Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie

School of Information Technology
Skool vir Inligtingtegnologie

Department of Computer Science
Departement Rekenaarwetenskap

Software Modelling (COS 121)
Programmatuurmodellering (COS 121)

Lecturers: Dr Linda Marshall, Mr Marius Riekert, Mr Christoph Stallmann and Mr Brian Nyatsine
Last Revision: 20 July 2015

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1 Overview

The following is a description of the module and its position in the broader Computer Science curriculum.

1.1 Description

The module will introduce the concepts of model-driven analysis and design as a mechanism to develop and evaluate complex software systems. Systems will be decomposed into known entities, such as design patterns, classes, relationships, execution loops and process flow, in order to model the semantic aspects of the system in terms of structure and behaviour. An appropriate tool will be used to support the software modelling. The role of the software model in the enterprise will be highlighted. This module also teaches programming using design patterns. Popular object-oriented languages are used as implementation medium.

1.2 Prerequisites

The prerequisites for COS121 are: COS 153 or COS 131 or COS 132. You are required to have a good understanding of basic procedural programming principles.

1.3 Related Modules

- COS110 - Introduction to Software Design, which runs concurrently with this module provides the Object Oriented programming principles on which the modelling and design patterns are based.
- COS212 - Data Structures and Algorithms and many others require a basic understanding of the fundamentals taught in this module.
- COS301 - Software Engineering, makes use of the Software Modelling principles discussed in this module and places them in the context of Software Engineering and particularly software design.
- COS341 - Compiler Construction
- COS314 - Artificial Intelligence,

1.4 Study Units

The module consists of two main themes:

- UML Modelling
- Design patterns

These themes are presented in parallel and combined with practical application using the C++ programming language.
2 Outcomes

2.1 Career

Skills in design patterns are regarded as a key qualification in the contemporary Software Engineering industry. Moreover, this module also prepares its students for the Department’s third year project as well as Hons.-modules on Software Architecture and Generic Programming.

2.2 Module

After successful completion of this module, the student will:

- appreciate the philosophy of object-orientated design and understand the application of its underlying concepts
- have a fundamental understanding of design patterns
- be able to use design patterns in conjunction with one another
- understand the necessity for modelling software
- have a good understanding of the properties of good software design
- be able to apply software modelling techniques to design patterns
- have completed a project that models the system using UML and design patterns

3 Plagiarism Policy

The Department of Computer Science considers plagiarism as a serious offense. Disciplinary action will be taken against student who commit plagiarism: First-time offenders will meet the Head of Department, second-time cases will be escalated to higher UP committees.

For a formal definition of plagiarism, the student is referred to the following website:
http://www.ais.up.ac.za/plagiarism/index.htm
(From the UP Main page follow the Library quick link and then the Plagiarism link)

Note that plagiarism also includes inappropriate behaviour during Tests and Exams, such as using non-permitted materials, or staring into the papers of a bench neighbour in the exam room, etc.

4 Instructors

4.1 Lecturers

<table>
<thead>
<tr>
<th>Name</th>
<th>Office no.</th>
<th>email</th>
<th>Tel no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linda Marshall</td>
<td>IT 4-28</td>
<td><a href="mailto:lmarshall@cs.up.ac.za">lmarshall@cs.up.ac.za</a></td>
<td>012 420 3624</td>
</tr>
<tr>
<td>Marius Riekert</td>
<td>IT 5-43</td>
<td><a href="mailto:mriekert@cs.up.ac.za">mriekert@cs.up.ac.za</a></td>
<td>012 420 3561</td>
</tr>
<tr>
<td>Christoph Stallmann</td>
<td>IT 5-50</td>
<td><a href="mailto:cstallmann@cs.up.ac.za">cstallmann@cs.up.ac.za</a></td>
<td></td>
</tr>
<tr>
<td>Brian Nyatsine</td>
<td>tba</td>
<td>tba</td>
<td></td>
</tr>
</tbody>
</table>
4.2 Tutors and Teaching Assistants

The tutors and teaching assistants (TA’s) assigned to the module are listed on the module website.

4.3 Administrative support

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td><a href="mailto:cos121queries@cs.up.ac.za">cos121queries@cs.up.ac.za</a></td>
<td>Queries</td>
</tr>
<tr>
<td>queries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech-team</td>
<td><a href="mailto:techteam@cs.up.ac.za">techteam@cs.up.ac.za</a></td>
<td>Linux logins</td>
</tr>
<tr>
<td>Web-team</td>
<td><a href="mailto:webteam@cs.up.ac.za">webteam@cs.up.ac.za</a></td>
<td>Access to module website</td>
</tr>
</tbody>
</table>

5 Organisation

Students are required to attend lectures, practical sessions and tutorial sessions. Mentor sessions are compulsory for students who are invited and are available to students who would like guidance regarding a specific aspect of the module content.

The module follows a continuous assessment model, it is therefore imperative that a student keeps up to date. Students that apply a continuous work schedule are more likely to succeed than students that work sporadically and tend to work in bursts before crucial deadlines and examination opportunities. Therefore, you are advised to continuously make use of the available opportunities to make sure that you understand the work. It is hard work to stay up to date, but much harder work to catch up.

In the following sections the support that is given to assist you to stay up to date is described in more detail.

5.1 Module website

The module website at
http://www.cs.up.ac.za/courses/COS121

is used to publish module material and provide additional information.

5.2 Lecture Schedule

You are advised to prepare for lectures. To assist you a lecture schedule is listed at the end of this document. Furthermore, the topics of the following week’s lectures will be published on the module website prior to the week’s lectures.

5.3 Announcements

Ad-hoc announcements during the semester will appear on the module website. It is recommended that students should visit this website regularly, not to miss anything important. Note that the Department reserves the right to deviate from planned schedules under circumstances which cannot yet be foreseen, and that some announcements or instructions on the module website might be of a mandatory character.
5.4 Practical lab sessions

Each student must book a practical session and will be allocated to a specific lab during that session. The allocated labs and sessions will be placed on a class list named LabBookings.pdf which can be found in the administration section on the module webpage. It is expected that you attend this practical session as per the schedule. There will be teaching assistants on duty during these sessions to assist you with your practical assignments and to assess (mark) your previous assignment.

5.5 Mentor sessions

Sometimes it helps to participate in a mentor session with a tutor to enhance your understanding of the work. Mentor sessions will be available at specific times. At risk students may also be invited to attend a mentor session regarding a particular topic. The quality of your participation in the mentor sessions will be evaluated. These sessions will be conducted in the CoSTutorium next to the Computer Science Reception desk on the fourth level of the IT Building.

5.6 Ticket system

Email all your administrative queries to the query ticket system. The email for address for this system is given by: cos121queries@cs.up.ac.za. Once your query has been logged, a person responsible for the topic to which your query relates will provide an answer to your query.

5.7 Communication with lecturers

You are encouraged to ask questions in class during lectures. You may also approach the lecturer before or after a lecture in the lecture hall to resolve minor problems.

If you have applied all of the above and your problem is still unsolved, you may make an appointment with a lecturer to discuss the problem. You are advised to send an email with enough information as to what your problem might be to request an appointment. Sometimes a simple email will suffice in answering a question if enough information is provided.

5.8 Summary

The activity diagram given in Figure[1] provides a summary of the procedures to be followed should you require assistance in the module.
6 Study Material

6.1 Prescribed

No textbook has been prescribed for the module, lecture notes will be made available for each lecture. In order to prepare for a lecture you will need to search for the relevant information on the internet. The lecture notes will be the material you study for the examination opportunities. The lecture notes from 2014, which will be updated as needed for 2015, are available at: http://www.cs.up.ac.za/cs/lmarshall/TDP/TDP.html

6.2 Additional references

The following references were prescribed in 2009 and 2010 and should be available in the library. It may be prudent to purchase the first one in any case if you have the funds.

E. Gamma, R. Helm, R. Johnson and J. Vlissides (1995); Design Patterns: Elements of Reusable Object-Oriented Software; Addison-Wesley; ISBN: 0201633612.


You are strongly advised to download the following references to help you with your studies:
7 Assessment

Assessment follows a continuous evaluation model. The module assessment events are described in the sections that follow.

7.1 Examination opportunities

The student will be presented with four examination opportunities during the semester. Three will take place during the semester and the final one will be written during the examination period. The examination period opportunity is compulsory for all who obtained exam entrance in order to pass the module.

A sub-minimum of 40% needs to be achieved to gain entrance to the fourth examination opportunity, that is a continuous evaluation mark of at least 24 at the end of the semester.

A sub-minimum of 40% needs to be achieved in the examination period opportunity and a final mark of at least 50% to pass the module. Because of the availability of three examination opportunities during the semester, of which the worst one will have minimal contribution to your marks, no aegrotat (sick) examination opportunities will be taken, examination opportunity 4 will have an aegrotat associated with it.

7.2 Class Tests

During the semester, six class tests have been scheduled. There is a possibility that you will be required to write unannounced class tests during any lecture or tutorial class. Not all class tests have equal weighting but all class test will be used to calculate the final mark. No aegrotat class test will be taken.

7.3 Practical and written Assignments

Assignments may take the form of either a programming (as required during Practical Sessions) or a written type assignment which are to be done individually unless otherwise stated. Not all assignments have equal weighting but all assignments will be used to calculate the final mark.

Deadlines will be applied strictly. No late submissions will be accepted. There will also be no aegrotat practicals.
### 7.4 Mark Allocation

Students will be evaluated continuously by means of examination opportunities, class tests and assignments. The final mark for the module will be calculated as follows:

<table>
<thead>
<tr>
<th>Evaluation Event</th>
<th>Percentage</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination Opportunities</td>
<td>70%</td>
<td>A sliding contribution with regards to the 3 examination opportunities (EO's) written during the semester will contribute towards 30% (5% for the worst EO and 15% for the best) of the mark. The 4\textsuperscript{th} examination opportunity written during the exam will count towards the outstanding 40%.</td>
</tr>
<tr>
<td>Class Tests</td>
<td>15%</td>
<td>At least the six announced class tests and an unknown number of \textit{unannounced} class tests during the semester</td>
</tr>
<tr>
<td>Assignments</td>
<td>15%</td>
<td>Marks obtained for the practical and homework assignments done throughout the semester.</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

### 8 Schedule

#### 8.1 Lectures

There are three (3) lectures scheduled per week for the module. These take place and are synchronised as follows:

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Day</th>
<th>Time</th>
<th>Venue</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday</td>
<td>10:30-11:20</td>
<td>Centenary 6</td>
<td>English</td>
</tr>
<tr>
<td></td>
<td>Tuesday</td>
<td>13:30-14:20</td>
<td>IT 4-2</td>
<td>Afrikaans</td>
</tr>
<tr>
<td>2</td>
<td>Wednesday</td>
<td>11:30-12:20</td>
<td>Centenary 3</td>
<td>English</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:30-13:20</td>
<td>IT 4-3</td>
<td>Afrikaans</td>
</tr>
<tr>
<td>3</td>
<td>Friday</td>
<td>07:30-08:20</td>
<td>IT 2-24</td>
<td>Afrikaans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:30-13:20</td>
<td>IT 4-5</td>
<td>English</td>
</tr>
</tbody>
</table>

#### 8.2 Practical Sessions

All practical sessions are bilingual and are scheduled for 3 hours per week. The practical sessions take place in the laboratories in the Informatorium.

<table>
<thead>
<tr>
<th>Practical</th>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday</td>
<td>13:30-16:30</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday</td>
<td>10:30-13:30</td>
</tr>
<tr>
<td>3</td>
<td>Thursday</td>
<td>10:30-13:30</td>
</tr>
</tbody>
</table>

Consult \texttt{LabBookings.pdf} for your allocated venue.
8.3 Tutorials

Students are required to attend one tutorial per week. There are two sessions to choose from scheduled on a Thursday.

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Venue</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>9:30-10:20</td>
<td>HB 4-6</td>
<td>Bilingual</td>
</tr>
<tr>
<td></td>
<td>16:30-17:20</td>
<td>IT 4-5</td>
<td>Bilingual</td>
</tr>
</tbody>
</table>

9 Semester calendar

A detailed calendar will be posted on the module website on a weekly basis. Class tests are scheduled for 22 July 2015, 5 and 26 August 2015, 9 and 30 September 2015, and 2/3 November 2015 for the last class test. Examination opportunities, both during the semester and the examination period, are scheduled centrally and are available on the official University of Pretoria tests and examination timetables site, accessible via the student portal.