr. Paulo Quinan ([quinan@uvic.ca](mailto:quinan@uvic.ca))  
Mr. Ujwal Reddy  
([ujwal1995reddy@gmail.com](mailto:ujwal1995reddy@gmail.com))

Days: Monday, Thursday

Time: 10:00-11:20am

Location: ELL 060

### Required Text

Title: Course Pack SENG 426  
(available Uvic Bookstore)

Author:

Publisher:

Year:

### Optional Text

Title:

Author:

Publisher:

Year:

### References:

1. Software Quality Engineering, Jeff Tian, Wiley, 2005
2. "Software Reliability Engineering: More Reliable Software Faster and Cheaper", John D. Musa, 2<sup>nd</sup> Edition, McGraw-Hill 1998, ISBN: 0-70-913271-5
3. Secure Programming with Static Analysis, by Brian Chess, Jacob West, Addison-Wesley, 2007
4. Foundations of Software and System Performance Engineering: Process, Performance Modeling, Requirements, Testing, Scalability, and Practice, by André B. Bondi, Addison-Wesley, 2014
5. Testing Object-Oriented Systems: Models, Patterns, and Tools, by Robert V. Binder, ISBN-13: 978-0321700674
6. Software Testing and Quality Assurance, Kshirasagar Naik and Priyadarshi Tripathy, Wiley, 2008
7. **Lectures Notes/Slides: on Course Space**

### Assessment:

Attendance/Class participation: 4%

Project: 40% (Part I: 5%; Part II: 5%; Part III: 10%; Part IV: 10%; Part V: 10%)

Mid-term Exam: 20% Date: July 4, 2019

Final: 36%

### Note:

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

<https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/grading.html>

**There will be no supplemental examination for this course.**

**Note to students:** Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Assistant to set up an appointment.

### Accommodation of Religious Observance:

<https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/religious-observanc.html>

**Policy on Inclusivity and Diversity:**

<https://web.uvic.ca/calendar2019-05/general/policies.html>

**Standards of Professional Behaviour:** You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

<https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Undergraduate Calendar for the UVic policy on academic integrity.

<https://web.uvic.ca/calendar2019-05/undergrad/info/regulations/academic-integrity.html>

**Equality:** This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

**Course Lecture Notes:** Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

**Sexualized Violence Prevention and Response at UVic**

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting [www.uvic.ca/svp](http://www.uvic.ca/svp). If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

**Where:** Sexualized violence resource office in EQHR; Sedgewick C119

**Phone:** 250.721.8021

**Email:** [svpcoordinator@uvic.ca](mailto:svpcoordinator@uvic.ca)

**Web:** [www.uvic.ca/svp](http://www.uvic.ca/svp)