School of Electrical and Information Engineering
University of the Witwatersrand, Johannesburg
ELEN4010A — Software Development III

Course Brief and Outline — 2025

Academic Staff

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1 Course Background

The course forms part of the "Software Development" line of courses. It follows on from Software Development II and focuses on "modern" software development. Modern software development is defined as being highly collaborative, making use of an agile methodologies, and using modern platforms, languages, technologies, and architectures.

2 Course Objectives

This course has three main objectives. In terms of collaboration, students will learn how to work effectively in small teams and use tools like version control to continuously integrate and deliver software solutions. Agile project management approaches will be explored and practised, illustrating how agile teams can be responsive to change and maximise value for the customer. The web as a development platform, browser technologies, and a client-server architecture will be introduced.

3 Course Outcomes

On successful completion of this course, the student is able to:

1. work within a small team to deliver a software product and apply good practices for collaborative software development;
2. use agile project management techniques to deliver business value in an iterative and incremental fashion;
3. capture, clarify, and prioritize an initial set of vague functional requirements using well-known, and popular, agile techniques;
4. demonstrate basic proficiency with web development technologies;
5. perform a small-scale investigation into a software engineering topic.

4 Course Content

Agile Methodologies
: Iterative and incremental development; user stories; story mapping; vertical slices; project planning; Scrum; sprints

DevOps
: Continuous integration, delivery and deployment; Git workflows; trunk-based development; feature toggles; short-lived feature branches; pull requests for code review

Web Technologies and Techniques
: The web as a development platform; JavaScript; HTML; CSS; Node; asynchrony and the event queue; cloud hosting

Data Persistence
: Relational databases and other forms of persistence; normal forms; SQL

Testing
: Testing pyramid; integration and acceptance testing; testing in JavaScript

5 Prior Knowledge Assumed

This course assumes students have a solid knowledge of fundamental programming language concepts including functions, classes, flow control, variables and scope. Students also need to be familiar with unit testing and be able to use version control in a simple manner.

The prerequisites and co-requisites to register for this course are defined in the current *Rules & Syllabuses: Faculty of Engineering and the Built Environment*.

6 Assessment

6.1 Formative Assessment

A number of preparatory laboratories will be made available to students in order to introduce them to the concepts and techniques required for completing the group laboratory assignment. Although these preparatory laboratories do not count for marks, doing them properly is essential for understanding the course material. Teaching assistants will be on-hand during dedicated laboratory sessions in the Computer Lab (D-Lab) to assist students.

6.2 Summative Assessment

Assessment Contributor	Duration (hours)	Component	Method & Weight	Calculator Type	Permitted Supporting Material
Individual Project	20	No	Rubric, 20%	–	–
Group Laboratory	30	No	Rubric, 35%	–	–
Examination*	2	No	Marks, 45%	1	–

*Note that the end-of-year examination requires a minimum of 35% in order to pass the course (termed a subminimum). This means that even if the average final mark for the course is 50% or above, a final examination mark of less than 35% does not qualify one to pass the course, as per the University Rules and Syllabuses.

6.3 Assessment Methods

The student will be assessed in the group laboratory, the individual project and in the examination. The laboratory and project will require the student to demonstrate proficiency and ability in the areas listed in the Course Outcomes (Section 3) in a practical, hands-on environment.

The project will be undertaken *individually*. It will require students to research a topic that is not covered formally in the course lectures. Each student will submit a written report as well as source code, and associated artefacts, for assessment.

The group laboratory will require the student to work *as part of a team* to creatively identify, assess, formulate and solve a software development problem by using concepts, methods, tools and techniques introduced in the course. The emphasis in the laboratory will be on team work and the students will be assessed by means of their laboratory artefacts, written reports and recorded presentations.

Students will be required to write the final examination on the Wits campus at the venue, and scheduled date and time, that is published by the Examination and Graduations Office.

7 Satisfactory Performance (SP) Requirements

For the purpose of Rule G.13 *satisfactory performance in the work of the class* means attendance and completion of prescribed laboratory activities, attendance at tutorials designated as compulsory in this CB&O, submission of assignments, writing of scheduled tests unless excused in terms of due procedure.

8 Teaching and Learning Process

8.1 Teaching and Learning Approach

The material of the course is covered in both video and in-person lectures. Students are *expected to attend in-person lectures* in order to engage properly with the material. In general, the lectures are complemented by additional material which will be available on the course website and/or given out during lectures.

The student is expected to undertake a significant amount of self-study and practice in this course in order to gain a full understanding of the material. Lectures will be used to introduce,

explain, and discuss key concepts, but these will need to be reinforced. Students are expected to spend an extra four hours per week of their time working alone and in groups enhancing their software development skills. The Computer Lab (on the ground floor of the Chamber of Mines building) is available for students to work.

Since the software development tools used during the course will be open-source and available at no cost, students will be able to use their own computer facilities if available. All material covered in the lectures, laboratories, project, or made available on the course website, is examinable.

8.2 Information to Support the Course

All supporting information for this course can be found on the course website and in the handouts/articles provided to students.

8.3 Learning Activities and Arrangements

Lectures

Lectures will take the form of prepared videos which students are expected to watch as well as in-person discussions of topics related to the videos. The purpose of these discussion is to reinforce or deepen the material covered in the lectures.

Individual Project

Details on the project will be provided in the form of a project brief. Refer to the School's document detailing the key dates for fourth year students for the submission deadline. Note that the School's policy on the timely submission of projects, as described in the *Red Book*, will be strictly enforced.

Group Laboratory

This laboratory forms an essential part of the course, as many of the concepts introduced can only be fully understood through practical exercises. The laboratory will include a comprehensive team programming project. The laboratory project will be developed incrementally and iteratively over a number of weeks.

Consultation

The lecturer is available for consultation during the laboratory sessions and directly after lectures. Students are encouraged to make use of the laboratory sessions to discuss any problems they may have with the course material.

9 Course Home Page

All announcements regarding the course will be posted on Ulwazi. All students are expected to consult Ulwazi and their student email at regular intervals. The course content will be available on the course home page: https://witseie.github.io/software-dev-3/