Course PM

DIT635, Software Quality and Testing, 7.5 Hec, Vt, 2019

Examiner: Richard Torkar (richard.torkar@cse.gu.se)
Course responsible: Jan Schroeder (jan.schroder@gu.se)
Lecturer: *Jan Schroeder (main), Richard Torkar, Robert Feldt, David Issa Mattos, Vard Antinyan (from Volvo Cars), Micael Andersson (from Combitech), Mohammad Mousavi (from University of Leicester)*

Course content:

The course introduces the students to the concepts and best practices of quality assurance and testing in software engineering. The course has two general themes: (1) the role of quality assurance in software development; (2) the role of testing in software quality assurance.

The course first introduces the notion of software quality. The students are made acquainted with quality and quality assurance. They learn methods and techniques to assure quality of both the end product (a system or application), and for the software process itself. The role of quality assurance is described for software, for a software process, and for a software project. It is explained how these are related in an organization.

The course then covers testing tools, techniques and methods that can be used to assess the quality and correctness of software systems. The course brings understanding on how these methods, techniques and tools can be used in a software development project to increase the software quality. An overview of other verification techniques are also presented. Students will get hands-on experience in building a model for testing and they use this model for both testing and verification purposes.

Learning outcomes:

Knowledge and understanding

- explain quality assurance models in software engineering and the contents of quality assurance plans
- describe the distinction between software verification and software validation
- name and describe the basic concepts on testing, as well as different testing techniques and approaches
- describe the connection between software development phases and kinds of testing
- exemplify and describe a number of different test methods, and be able to use them in practical situations
- exemplify and describe tools used for testing software, and be able to use them and interpret their output

Competence and skills

- exemplify and describe the area of formal verification in general, including model checking and runtime verification, and its relationship to software quality
- define metrics required for monitoring the quality of projects, products and processes in software engineering
- construct appropriate and meaningful test cases, and interpret and explain (to stakeholders) the results of the application of such test cases (using appropriate tools) to practical examples
- write models in at least one formal specification language
- plan and produce appropriate documentation for testing
- apply different testing techniques on realistic examples

Judgement and approach

- identify emerging techniques and methods for quality management using relevant information sources
- identify and hypothesize about sources of program failures, and reflect on how to better verify the correctness of such programs

Course structure/course implementation

The course is provided in the form of two main modules, which combine lectures, discussions, and supervised practical assignments in form of lab exercises. The students are expected to have prepared for and to be active during the modules. The exercises are both theoretical and practical in nature.

Examination forms:

The course is examined by an individual written exam, carried out in an examination hall, and by multiple, written assignments. Some of the assignments are carried out individually, some in small groups of normally 2-3 students.

1. Written examination (Skriftlig tentamen), 4.5 higher education credits
Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
2. Assignments (Inlämningsuppgifter), 3 higher education credits
Grading scale: Pass (G) and Fail (U)

A Pass grade (G) for the entire course requires at least a Pass grade for all sub-courses. In order to get the grade Pass with Distinction (VG) the student must get the pass grade on all assignments and the grade VG on the written examination.

Written exam (Ordinary): March 21st 2019 08:30-12:30, Lindholmen
Written exam (Additional/Re-Exam): June 10th 2019 08:30-12:30, Lindholmen
Written exam (Additional/Re-Exam): August 26th 2019 08:30-12:30, Lindholmen

CHALMERS TEKNISKA HÖGSKOLA AB
GÖTEBORGS UNIVERSITET
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Assignments Deadline (Ordinary): Three individual deadlines during the course.
Assignments Deadline (Re-Exam): June 30th 2019
Assignments Deadline (Re-Exam): August 31st 2019

Course Literature:

The course covers two major software engineering topic as modules, 1.) software quality and 2.) software testing.
For the **quality** module, we will mostly use
• Software Metrics: A Rigorous and Practical Approach. Fenton, Norman. ISBN: 1439838224. Edition: 3. 2014

Small parts of this module will be taken from
• Handbook of Software Quality Assurance. G. Gordon Schulmeyer. ISBN: 1596931868. Edition 4. 2007

For the **testing** module will mostly use two books. Getting one of them is sufficient. Both cover the testing basics.
• Software Testing: A Craftsman's Approach. P.C. Jorgensen. Auerbach Publications. ISBN: 1466560681. Edition: 3. 2008
OR
• Introduction to software testing. Ammann, Paul, and Jeff Offutt. Cambridge University Press. ISBN: 9781107172012. Edition: 2. 2016

Next to those books, we will provide a set of research papers to read during the course.

Schedule:

The schedule, particularly in the second module, later in the course, is subject to change. The most up-to-date schedule can be found on the course homepage.

CW	Week day	Date	Time	Room	Activity	Topic
Part 1: Introduction						
4	Mon	1/21/2019	8:15 -- 10:00	Alfons	Lecture	L1: Introduction & Course Organisation
			15:15 -- 17:00	Alfons	Lecture	L2: Verification & Validation
Part 2: Software Quality						
4	Fri	1/25/2019	8:15 -- 10:00	Alfons	Lecture	L3: Intro Software Quality
			10:15 -- 12:00	Alfons	Lecture	L4: Measurement Systems & Base & Derived Measures

			13:15 -- 15:00	Alfons	Assignment	Quality Assignment 1, Quality & Measurement
5	Mon	1/28/2019	8:15 -- 10:00	Alfons	Lecture	L5: Maintainability, Reliability
			15:15 -- 17:00	Alfons	Lecture	L6: Analysing Measurement Data
	Fri	2/1/2019	8:15 -- 10:00	Alfons	Assignment	Quality Assignment 1, Quality & Measurement
			10:15 -- 12:00	Alfons	Assignment	Quality Assignment 1, Quality & Measurement
			13:15 -- 15:00	Alfons	Assignment	Quality Assignment 1, Quality & Measurement
6	Mon	2/4/2019	**8:15 -- 10:00**	**no room avail.**	no session	self study, work on assignment
			15:15 -- 17:00	Alfons	Lecture	L7 Quality Assurance
	Fri	2/8/2019	8:15 -- 10:00	Alfons	no session	self study, work on assignment
			10:15 -- 12:00	Alfons	Lecture	L9: Software Complexity Awareness
			13:15 -- 15:00	Alfons	Assignment	Quality Assignment 2, Complexity & QA
7	Mon	2/11/2019	8:15 -- 10:00	Alfons	Assignment	Quality Assignment 2, Complexity & QA
			15:15 -- 17:00	Alfons	Assignment	Quality Assignment 2, Complexity & QA
Part 3: Software Testing						
7	Fri	2/15/2019	8:15 -- 10:00	Alfons	no session	self study
			10:15 -- 12:00	Alfons	Lecture	Intro Software Testing
			13:15 -- 15:00	Alfons	Lecture	Unit-, System-, Integration testing etc.
8	Mon	2/18/2019	8:15 -- 10:00	Alfons	Lecture	Functional Testing & Instructional Testing (Coverage Criteria)
			15:15 -- 17:00	Alfons	Assignment	Testing Assignment 1: Junit, ECLemma?
	Fri	2/22/2019	8:15 -- 10:00	Alfons	Assignment	Testing Assignment 1: Junit, ECLemma?
			10:15 -- 12:00	Alfons	Lecture	Test-Driven Development, Integration Testing
			13:15 -- 15:00	Alfons	Lecture	Design For Testing, Mocking

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9	Mon	2/25/2019	8:15 -- 10:00	Alfons	no session	self study, work on assignments
			15:15 -- 17:00	Alfons	Lecture/ Assignment	A/B Testing
	Fri	3/1/2019	8:15 -- 10:00	Alfons	no session	self study, long afternoon
			10:15 -- 12:00	Alfons	Lecture	Slicing & Debugging
			13:15 -- 15:00	Alfons	Lecture	Slicing & Debugging
			15:15 -- 17:00	Alfons	Lecture	Slicing & Debugging
10	Mon	3/4/2019	8:15 -- 10:00	Alfons	no session	self study
			15:15 -- 17:00	Alfons	Lecture	Inspection & Code Reviews
	Fri	3/8/2019	8:15 -- 10:00	Alfons	no session	self study
			10:15 -- 12:00	Alfons	no session	self study
			13:15 -- 15:00	Alfons	Lecture	Model-based Testing
Part 4: Wrap Up and Exam						
11	Mon	3/11/2019	10:15 -- 12:00	Alfons	Lecture	Wrap Up & Exam Prep?
12	Thu	**3/21/2019**	**8:30 - 12:30**	**Lindholmen**	**Exam**	

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