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FIT5171 System validation and verification, quality and standards - Semester 1, 2014

This unit covers the core software engineering disciplines concerned with managing and delivering quality software. Topics include processes, tools and techniques for system validation and verification, including major commercial tools used in industry. It shows how to detect, analyse and control defects in complex software systems. Inspection and testing methodologies, analysis of artefacts, robustness, quality assurance, and advanced software validation and verification methods are covered.

Mode of Delivery

Caulfield (Day)

Workload Requirements

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

• Two hours of lectures
• One 1-hour tutorial

(b.) Additional requirements (all students):

• A minimum of 9 hours independent study per week for completing tutorial and project work, private study and revision.

Additional workload requirements

You will need to allocate one hour per week for unsupervised lab/tute activity in the MUSE Lab to get familiarised with tools, work on assignments and for self study.

Unit Relationships

Prohibitions

CSE4431, FIT4004

Prerequisites

((FIT5131 or FIT9017) and (FIT5132 or FIT9003 or FIT9019)) or equivalent
Advanced programming in Java; Object-oriented software engineering: UML notation, method and SE process; Basic discrete mathematics: sets, relations, functions, graphs; Project management.
Chief Examiner

Dr Chris Ling

Campus Lecturer

Caulfield

Lito Cruz

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through the Student Evaluation of Teaching and Units (SETU) survey. The University’s student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash’s educational strategy, see:

www.monash.edu.au/about/monash-directions/ and on student evaluations, see:
www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this Unit

Previous feedback has highlighted the following strengths in this unit:

- Practical, programming based project
- Challenging and stimulating tutorials and assignment

Student feedback has also informed improvements to this unit including:

- The assignment timing and weights have been adjusted to reflect their relative difficulty level
- Practical sessions have been introduced to make tools/systems more accessible to students unfamiliar with them

If you wish to view how previous students rated this unit, please go to https://emuapps.monash.edu.au/unitevaluations/index.jsp
Academic Overview

Learning Outcomes

At the completion of this unit students will have -A knowledge and understanding of:

- the role of validation and verification methods in the system life cycle; key issues in software testing, testing levels and testing techniques;
- specification-based: equivalence partitioning, boundary-value analysis, decision table testing, random testing
- code-based: control-flow testing;
- fault-based: error seeding, mutation testing;
- type of apps: Web based, Object-oriented, component testing, testing concurrent/distributed/real-time/embedded systems;
- selection and combination of techniques; test related measures;
- evaluation of software under test - fault density, testing coverage metrics.

Developed attitudes that enable them to:

- adhere to software quality engineering principles;
- recognise the importance of adhering to software engineering principles of validation and verification in the design and development of test methods;
- have an understanding of inspection and debugging approaches, configuration management, performance, and quality standards issues;
- apply validation and verification methods to ensure and improve quality of software systems;
- measure and evaluate a software system's quality, complexity and reliability using software metrics.

Developed the skills to:

- use industry-strength IDEs such as Eclipse, NetBeans and IntelliJ and unit testing with JUnit, code coverage tools such as Cobertura, and other similar products to help detect software system defects;
- conduct continuous integration (CI) at unit, integration and system testing level using a CI server such as Jenkins to automatically run regression test suites on the system under test;
- be able to analyse and control defects in complex systems.
## Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No formal assessment or activities are undertaken in week 0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Overview, Fundamentals of Software Testing</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mathematics for software testing &amp; quality: set theory, graph theory, etc.</td>
<td>Weekly assessed tutorials start in Week 2</td>
</tr>
<tr>
<td>3</td>
<td>Black-box testing</td>
<td>Unit, Integration, System and Continuous testing - Phase 1 due Week 3</td>
</tr>
<tr>
<td>4</td>
<td>White-box testing I</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>White-box testing II</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Component testing</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Software quality &amp; metrics</td>
<td>Unit, Integration, System and Continuous testing - Phase 2 due Week 7</td>
</tr>
<tr>
<td>8</td>
<td>System testing</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Object-oriented testing</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mutation testing</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>A comparison of software verification and validation techniques</td>
<td>Unit, Integration, System and Continuous testing - Phase 3 due Week 11</td>
</tr>
<tr>
<td>12</td>
<td>Web testing overview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SWOT VAC</td>
<td>No formal assessment is undertaken in SWOT VAC</td>
</tr>
</tbody>
</table>

*Unit Schedule details will be maintained and communicated to you via your learning system.

## Teaching Approach

### Lecture and tutorials or problem classes

This teaching and learning approach provides facilitated learning, practical exploration and peer learning.

## Assessment Summary

In-sememester assessment: 50%; Examination (2 hours): 50%

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit, Integration, System and Continuous testing - Phase 1</td>
<td>10%</td>
<td>Week 3</td>
</tr>
<tr>
<td>Unit, Integration, System and Continuous testing - Phase 2</td>
<td>15%</td>
<td>Week 7</td>
</tr>
<tr>
<td>Unit, Integration, System and Continuous testing - Phase 3</td>
<td>15%</td>
<td>Week 11</td>
</tr>
<tr>
<td>Tutorial Participation</td>
<td>10%</td>
<td>Weekly</td>
</tr>
<tr>
<td>Unit Schedule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Examination 1</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To be advised</td>
<td></td>
</tr>
</tbody>
</table>
Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles

Academic Integrity - Please see resources and tutorials at
http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/

Assessment Tasks

Participation

Students are expected to attend all tutorials and participate in active discussions. Tutorials will carry 10% assessment and will be assessed on participation.

• Assessment task 1

Title: Unit, Integration, System and Continuous testing - Phase 1

Description: The first phase of the semester-long project consists of two parts:

♦ System setup,
♦ Implementation as specified in the assignment specification, and
♦ Unit testing of the various component classes in the code base provided to and extended by you.

Weighting: 10%

Criteria for assessment: This assignment is evaluated on the correctness and completeness of the work:

♦ System setup, and
  ◊ Successful setup of the working environment on personal laptops, and
  ◊ Successful connection to the integration server.
♦ Implementation
  ◊ Completeness of the implementation.
♦ Unit testing
  ◊ Developing functionality according to a given specification,
  ◊ Successfully invoking automated builds on the server, and
  ◊ Development of non-trivial unit tests appropriate for specified system functionality.

No written or file submission is required for this assessment. It will be based only on a demo in the tutorial and answering queries & during an interview.

Due date: Week 3
Assessment Requirements

• Assessment task 2

Title:
Unit, Integration, System and Continuous testing - Phase 2

Description:
The second phase of the semester-long project focuses on integration testing.

You will continue to develop the system based on a given specification and write unit tests and integration tests for the newly developed components. Such tests will also need to be automatically executed on the continuous integration server.

Students enrolled in FIT5171 will be given additional creative tasks to complete in this assignment. Details will be given in the assignment description.

Weighting:
15%

Criteria for assessment:
The assignment will be assessed by its correctness and completeness.

♦ Sufficient functionality in the different layers of the system.
♦ Sufficient testing adequacy of the developed functionality.

No written or file submission is required for this assessment. It will be based only on a demo in the tutorial and answering queries & during an interview.

Due date:
Week 7

• Assessment task 3

Title:
Unit, Integration, System and Continuous testing - Phase 3

Description:
The third phase of the semester-long project focuses on system testing.

You will continue to develop the system based on a given specification and write unit tests, integration tests and system tests for the newly developed components. Such tests will also need to be automatically executed on the continuous integration server.

Students enrolled in FIT5171 will be given additional creative tasks to complete in this assignment. Details will be given in the assignment description.

Weighting:
15%

Criteria for assessment:
The assignment will be assessed by its correctness and completeness.

♦ Sufficient functionality of the whole system (backend and the Web frontend).
♦ Sufficient testing adequacy of the components and the system.

Assessment will consist of a demo & interview in the tutorial and a short written report.

Due date:
Week 11
Assessment Requirements

• Assessment task 4

  Title:  
  Tutorial Participation

  Description:  
  Tutorials run from Week 2 through to Week 12. Questions related to lectures, assignment 
  demos and literature reading will be conducted in tutorials.

  Weighting:  
  10%

  Criteria for assessment:  
  Active participation in discussions.

  Due date:  
  Weekly

Examinations

• Examination 1

  Weighting:  
  50%

  Length:  
  2 hours

  Type (open/closed book):  
  Open book

  Electronic devices allowed in the exam:  
  None

Learning resources

Reading list

  Publications.
  Publ.
  Addison-Wesley.
• David A Sykes John D McGregor (2001), *Practical Guide to Testing Object-Oriented 
  Software*, Addison-Wesley.
• Daniel J.Mosley, Bruce A. Posey (2002), *Just Enough Software Test Automation*, 
  Addison-Wesley.
• Jerry Gao, H S Tsao and Ye Wu (2003), *Testing and Quality Assurance for 
  Component-based Software*, Artech House.
• Matt Staats, Michael W. Whalen, Mats P.E. Heimdahl. *Programs, Tests, and Oracles: The 
  Foundations of Testing Revisited*. In *Proceedings of the 33rd International Conference on 
  Software Engineering (ICSE’11)*. 2011, pages 391-400. ACM.
  ICSE 2007. 29th International Conference on* (pp. 416-426). IEEE.
Assessment Requirements


Monash Library Unit Reading List (if applicable to the unit)
http://readinglists.lib.monash.edu/index.html

Faculty of Information Technology Style Guide

Feedback to you

Examination/other end-of-semester assessment feedback may take the form of feedback classes, provision of sample answers or other group feedback after official results have been published. Please check with your lecturer on the feedback provided and take advantage of this prior to requesting individual consultations with staff. If your unit has an examination, you may request to view your examination script booklet, see
http://intranet.monash.edu.au/infotech/resources/students/procedures/request-to-view-exam-scripts.html

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments without comments
- Solutions to tutes, labs and assignments

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process: http://www.monash.edu.au/exams/special-consideration.html

Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

Assignment submission

It is a University requirement (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-plagiarism-collusion-procedures.html) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at http://www.infotech.monash.edu.au/resources/student/forms/. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an online quiz). Please note that it is your responsibility to retain copies of your assessments.
Online submission

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

The MUSE Lab in Bldg 26/G13 is the lab used for this unit. However, students are required to install the required software on their laptops to minimise interruptions to development and testing. The required software include:

- Tools for Software testing such as JUnit 4.x (latest vers)
- Java build management Apache Maven 2.x or 3.x
- The version control system Subversion
- An open source or commercial Java IDE (Eclipse, NetBeans or IntelliJ IDEA)

Software may be:

- Downloaded from:
  - http://www.jetbrains.com/idea/download/
  - http://tortoisesvn.net/downloads.html

- A free classroom license for IntelliJ IDEA will be provided via Moodle

Recommended Resources

Students are encouraged to use their own laptops to work on project assignments. All required software can be downloaded and installed onto personal laptops.

Recommended text(s)

Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University’s academic standards, and to provide advice on how they might uphold them. You can find Monash’s Education Policies at: www.policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Student Academic Integrity Policy and Student Academic Integrity: Managing Plagiarism and Collusion Procedures; http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.html
- Special Consideration; http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.html
- Grading Scale; http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html
- Discipline: Student Policy; http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html
- Academic Calendar and Semesters; http://www.monash.edu.au/students/dates/
- Orientation and Transition; http://intranet.monash.edu.au/infotech/resources/students/orientation/

Faculty resources and policies

Important student resources including Faculty policies are located at http://intranet.monash.edu.au/infotech/resources/students/

Graduate Attributes Policy

http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.html

Student Charter


Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at http://www.monash.edu.au/students. For Malaysia see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/.
Other Information

**Monash University Library**

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to www.lib.monash.edu.au or the library tab in my.monash portal for more information. At Malaysia, visit the Library and Learning Commons at [http://www.lib.monash.edu.my/](http://www.lib.monash.edu.my/). At South Africa visit [http://www.lib.monash.ac.za/](http://www.lib.monash.ac.za/).

**Disability Liaison Unit**

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus