# ISYS326

## Advanced Databases and Enterprise Systems

S1 Evening 2014

*Computing*

# Contents

# General Information

Unit convenor and teaching staff
Unit Convenor
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Other Staff
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Credit points
3

Prerequisites
39cp including [(ISYS224(P) or COMP224(P)) and (ISYS254(P) or ISYS227(P) or ISYS201(P) or COMP225(P) or COMP227(P) or COMP229(P) or COMP255(P))]

Corequisites

Co-badged status

Unit description
This unit is an advanced unit on databases, emphasising database foundations and assistance for large enterprise information systems. It focuses on the support, technologies and tools that database management systems (DBMSs) provide to facilitate enterprise and business-to-business application development and integration. This unit takes direct advantage of students' prior knowledge of database programming and application development, and extends that knowledge through the study of advanced features of DBMSs in support of development and integration of enterprise applications. Particular emphasis is placed on the DBMS software for managing business transactions and database states, including transaction processing on 'stateless' internet. In doing so, the unit explains the dependencies and separation of concerns between database servers and application servers. The unit explains the demands that various enterprise application domains place on databases and how DBMSs respond to these demands. Related technologies include: object-oriented databases, multimedia databases, online analytical processing, data warehouses, workflow management systems, data mining, web services and electronic commerce.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are

available at https://www.mq.edu.au/study/calendar-of-dates

# Learning Outcomes

On successful completion of this unit, you will be able to:

Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems

Design and develop functional and maintainable database applications

Use industrial-strength tools and interactive development environments

Demonstrate understanding of distributed transaction processing systems

# Assessment Tasks

| Name | Weighting | Due |
|------|-----------|-----|
| Diagnostic Assessment | 10% | Monday 17 March 2014 |
| Assignment 1 | 20% | Monday 5 May 2014 |
| Assignment 2 | 20% | Monday 2 June 2014 |
| Final Examination | 50% | TBA |

## Diagnostic Assessment

Due: **Monday 17 March 2014**
Weighting: **10%**

In Week 2, a set of exercises will be made available online on the unit website on iLearn on Friday. You are expected to attempt all the exercises in this assessment and submit your solutions electronically (in the form of a pdf or text file) on iLearn before 6pm on Monday of Week 3. Your submission will be assessed and returned with some feedback within 10 days.

This assessment is primarily designed to give you early feedback on your progress in the unit and may test your background knowledge as well as the knowledge you acquire in the first 3 weeks of the semester.

On successful completion you will be able to:

• Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems

## Assignment 1

Due: **Monday 5 May 2014**
Weighting: **20%**

The first assignment will require the design and development of a database application using the tools available on the PCs in the 300-level labs or on your own PCs.

On successful completion you will be able to:

- Design and develop functional and maintainable database applications
- Use industrial-strength tools and interactive development environments

# Assignment 2

Due: **Monday 2 June 2014**
Weighting: **20%**

The second assignment will require a written submission (in the form of a doc/docx/rtf or pdf file) of your solutions to several questions that test your understanding of several fundamental concepts that underlie modern database management systems.

On successful completion you will be able to:

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Demonstrate understanding of distributed transaction processing systems

# Final Examination

Due: **TBA**
Weighting: **50%**

For this unit, a final examination is fully appropriate to test learning outcomes #1 and to a lesser extent #2. With regards to learning outcome #1, it in particular allows to accurately assess the degree of understanding of fundamental concepts such as Client-server and distributed processing, transaction processing (systems), security and electronic commerce as well as the written communication skills of students. With regards to learning outcomes #2, it allows to accurately assess the appreciation of good database design skills. **The final examination accounts for 50% of the final mark.**

Regarding the examination process, note that

- you must attend all required classes and submit all required assessment, otherwise the Executive Dean of the Faculty or delegated authority has the power to refuse permission to attend the final examination
- you are expected to present yourself for examination at the time and place designated in the University Examination Timetable
- the timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of examinations

- no early examinations for individuals or groups of students will be set. All students are expected to ensure that they are available until the end of the teaching semester, that is the final day of the official examination period
- the only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration.

On successful completion you will be able to:

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Design and develop functional and maintainable database applications
- Demonstrate understanding of distributed transaction processing systems

# Delivery and Resources

## Classes

Each week you should attend three hours of lectures, a tutorial class and a practical session. For details of days, times and rooms consult the timetables webpage.

**Note that practicals and tutorials commence in week 2.** You should have selected a practical session and a tutorial session during enrolment. **You should attend the sessions you are enrolled in**. If you do not have a class, or if you wish to change one, you should see the enrolment operators in the E7B courtyard during the first two weeks of the semester. Thereafter you should go to the Student Centre.

Lectures are used to introduce new material, give examples of the use of database design and programming methods and techniques and put them in a wider context. Furthermore, to reinforce the nexus between teaching, research, and learning, several research topics may be discussed throughout the semester. This additional material may prove useful to complete the assignments.

You learn by **processing concepts**, not just by hearing them. Practicals are small group classes in the laboratories which give you the opportunity to do exactly that by interacting with a tutor who has a sound knowledge of the subject and with your peers. This also gives you a chance to practice your database programming skills.

The feedback that you receive plays also a crucial role in your learning. You have many opportunities to seek for and to receive feedback. During lectures, you are encouraged to ask the lecturer questions to clarify anything you might not be sure of. Assignments and any other assessment tasks have been especially designed to deliver continuous feedback on your work.

Each week you should:

- Attend lectures, take notes, ask questions
- Attend your practical and tutorial classes and seek feedback from your tutors on your

work

- Read assigned reading material, add to your notes and prepare questions for your lecturer and/or tutor

- Start working on any assignments immediately after they have been released.

Practical and tutorial tasks for the next week are published on the ISYS326 iLearn site on Friday of each week. Students should bring a printed copy of the tutorial tasks for the week to their tutorial class. Students are expected to work on those tasks prior to attending their classes.

Assignments scheduled for the unit should be handed in via iLearn at https://ilearn.mq.edu.au/ by the time and in the manner specified in the assignment description.

# Resources

**ECHO360 -** Digital recordings of lectures will be available via iLearn at https://ilearn.mq.edu.au/. Read these instructions for details.

**Textbook -** The textbook listed below covers most of the required material and that will be used in preparation of lectures and/or tutorials and/or practicals.

- Kifer M., Bernstein A. and Lewis P. *Database Systems. An Application-Oriented Approach, Complete Version*, Second Edition, Addison-Wesley, 2006, ISBN 0-321-26845-8

It will be available from the University Co-op Bookshop.

For some parts of learning, the necessary reading (book chapters, software documentation, papers, etc.) will be made available on iLearn.

**Technology -** In this unit you will will be exposed to the following technology and tools

- Oracle - Database Management System
- Powerdesigner - Data Modeling Software Tool

**Websites -** The web page for this unit can be found at http://www.comp.mq.edu.au/units/isys326

**Discussion Boards -** The unit will make use of discussion boards hosted within iLearn. Please post questions there, they will be monitored by the staff on the unit.

## Staff-Student Liaison Committee

The Department has established a Staff-Student Liaison Committee at each level (100, 200, 300) to provide all students studying a Computing unit the opportunity to discuss related issues or problems with both students and staff.

The committee meets three times during the semester. For each meeting, an agenda is issued and minutes are taken. These are posted on the web at http://www.comp.mq.edu.au/undergrad/info/liaison/300-level/

If you have exhausted all other avenues, then you should consult the Director of Teaching (A/

Prof. Steve Cassidy) or the Head of Department (Dr. Christophe Doche). You are entitled to have your concerns raised, discussed and resolved.

# Unit Schedule

| 1 | Overview of Databases and Transactions<br><br>Conceptual Modeling of Databases | Kifer, Ch.1, 2, 4;<br><br>PowerDesigner CDM & PDM |
|---|---|---|
| 2-3 | Physical data Organization<br><br>Physical Database Tuning | Kifer, Ch. 9, 12 |
| 4-5 | ACID Properties of Transactions<br><br>Artchitecture of Transaction Processing Systems | Kifer, Ch. 18, 23 |
| 6-7 | Distributed processing<br><br>Distributed Transactions | Kifer, Ch. 16, 24 |
| 9-10 | Object databases | Kifer, Ch. 14 |
| 11-12 | Data warehouses and OLAP | Kifer, Ch. 17 |
| 13 | Revision | TBA |

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

# Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

## Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

# Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

# Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

# IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

# Graduate Capabilities

# Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

## Learning outcomes

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Design and develop functional and maintainable database applications
- Demonstrate understanding of distributed transaction processing systems

## Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

# Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

## Learning outcomes

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Design and develop functional and maintainable database applications
- Use industrial-strength tools and interactive development environments
- Demonstrate understanding of distributed transaction processing systems

## Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

# Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and

systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

### Learning outcomes

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Design and develop functional and maintainable database applications

### Assessment tasks

- Diagnostic Assessment
- Assignment 2
- Final Examination

## Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

### Learning outcomes

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Design and develop functional and maintainable database applications
- Use industrial-strength tools and interactive development environments
- Demonstrate understanding of distributed transaction processing systems

### Assessment tasks

- Assignment 1
- Assignment 2

## Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

## Learning outcomes

- Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems
- Design and develop functional and maintainable database applications
- Demonstrate understanding of distributed transaction processing systems

## Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

# Administration Policies

Macquarie is developing a number of policies in the area of learning and teaching. Approved policies and associated guidelines can be found at Policy Central. Refer to the Science Centre regarding the implementation of these policies (e.g. precise procedures, forms, deadlines, etc).

### LATE SUBMISSION OF ASSESSMENT TASKS

No extensions will be granted. Students who have not submitted an assessment task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for special consideration for that task is made and approved.

### SPECIAL CONSIDERATION

Special Consideration is intended for a student who is prevented by serious and unavoidable disruption from completing any unit requirements in accordance with their ability. To apply for special consideration you need to use the online submission system along with some evidence to support your case. Depending on the circumstances presented, the convenor may choose to give you an alternate assessment, additional time for an assessment, make-up exam, etc. If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period. For details of the Special Consideration policy specific to the Department of Computing, see the Department's policy page.

### GRADE APPEAL

In case of problems arising with your final grade, the first step is to organise a review. The Department recommends that you request an appointment with the convenor of the unit in order to review your grade. If the review does not solve the problem, a formal Grade Appeal can be lodged. See the grade appeal policy.

### ACADEMIC HONESTY AND PLAGIARISM

Plagiarism involves using the work of another person and presenting it as one's own. The Department, in line with University policy, treats all cases seriously. In particular, the Department,

keeps a record of all plagiarism cases. This record is referred to so that an appropriate penalty can be applied to each case. For concrete examples, see this page.

# Assessment Standards

## Standards

Four standards, namely Developing, Functional, Proficient, and Advanced, summarize as many different levels of achievement. Each standard is precisely defined to help students know what kind of performance is expected to deserve a certain mark. The standards corresponding to the learning outcomes of this unit are given below:

| Criteria for Learning Outcome 1 | Developing | Functional | Proficient | Advanced |
|---|---|---|---|---|
| Demonstrate understanding of the fundamental advanced concepts that underlie modern database management systems | Represents a student who has demonstrated inaccurate knowledge of fundamental advanced database concepts | Represents a student who has demonstrated broad knowledge of fundamental advanced database concepts but with limited understanding | Represents a student who has demonstrated critical analysis skills in fundamental advanced database concepts | Represents a student who has demonstrated critical analysis skills in fundamental advanced database concepts who also has exceptional analytical and critical thinking capability |
| Design and develop functional and maintainable database applications | Represents a student who has limited database design and development skills | Represents a student who has capability to design and develop functional database applications with documentation | Represents a student who has capability to design and develop functional and highly maintainable database applications, with documentation | Represents a student who has capability to design and develop functional and highly maintainable database applications, with documentation and has exceptional ability to solve challenging database problems |
| **Criteria for Learning Outcome 3** | **Developing** | **Functional** | **Proficient** | **Advanced** |
| Use industrial-strength tools and interactive development environments | Represents a student who has very basic demonstration of tools and interactive development environments | Represents a student who has satisfactory familiarity with tools and interactive development environments | Represents a student who has very good skills with tools and interactive development environments | Represents a student who has mastery of tools and interactive development environments |

| Criteria for Learning Outcome 4 | Developing | Functional | Proficient | Advanced |
|---|---|---|---|---|
| Demonstrate understanding of distributed transaction processing systems | Represents a student who has demonstrated inaccurate knowledge of distributed transaction processing systems | Represents a student who has demonstrated broad knowledge of distributed transaction processing systems but with limited understanding | Represents a student who has demonstrated critical analysis skills in distributed transaction processing systems | Represents a student who has demonstrated critical analysis skills in fdistributed transaction processing systems who also has exceptional analytical and critical thinking capability |

# Grading

At the end of the semester, you will receive a grade that reflects your achievement in the unit

- **Fail (F)**: does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.

- **Pass (P)**: provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.

- **Credit (Cr)**: provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.

- **Distinction (D)**: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.

- **High Distinction (HD)**: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in

identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

In this unit, your final grade depends on your performance in each part of the assessment. For each assessment task, you receive a mark that combines your standard of performance regarding each learning outcome assessed by this task. Then the different component marks are added up to determine your total mark out of 100. Your grade then depends on this total mark and your overall standards of performance.

Concretely, **in order to pass the unit**, you must

- obtain a total mark of 50% or higher and a mark of 40% or higher in the final examination;
- make a reasonable attempt at the exercises in the diagnostic assessment;
- demonstrate that you can perform at a Functional level or higher for each criterion assessed in the two assignments;
- reach a Functional level or higher for each criterion assessed in the final examination.

In order to obtain a higher grade than a Pass, you have to fulfill additional conditions. Namely, you must demonstrate and apply your knowledge of fundamental database concepts consistently

- at an Advanced level and have a total mark of 85% or higher to obtain **High Distinction**;
- at least at a Proficient level and have a total mark of 75% or higher to obtain **Distinction**;
- at least at a Proficient level and have a total mark of 65% or higher to obtain **Credit**.

# Assumed Knowledge

As reflected by the prerequisites, this units requires

- understanding of the basic principles underlying relational database systems, database modeling and programming,
- ability to analyse the system requirements and build a logical model of a given problem,
- ability to turn the logical model from the analysis phase into a design model from which a system can be built,
- the skills of problem formulation, modelling and problem solving,
- the fundamental concepts and models of applications development, and
- the basic principles of transaction processing, concurrency control and database recovery.

# Changes Made to Previous Offerings

Note that a new topic on Physical Database Tuning has been introduced in 2014 offering of the unit. It replaces the topic on Models of Transactions which was discussed in the previous offering of the unit in 2013. There are no other changes made to the previous offering of the unit.

# Changes since First Published

| Date | Description |
|------|-------------|
| 14/01/2014 | The Prerequisites was updated. |