Advanced Database Design and Implementation - Course Outline
SWEN 432: 2013 Trimester 1

This document sets out the workload and assessment requirements for SWEN 432. It also provides contact information for staff involved in the course. If the contents of this document are altered during the course, you will be advised of the change by an announcement in lectures and/or on the course web site. A printed copy of this document is held in the School Office.

SWEN 432 is an advanced course in database and information systems. Databases and information systems facilitate the handling of large amounts of information. The information we want to process is now more complicated than it used to be. We require more intelligent, application-specific, and sophisticated systems to do the processing.

This year the course will examine the following two contemporary fields in the database systems area:
- XML Data Model and XML Databases, and
- Data Warehousing.

XML Data Model and XML Databases will comprise approximately 65% of the course. There, we shall consider topics such as: XML documents, Document Type Definition (DTD) and XML Schema, XML constraints, XML query languages, Types of XML Databases, Mapping XML data to relational databases, Publishing relational databases as XML documents, and what research is going on in the XML database area. The practical experience will be achieved through the use of XML processors like `xmllint` and the native XML database management system `eXist`.

The Data Warehouse field will comprise approximately 35% of the course and will consider questions like: what is a Data Warehouse and what is it used for, how is data organized in a Data Warehouse, what operations and queries are executed against a Data Warehouse, SQL:1999 standard and Data Warehouse, query accelerating techniques, and what are contemporary Data Warehouse architectures. A practical assignment will use PostgreSQL to demonstrate issues in designing, building and querying Data Warehouses.

Objectives

By the end of the course, students should be able to:
1. Design well formed XML documents that are valid with regard to a given DTD or XML Schema and thus develop the ability to solve practical engineering problems (BE graduate attribute 3(f)),
2. Analyze a part of the real world and design a corresponding XML DTD or Schema in XML normal form and thus develop the ability to formulate and build efficient models of complex systems using principles of engineering science and mathematics (BE graduate attribute 3(b) and BE graduate attribute 3(c)),
3. Design faithful models of a part of the real world using XML database constraints and thus develop the ability to apply mathematical and engineering science in solving engineering problems (BE graduate attribute 3(a)),
4. Use available web sources to learn about the eXist XML database management system and define XQuery queries and XUPdata updates of an almost arbitrary complexity against a native XML database and thus develop the ability to look for additional information from pertinent sources (BE graduate attribute 3(d)),
5. Analyze properties and usage of a set of XML documents, decide on the most appropriate kind of a database management system and implement the database and thus develop ability to formulate the problem and create a solution that models behavior of a part of the real world (BE graduate attribute 3(c)),
6. Demonstrate a comprehensive understanding of Data Warehouse structures and On-Line Analytical Processing (OLAP) queries,
7. Analyze a set of OLAP queries and design measures to accelerate their execution,
8. Analyze the requirements for a Data Warehouse, design it and implement it and thus develop the ability to synthesize a solution and make design documentation (BE graduate attribute 3(b) and BE graduate attribute 2(b)), and
9. Read, critically analyze, and write reports on research articles in an area covered by the course and thus develop the ability to communicate effectively (BE graduate attribute 2(b)), and
10. Understand influence of null values on database schema design.

Knowledge assumed of participants

Before you enroll in SWEN 432 you are expected to have passed SWEn304 OR COMP302. Particularly, you will need to be familiar with the following topics:
- Relational Data Model,
- Structured Query Language (SQL),
- Relational Functional Dependencies and Normal Forms,
- PostgreSQL Data Base Management System.

You must also have a good understanding of English and be able to write clearly.

Recommended Reading

The book: Ramakrishnan R., Gehrke J. " *Database Management Systems* ", Third *Edition, McGraw-Hill, 2004,* represents a possible starting point for areas intended to be covered by this course. The book: Ponniah, P. " *Database Warehouse Fundamentls* ", *John Wiley & Sons, New York, 2001*, represents a supplemental reading for the area of Data Warehousing . You may access the electronic version of Ponniah book using the following link. Additionally, useful links is a reading list of material that may be of use. You will also find there a link to PostgreSQL and eXist documentation.

Lectures

A schedule of lecture topics and tentative assignment due dates is available online. Lectures for SWEN 432 are:
- Monday 02:10 to 03:00 pm in MY 105,
- Tuesday 08:00 to 08:50 am in CO 118,
- Wednesday 10:00 to 10:50 am, in CO 118.

Assignments

There will be five assignments. A tentative assignment schedule is given here. In principle, each assignment will be issued on Monday and due on Friday next week. In your answers to assignment questions, you are expected to communicate your solutions in a clear way and, if needed, to present a proper design documentation. If you think you need more information than covered in lectures, use useful links, where you will find XML standards, and links to other sources.

The first assignment covers basics of XML documents and their two meta languages DTD and XML Schema, helping you to meet objectives one and two. The second assignment is about XML Schema identity constraints, XML functional dependencies and XML normal form. The second assignment brings into focus aspects of designing high quality XML schemes using mathematically grounded methods and thus to achieve the course objective three. The third assignment considers querying and updating XML documents using the native XML database management system eXist. The third assignment helps you to achieve objective four. In the fourth assignment you are asked to design and implement the same XML database using three different approaches and to compare their performance. The fourth assignment leads to the course objective five. Finally, the assignment five asks you to design, and build a small Data Warehouse and to exercise OLAP specific queries using PostgreSQL. By doing the assignment five, you achieve the course objectives six, seven, and eight. Assignments will be handed out in lectures. You will find all necessary information about assignments and files needed here. Assignments should be submitted electronically. Any assignment submitted after the due date will be penalized at the rate of 5% per day (a weekend counts as one day). Approval to submit assignments late without penalty will only be granted in exceptional circumstances and if the arrangement is made prior to the due date. Any medical excuse must be accompanied by a doctor's certificate.

Essay

Writing an essay is an important part of your assessment. The essay helps you to achieve the course objective nine. You will find the essay title and description in essay 2013 guidelines. The essay is *due on Friday 24 May.* You may find it useful to consult also general essay guidelines. Your essay should not exceed 7000 words. Submit the essay electronically as a .ps, or .pdf file, and also print it and hand in a hard copy into the hand-in box. There will be no essay presentations this year. The mark you get for your essay will be based on how interesting the content of your essay is, how readable the essay is, and how good your analysis of the problem is.

Workload

In order to maintain satisfactory progress in SWEN 432, you should plan to spend an average of at least 10 to 12 hours per week, which includes attending lectures, solving assignments, writing essay, reading literature and reviewing lecture material.

School of Engineering and Computer Science

The School office is located on level three of the Cotton Building (Cotton 358).

Staff

The course organizer and lecturer for SWEN 432 is: Pavle Mogin. His contact details are:
- Pavle Mogin
- Room: Cotton 262
- Phone: 463 5302
- email: Pavle.Mogin@ecs.vuw.ac.nz

Your class representative is:
- Person: David Mitchell
- Phone: 021 402443374

Announcements and Communication

The main means of communication outside of lecture will be email and the SWEN 432 web area at http://ecs.victoria.ac.nz/Courses/SWEN432_2013T1/. There you will find, among other things, this document, the lecture schedule, assignment handouts, and the SWEN 432 Forum. The forum is a web-based bulletin board system. Questions and comments can be posted to the forum, and staff will read these posts and frequently respond to them.

Assessment

Your grade for SWEN 432 will be determined from your work on the essay, assignments, and the final examination, as follows:

Item	Weight	Week Due
Essay	12%	10
Assignment 1	4%	4
Assignment 2	5%	6
Assignment 3	5%	7
Assignment 4	4%	9
Assignment 5	5%	12
Final examination	65%	

Final Examination

The timetable for final examinations will be available from the University web site and will be posted on a notice board outside the faculty office. The final examination will be three hours long. No computers, or similar device will be allowed in the final examination. Only paper non-English to English dictionaries and simple calculators will be permitted. The study and examination period for trimester T1 is 10 June to 03 July.

Plagiarism

Working Together and Plagiarism We encourage you to discuss the principles of the course and assignments with other students, to help and seek help with programming details, problems involving the lab machines. However, any work you hand in must be your own work. The School policy on Plagiarism (claiming other people's work as your own) is available from the course home page. Please read it. We will penalize anyone we find plagiarizing, whether from students currently doing the course, or from other sources. Students who knowingly allow other students to copy their work may also be penalized. If you have had help from someone else (other than a tutor), it is always safe to state the help that you got. For example, if you had help from someone else in writing a component of your code, it is not plagiarism as long as you state (e.g., as a comment in the code) who helped you in writing the method.

Mandatory Requirements

To pass SWEN 432 a student must:
- hand in an essay, and
- achieve at least 40% for the assignments.

Passing SWEN 432

To pass SWEN 432, a student must satisfy mandatory requirements, achieve at least a D grade for the exam, and gain at least a **C** grade overall.

Course Withdrawal

You will no longer be liable for the applicable course fees if you apply for a withdrawal by completing a Change of Course form (available from your Faculty Student Administration Office) or apply in writing on or before Friday, 15 March 2013.

Rules & Policies

Find key dates, explanations of grades and other useful information at http://www.victoria.ac.nz/home/study.

Find out about academic progress and restricted enrolment at http://www.victoria.ac.nz/home/study/academic-progress.

The University's statutes and policies are available at http://www.victoria.ac.nz/home/about/policy, except qualification statutes, which are available via the Calendar webpage at http://www.victoria.ac.nz/home/study/calendar (See Section

statutes, which are available via the Calendar webpage at http://www.victoria.ac.nz/home/study/calendar (See Section C).

Further information about the University's academic processes can be found on the website of the Assistant Vice-Chancellor (Academic) at http://www.victoria.ac.nz/home/about/avcacademic

All students are expected to be familiar with the following regulations and policies, which are available from the school web site:

Grievances
Student and Staff Conduct
Meeting the Needs of Students with Disabilities
Student Support
Academic Integrity and Plagiarism
Dates and Deadlines including Withdrawal dates
School Laboratory Hours and Rules
Printing Allocations
Expectations of Students in ECS courses

The School of Engineering and Computer Science strives to anticipate all problems associated with its courses, laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning experience.

If you think we have overlooked something or would like to make a suggestion feel free to talk to your course organiser or lecturer.

Course Outline as PDF