School of Information and Physical Sciences

COMP3350: Advanced Database

Singapore PSB
Trimester 2 - 2024 (Singapore)

COURSE OUTLINE

OVERVIEW

Course Description
This course provides students with theoretical knowledge and practical skills in advanced topics in database systems, big data and modern data-intensive systems. Specific topics include indexing methods, query processing and optimisation strategies for relational database systems, Object Relational Mapping and Object Database design, distributed database systems, and data mining on large databases.

Academic Progress Requirements
Nil

Requisites
You cannot enrol in this course if you have successfully completed INFT3007.

Assumed Knowledge
COMP1140 Database & Information Management and either INFT1004 Introduction to Programming or SENG1110 Object Oriented Programming

Contact Hours

Singapore PSB
Lecture
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1

Workshop
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1

Unit Weighting
10

Workload
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Singapore PSB
Associate Professor Suhuai Luo
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Consultation: by Email

Teaching Staff

Other teaching staff will be advised on the course Canvas site.

School Office

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SYLLABUS

Course Content

1. DBMS Internals
   - Storage and Indexing
   - Query Processing and Optimization
   - Concurrency Control
   - Crash Recovery
2. Physical Database Design and implementation issues
3. Object Relational Mapping (ORM)
4. Big Data and Parallel and Distributed databases (topics such as role of NoSQL, Map-reduce, Hadoop platform etc.)
5. Contemporary issues and emerging technologies such as On-Line Analytical Processing (OLAP), Data Warehouses, database-as-a-service (DB clouds)

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Design, develop and implement a mid-scale relational database for an application domain using a commercial-grade RDBMS
2. Identify and resolve physical database design and implementation issues
3. Use the persistence framework of chosen language to perform Object Relational Mapping
4. Research, analyse and use emerging technologies such as Big Data, NoSQL, On-Line Analytical Processing (OLAP) and Data Warehouses
5. Have hands-on experience with a number of contemporary information management systems

Course Materials

Recommended Reading:

- Microsoft SQL Server Technical Documentation - https://docs.microsoft.com/en-us/sql/sql-server/?view=sql-server-ver15
- Microsoft PowerBI Guided Learning - https://docs.microsoft.com/en-us/learn/powerplatform/power-bi?WT.mc_id=powerbi_landingpage-marketing-page
- Microsoft SQL Big Data Clusters - https://docs.microsoft.com/en-us/sql/big-data-cluster/big-data-cluster-overview?view=sql-server-ver15

Recommended Texts:

- Database systems: A Practical Approach to Design, Implementation and Management - 6th Edition by Thomas Connolly and Carolyn Begg, 2015, Pearson Education. ISBN 78-1-292-06118-4
- Database Management Systems – 3rd Edition by Raghu Ramakrishnan and Johannes Gehrke, 2003, McGraw-Hill, ISBN 0072465638
- Fundamentals of Database Systems - 7th Edition by Ramez Elmasri and Shamkant B Navathe, 2017. ISBN 978-0-13-397077-7

COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

Course Assessment Requirements:

- Assessment 4 - Final exam: Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.

  Students whose overall mark in the course is 50% or more, but who score less than 40% in the compulsory item and thus fail to demonstrate the required proficiency, will be awarded a Criterion Fail grade, which will show as FF on their formal transcript. However, students in this position who have scored at least 25% in the compulsory item will be allowed to undertake a supplementary 'capped' assessment in which they can score at most 50% of the possible mark for that item.

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Written Assignment 1	Week 6	Group	25%	1, 2, 3, 5
2	Written Assignment 2	Week 8	Group	20%	4, 5
3	Written Assignment 3	Week 12	Individual	20%	4, 5
4	Final exam*	Formal examination period	Individual	35%	1, 2, 3, 4, 5

* This assessment has a compulsory requirement.

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Written Assignment 1

Assessment Type Written Assignment
Purpose Students will demonstrate their skills in conceptual modelling, mapping EER-Relational, Normalisation, and Advanced SQL.
Description Students will demonstrate their skills in conceptual modelling, mapping EER-Relational, Normalisation, and Advanced SQL. In addition to the online submission of all code and related documentation, students will demonstrate their assessment to the tutor in a lab class.
Weighting 25%
Due Date Week 6
Submission Method In Class
Online
Assessment Criteria See assignment specifications
Return Method In Class
Feedback Provided In Class
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Written Assignment 2

Assessment Type	Written Assignment
Purpose	Students will develop, implement and present a Business Intelligence (BI) report.
Description	In this assignment, student groups will develop, implement and present a Business Intelligence (BI) report for a given context. In addition to the online submission, students will present their assessment to the class.
Weighting	20%
Due Date	Week 8
Submission Method	In Class Online
Assessment Criteria	See assignment specifications
Return Method	Not Returned
Feedback Provided	In Class
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Written Assignment 3

Assessment Type	Written Assignment
Purpose	Study NoSQL data store and product.
Description	Students will select one NoSQL data store (Key-Value, Graph Databases, Column-based, Document Store, etc.) and a product that implements the selected technology, and write a research report on the NoSQL data store and product.
Weighting	20%
Due Date	Week 12
Submission Method	In Class Online
Assessment Criteria	See assignment specifications.
Return Method	Not Returned
Feedback Provided	In Class.
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 4 - Final exam

Assessment Type	Formal Examination
Purpose	To provide students the opportunity to demonstrate their learning in the course in an exam setting.
Description	This is a formal examination providing students the opportunity to demonstrate their learning in the course in an exam setting.
Weighting	35%
Compulsory Requirements	Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.
Due Date	Formal examination period
Submission Method	Formal Exam
Assessment Criteria	Marks specified for each question
Return Method	Not Returned
Feedback Provided	No Feedback
Opportunity to Reattempt	Students WILL be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances

system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:
https://policies.newcastle.edu.au/document/view-current.php?id=236

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

GRADUATE PROFILE STATEMENTS

The following table illustrates how this course contributes towards building the skills students will need to work in their profession.

Level of capability

- Level 1 indicates an introduction to a topic at a university level
- Levels 2 and 3 indicate progressive reinforcement of that topic
- Level 4 indicates skills commensurate with a graduate – entry to professional practice
- Level 5 indicates highly specialist or professional ability

Bachelor of Information Technology

	University of Newcastle Bachelor of Information Technology Graduate Profile Statement	Taught	Practised	Assessed	Level of capability
1	Demonstrate a comprehensive understanding of the discipline of information technologies with an emphasis on net-centric applications, information management, and user requirements for ethical professional practice.	X	X	X	3
2	Apply critical reasoning and systems thinking to understand and support the operation and constraints of contemporary enterprises and their dynamic environment.	X	X	X	3
3	Work independently and collaboratively to locate, manage and organise information and resources and apply evidence-based methodologies to create, modify and maintain designs and design solutions.	X	X	X	4
4	Use creativity, problem solving skills, project management skills and technical expertise to analyse, interpret, evaluate and generate solutions to complex technical and organisational problems.	X	X	X	4
5	Demonstrate professional judgement and responsibility by communicating information technology principles, practices, standards to specialist and non-specialist audience clearly and persuasively.	X	X	X	3

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.