DIT635 Software Quality and Testing

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Click here for the detailed schedule, slides, and reading (Last Updated: January 21)

Course-PM

DIT635 Software Quality and Testing lp3 VT20 (7.5 hp)

Course is offered by the department of Computer Science and Engineering

Contact Details

Examiner/Course Responsible
Gregory Gay (**ggay@chalmers.se (mailto:ggay@chalmers.se)**)

Teaching Assistants
Mohamad Drgham (**gusdrgmo@student.gu.se (mailto:gusdrgmo@student.gu.se)**)
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Student Representatives
TBD (e-mail Dr. Gay if you are interested in volunteering)

Student Office
Contact **student_office.cse@chalmers.se (mailto:student_office.cse@chalmers.se)** for questions related to the course administration (e.g., registration, signup, grades in LADOK).

Course Purpose

Our society is built on software. It powers our homes, it manages our private information, it controls our cars, it automates our factories, and it even regulates our bodies. It is incredibly important that we construct robust, operational systems, especially given growing demand for features, limited development budgets and strict time constraints.

The key to delivering robust software is through a thorough verification and validation (V&V) process. In this course, we will explore the V&V process and examine a variety of methods to test systems, prove their correctness, and provide evidence that the software we build is reliable and safe to use. 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.

Schedule

Detailed Course Schedule (updated: 2020-16-01)

TimeEdit (https://cloud.timeedit.net/chalmers/web/public/ri1X50gQ0560YvQQ55Z6874Y0Zy6007355Y69Q517.html)

Course Literature

There is no **mandatory** course literature.

The following text book is **optional**:
Mauro Pezze, Michal Young. Software Testing and Analysis: Process, Principles, and Techniques.
2008. John Wiley & Sons, Inc., USA.
ISBN-13: 978-0471455936

Students can request a free copy of the textbook from **https://ix.cs.uoregon.edu/~michal/book/free.php (https://ix.cs.uoregon.edu/~michal/book/free.php)** .

This book was used during the creation of some of the slides, and provides additional background material for many of the course topics. Students are recommended to request their free copy for use when studying the testing material in the course.

Additional optional readings may be provided for individual topics.

Course Design

The teaching consists of lectures, group work (assignments), class exercises, as well as supervision in connection to the exercises and assignments.The course emphasizes problem-based learning. Basic concepts of are presented in the lecture, applied in exercise sessions, and then extended in the context of integrated, graded assignments. Assignments are developed in teams of 3 students.

Language of instruction: English

Teaching and Learning Activities

Lectures: There will generally be two lectures per week (Wednesday, 08:15-10:00, and Friday, 10:15-12:00), with occasional third lectures (see Schedule). Attendance in the lecture is highly recommended, but not mandatory.

Exercises: We will work through a specific set of exercises in formal exercise sessions (Fridays, 13:15 - 15:00). This gives students the chance to apply class concepts, as well as to see demonstrations. Dr. Gay

and the TAs will be present to answer questions. Attendance in supervision sessions is, again, highly recommended but not mandatory.

Forum: Any questions related to the lecture, exercises, or assignment can be asked in the **Canvas discussion forum**. If you have any questions or doubts regarding the course material, this is a good place to express them.

Changes Made Since the Last Occasion

The course has been entirely re-designed by the new examiner, Dr. Gay. While some topics covered may overlap, there is no continuity with the previous version of the course.

Learning Objectives and Syllabus

Learning objectives:

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

Link to the syllabus **[https://kursplaner.gu.se/pdf/kurs/en/DIT635.](https://kursplaner.gu.se/pdf/kurs/en/DIT635)**
[(https://kursplaner.gu.se/pdf/kurs/en/DIT635)](https://kursplaner.gu.se/pdf/kurs/en/DIT635)

Examination Form

Sub-Courses

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)

Assessment

The course is examined by an individual written exam carried out in an examination hall at the end of course and written assignments normally carried out in groups of three students. The assignments part is examined on the basis of solutions to compulsory problems handed in during the course and on the basis of individual contribution to the group work.

There will be three group written assignments. Each assignment is equally weighted. Specific requirements for the assignments will be provided on Canvas.

Students are required to complete written self- and peer-assessment forms during the course which will be part of the assessment of the student's individual contribution to the project. The instructor may adjust the individual grades of a student depending on this evaluation.

Grading Scales

The grading scale differs for assignments vs. the exam. For the assignments, the GU grades Pass (G) and Fail (U) are used, for the exam, we use Pass with Distinction (VG), Pass (G) and Fail (U). To be awarded Pass (G) for a full course, the students must pass both the exam part and the assignments part with at least grade (G). To be awarded Pass with Distinction (VG) for a full course, the student must, in addition, receive a VG on the written exam part. Essentially, your final overall grade is the grade you get on the exam, as long as the assignment part of the course has been passed.

Written assignments and the final exam will be graded on a numeric scale, converted to percentages. The final percentage grade for the assignments and exams will be converted as follows:

Grading Scale for Assignments:

% Grade	Grading Scale
0-59%	Fail (U)
60-100%	Pass (G)

Grading Scale for Exams:

% Grade	Grading Scale
0-59%	Fail (U)
60-85%	Pass (G)
86-100%	Pass with Distinction (VG)

Assignment Grade Calculations

The final grade for the assignment part of the course (3 credits) will be an average of the grade for each of the three assignments. If the average grade across the assignments is passing, the students will receive a passing grade for the assignment part of the course. Failing one of three assignments does not necessarily mean there will be a failing grade for the assignments part of the course.

Group Grades

Note that although the grade is given for a group assignment, this grade is then assigned individually to students, and may be adjusted depending on the peer evaluation form. Thus, not all students in the same group are guaranteed to get the same grade. Such situations are rare.

Late Assignments

Up to One day late: - 20% reduction of final mark

Up to Two days late: - 40% reduction of final mark

Two or more days late: 0% on assignment

Failing Assignments

If the final average grade of all assignments is a failing grade, **all** three assignments must redone and resubmitted with a new case. The redone assignments are handed in again at a date after course completion. A new case will be provided. Redone assignments can be done in groups or individually.

Assignment Re-submission

If an assignment is failed, students have **up to two** chances to resubmit an improved version. Re-submissions will only be accepted until one month after the (first) written exam.

Failing the Exam

Retake examinations of the assignments part consist of written individual assignments. If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

Examination Dates

- First round: March 19th, Morning
- Second round: TBD
- Third round: TBD

See the following for any updates:

https://studentportal.gu.se/english/my-studies/cse/Examination **(https://studentportal.gu.se/english/my-studies/cse/Examination)**

Additional Information

This section contains some general rules that will be enforced during this course. Please review these guidelines carefully. Violations of conduct guidelines will be taken seriously and will lead to disciplinary action.

Integrity and Ethics

The homework and programs you submit for this class must be entirely your own. If this policy is not absolutely clear, then please contact me. Any other collaboration of any type on any assignment is not permitted. It is also your responsibility to protect your work from unauthorized access. Any violation of this policy will result - at minimum - in a failing grade on the assignment. Further infractions will result in a failing grade in the course and further disciplinary action. See the Gothenburg University Rules regarding plagiarism: **http://studentportal.gu.se/english/study-environment-and-rules/plagiarism-and-cheating/** **(http://studentportal.gu.se/english/study-environment-and-rules/plagiarism-and-cheating/)**

Classroom Climate

All students are expected to behave as scholars at a leading institute of technology. This includes arriving on time, not talking during lecture (unless addressing the instructor), and not leaving the classroom before the end of lecture. Disruptive students will be warned and potentially dismissed from the classroom.

Late Submissions

Homework assignments are due at the time noted on the assignment handout. Late work is not accepted without prior approval. Any assignment turned in after the due date will be considered late and will be subject to a penalty of 20% per day, including weekends and holidays.

Special Needs

It is university policy to provide, on a flexible and individual basis, reasonable accommodations to students that have disabilities that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact their instructor early in the semester to discuss their individual needs for accommodations.

Diversity

Someday you will graduate, and in the real world, you will have to work with a wide variety of people. Now is the time to abandon preconceived prejudices about others. Students in this class are expected to respectfully work with all other students, regardless of gender, race, sexuality, religion, or any other protected criteria. There is a zero-tolerance policy for any student that discriminates against other students for any reason.

Course summary:

Date	Details