



Informatics & Design National Diploma Information Technology

INFORMATION SYSTEMS 3 (MODULE B) (ISY300B)

SUBJECT GUIDE

2015

NQF LEVEL: 7

**PREREQUISISTE SUBJECTS:
Information Systems 2
or equivalent**

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Organisational component**1. Introduction / Word of welcome**

This subject will build on the basics of database modelling and development techniques acquired in the previous 2 years. Information Systems 3b also covers the development of databases for applications systems with an emphasis on problem solving. Advanced related theoretical concepts such as database implementation, testing and quality will also be addressed. This subject will require students to practice previously acquired programming, academic writing and communications skills.

Although the emphasis during this year is to acquire, interpret and discuss new knowledge, the critical evaluation of IT problems, the practical application thereof and the development of practical solutions will be encouraged through the use of real life business entity.

2. General**2.1 Contact information**

	Name	Building and room number	Telephone number	E-mail address	Consulting hours
Subject Co-ordinator	Mr A Mukherjee	Eng. 2.18	021-4603289	mukherjeea@cput.ac.za	As published on door
Lecturers :	Yet to be Decided				
Part-time Lecturer (Terms 1-4)	Sophie Bhebe	NA		sophiebhebe@yahoo.com	As published on BB
Secretary	Mrs. N. Allie	Eng 2.1	021-4603010	AllieN@cput.ac.za	N/A

2.2 Time-table

As published on Black Board @FID

Two theory lectures and two practical periods per week for Terms 1 and 2.

Note: Those placed in **industry** in the second semester (Term 3 and 4) will be required to attend classes for two periods/ week – probably on Mondays. Those not placed will have more contact time with the lecturer. You will be expected to write a test at the end of Term 3.

2.3 Learner Management System (LMS)

<http://eclassroom.cput.ac.za> : Blackboard used for general communications and announcements.

Please note all communication from lecturer to student will be done through Blackboard. It is a must for students to follow blackboard regularly for announcements.

3. Study materials and purchases

Course Notes: Certain notes and PowerPoint presentations can be obtained from Black Board.

The text book is essential specially for Data Warehouse if you did not buy it in second year

PRESCRIBED BOOK:

Database Principles 10e authors are
Coronel, Morris, Rob ISBN 1-133-31197-0 **Cengage International Edition 10th Ed. 2013** OR
Rob P and Coronel C : "Database Systems" **Cengage International Edition 2008** OR
[Rob P and Coronel C : "Database Systems" Thomson 7th Edition 2007 if that is all you can get]

4. Module credits

0.125 credits on NQF level 7.

5. Assessment

5.1 Assessment policy and regulations

This module has three theory assessments and two practical assessments. Two theory assessments are in the form of two written tests and one in the form of online quiz written during the test week. The practical assessment consists of 1 individual database project, 1 online quiz and the end of year integrated group project. The exam at the end of first Semester will be a combination of online quiz and theory.

Test queries: **Last day for any queries regarding a test is 1 week after the test was discussed in class or marks published on Black Board. Thereafter the test mark cannot be changed.**

Absence from a test: If you are absent from a test a valid medical certificate must be given to your lecturer **within one week after a test was written or the first day you come to class**. You must also inform your lecturer on the day of the test that you are ill or have any problems to write the test.

Full-time and Part-time: No full-time student is allowed to write the part-time test without the written permission of the campus subject co-ordinator. No part-time student is allowed to write the full-time test without the written permission of the campus subject co-ordinator. You will be marked absent without reason from the test if this rule is not adhered to. Alternatively, your registration will be changed to reflect your test preference.

Due dates must be strictly adhered to. If any prescribed assignment is not handed in on time, a penalty of 10% per day will be applied up to a maximum of 7 days. Thereafter zero marks will be given.

5.2 Assessment opportunities: administration

There will be one test per test week in March/April and June, one test/quiz at the end of Term 3. One final exam will be taken at the start of November 2015.

Assessment Type		Percentage	Moderated	System Name	Test scope material
Test 1 (theory test)	-	20%	No	T1	On Extended ERD Trans. Proc. Conversion to RDBMS
Test 2 (theory and online test)	-	30%	Yes	T2 (term2)	On Distr. Database and Data Warehouse
ASS 2/Project 1 Star Schema		5%	No	T3	Due on the last class before June Exam. Date will be posted via Blackboard.
BLACK BOARD quiz (time to recover on previous material and test)		15%	No	T4 (term 3)	On Distributed. Database , Data Warehouse, Transaction Processing and Advanced ERD
Assignment 4 Integrated	-	10%	Yes	T5 (term 4)	Due on the last day of

Project				Second Sem. Date will be posted via Blackboard.
Test 4 (theory test)		20%	Yes	T6 (term 4) On Advanced Data Warehouse, GIS data structures, XML, DTD, XSD, XSLT and XPATH.

5.3 Assessment details

Refer to Appendix named Information Systems 3 Assessments 2015

6. Additional information

- 6.1 Academic dishonesty. Unless specified, all work should be the student's own work. Students are required to familiarize themselves with CPUT's policy on plagiarism.
- 6.2 Project Work. Projects 1 star schema is an individual project, to be demonstrated in a labor otherwise stated by your Lecturer. Project 2 is group work. Students are required to select their group members as specified in the Appendix.
- 6.3 Self study Component. Please refer to the Subject Structure to determine topics requiring self study.

7. Subject specifications

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

1. Develop software solutions using MS ACCESS or any other RDBMS as the development tool.
2. Understand and use theoretical concepts relating to Database Design, Processing and Management, while developing a database system according to the Systems Development Life Cycle (SDLC) and Database Life Cycle.
3. Develop and apply information literacy skills and strategies within an academic context. You will be able to use information to help answer an essay question, by being able to analyse and evaluate the value of information that you find, and then communicate and structure this information into a suitable written form like an essay.
4. Use your understanding of database design, in the conceptualisation, planning and design of a database.
5. Understand and use the core principles and practices associated with the concepts of design for software development as well as the creation of a relational database.
6. Understand the issues involved in transaction management
7. Understand data warehousing techniques and implement a data warehouse using a star schema or another technique
8. Apply basic approaches and strategies of project management to define, plan, design develop and implement an IT related project with a substantial database element.
7. Use an understanding of basic technical writing conventions to create and develop original content in a project scoping document.
8. Develop a range of general abilities like using information appropriately, communicating your ideas and thoughts in written, oral and visual forms, managing and organising yourself effectively so that you can

complete your study tasks effectively and on time, work together with other people in a partnership or in groups where you are able to listen to others and solve problems collectively.

9. Use a design tool to generate design and development solutions
10. Work as a team member on an IT project
11. Research and evaluate an IT problem and provide recommendations from your research

The following are the main topics in the Information Systems 3b (Database)

CURRICULUM DETAILS	
Topic 1	Conceptual Database Design using advanced ER diagrams
Topic 2	Logical and Physical Database Design from the conceptual model diagram
Topic 3	Database implementation and application development
Topic 4	Data Warehousing, multidimensional databases and Decision Support Systems
Topic 5	Distributed Database Systems and Concurrency Control
Topic 6	Geographical Information Systems (GIS) and Cloud Computing
Topic 7	Understanding XML, DTD, XSD, XPATH and XSLT.

7.2 Module structure

REFERENCE 10th Edition <i>International Edition</i>	Theme / Topic	Specific Outcomes	Academic Schedule – week/s	Assessment Dates
TERM 1				
1 Ch 3, 7 <i>Ch 5,6</i>	1. ER Introduction	ER diagrams revised with introduction to advanced ER features like specialization, aggregation and generalization	1 2/2/2015	Test 1 Theory March Exam on topics 1-3
2 Ch 8 <i>Ch 6,7</i>	2. Advanced ER to database structure	Converting an advanced ER model into a database structure, General rules governing relationships among tables/classes Practical - From design to implementation ; SQL statements – detailed	2-3 9/2/2015	
3 Ch 13 <i>Ch 12</i>	3. Transaction Processing	Transaction Management and Concurrency Control	4-6 23/2/2015	
TERM 2				
4 Ch 10 <i>Ch 14</i>	4.Distributed Database	Distributed Databases and distributed transactions	1-3 6/4/2015	TEST 2 June Test on topics 4-5-6 Combination of online quiz and written test
5 Ch 15 <i>Ch 15</i>	5. Data Warehousing	The Need for Data Analysis, The Data Warehouse, Decision Support Systems, OLAP and data cubes	4-5 27/4/2015	
6 Ch 15 <i>Ch 15</i>	6. Multidimensional Databases	Star Schema, From Problem to Design, Practical Assignment - Star Schema Design Problem	6-7 11/5/2015	
7 Notes / Research	Cloud Computing	Technical Report: Adoption of Cloud Computing in South African Organisations	OWN TIME Self study	

TERM 3				
9 Notes / Seminar	GIS	Data structures for GIS databases like quad trees, PR trees, etc.	1-3 20/7/2015	
10 Ch 15	Advanced Data Ware.	Concepts of advanced data warehouses complex star schemas	4-5 11/8/2015	
11 Ch 7, 12, 14, 15	RECAP - TEST	WEBCT QUIZ - Covers all previous material		<i>September Test Online Quiz</i>
TERM 4				
12 Ch. 16 and Websites	XML	Concepts, Utilities and application	1 14/9/2015	
13 Ch. 16 Websites	DTD and XSD	Why Validation required? Difference between them. Some programing practice.	2-3 21/9/2015	
14. Websites	XSLT and XPATH	Introduction. Usage and some basic programing knowledge on rendering in the browser.	4-5 5/10/2015	Hand in or demo project 4- 13/10
15	Test 3	Topics 9 – 14.		November Test Topic 9-14 Theory

7.3 Articulation with other subjects in the programme

Information Systems 3b teaches students to analyse, design and implement IT business applications.

2nd year Linkages

Information Systems 3b continues, expands and focuses on the design and application of databases, and concurrency, data warehouse and distributed database theory as well as the Software development life cycle (SDLC) which were introduced in the following second year subjects:

Information Systems 2 (module A)

Information Systems 2 (module B)

3rd year Linkages

Information Systems 3 (Module B) has linkages with the following 3rd year subjects via the Integrated Project:-

Development Software 3

Information Systems 3 (Module A)

Technical Programming 3

Business Analysis 3

Internet Programming 3

Communications Skills

7.4 Learning presumed to be in place :-

- Knowledge of the information system and how and where it is used
- Understanding of basic database and database modelling , with Entity Relationship Diagrams
- Understanding the basics of query languages, especially SQL
- Ability to apply basic programming language(s)
- Problem solving skills
- Design skills
- Testing skills
- Reading and writing skills

7.5 Critical cross-field outcomes

The ability to:

1. Take decisions and accept responsibility.
2. Communicate effectively using models, visual and language skills
3. Work effectively in a team
4. Collect, organize and critically evaluate information, in order to assess the situation correctly
5. Demonstrate an understanding that the problem, solving contexts do not exist in isolation and therefore looks at the situation as a whole.

8. Study units/study themes

Study unit outcomes	Teaching events	Learning activities	Assessments
Entity Relationship Diagrams (ERDs) and Extended ERDs	Lectures, practical work, group and individual class exercises	Use ER diagrams, revised with introduction to advanced ER features like specialization, aggregation and generalization	Tutorials Test Project work
ERD to database structure	Lectures, group and individual class exercises	Practical Conversion of an ER model into a database structure, Gain understanding of general rules governing relationships among tables/classes Practical - From design to implementation	Test Tutorials Project work
Transaction Processing	Lectures and individual class exercises	Understand Transaction Management and Concurrency Control.	Tutorials Test
Distributed Databases	Lectures and individual class exercises	Gain understanding of the Distributed Database and distributed transactions and associated challenges.	Tutorials Test

<i>Data Warehousing</i>	Lectures, case study and projects to be implemented in practical classes	The Need for Data Analysis, The Data Warehouse, Decision Support Systems, OLAP and data cubes	Tutorials, Test
Multidimensional Databases	Lectures, case study and projects to be implemented in practical classes	Star Schema, From Problem to Design, <i>Practical Assignments - Star Schema Design Problem</i>	Tutorials, Project, implementation of Star Schema and Tests
Cloud Computing	Cloud Computing Seminar (Invited Industry Guest)	Cloud Computing Seminar	1. Technical Report: <i>Adoption of Cloud Computing in South African Organisations</i> 2. Essay
GIS databases	Seminar In House	Data structures for GIS databases like quad trees, PR trees, etc.	Test, Research Essay
<i>Business Case studies</i>	Group work	Gain understanding of the development of IT software with regard to the phases of the SDLC. Ability to collect, analyse and organise information Solve IT problems Design database and programming solutions Create a working system according to project management principles Communicate effectively using visual and basic academic writing forms Manage yourself, your activities and peers in relation to quality, comprehensiveness and teamwork	Projects
Document Databases	Self study and lectures	Conduct an IT study Analyse the findings of the study Provide a theoretical context for a problem Draw conclusions and make	Websites, Lectures and Test

		recommendations from your findings	
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8.1 Knowledge base

Databases, conceptual and logical database design (project), SQL with use in MS-ACCESS, Oracle or other relational Database Management System and database program units, database prototyping, database processing, Software Development Life Cycle, Testing, Software and Data Quality, Implementation, Systems Support, Security, Software Development Trends, Introduction to Academic Writing.

8.2 Assessment opportunities

Tests, Star Schema project, Data Warehouse project, Group project work, Essay

8.3 Assessment criteria

A mark scheme or comprehensive rubric will be published on Black Board for project work and the research essay.

8.3 Self-study activities

Cloud Computing and GIS database research

APPENDIX : DETAILS OF PROJECT ASSESSMENTS.

Term 1 Assignment 1

ERD design to be implemented in database . Problem to be specified during term 1. And **practical** database creation, loading and manipulation – with MS ACCESS (or other tool)

Term 2 Project 1 / Assignment 2

Star Schema (Latest

demonstration week of 8th June 2015 14h00)

You must create the Star Schema for **15.18** (Int edition) in MS-ACCESS (preferably) or another DBMS like ORACLE (Note MS-ACCESS is easiest for this problem). You must add to this figure a 4th dimension table representing “WHERE”. You must have more than 50 rows in the Fact table and 3-10 rows in each of the dimension tables. The Problem Statement is given at the end of this document.

You must produce a relationships diagram with the 5 tables linked in a star diagram.

You should have 1-2 queries from the Fact table (no group by), listing useful attributes for each fact;

and 7-8 queries to derive metrics (totals) using SUM and GROUP BY e.g. monthly product total quantity and total sales amount.

You must have sufficient, meaningful data in your tables – in particular the Fact table e.g. lots of facts for the same month (year), or same product, or same location (city), or same customer. Marks will be deducted if your group by queries produce almost as many rows as the FACT table.

You don't have to use TIME_CLOCKTIME or all the PRODUCT attributes e.g. PROD_PACKAGE.

You must demonstrate your working Star Schema to your lecturer in your practical time in Term 2. Try and demonstrate as soon as possible but at the latest in the first week of June (project week).

Term 4 IS3B Group PROJECT (not necessarily integrated with other subjects)

Full specifications to be given at the end of Term 2 for work starting in Term 3.

You may choose any suitable project including projects you are doing for other third year subjects but you must adapt the project to show sufficient database competence (i.e it must be suitable for ISY300B).

You must hand in a **hard copy document** for this subject module, neatly put together and presented with cover page, index, introduction, stating clearly the purpose of this project. You will work in groups of 3-5. Individual projects will be considered in exceptional cases.

You must have:

1. At least 10 database tables involving at least one subtype

Full ERD, Design (Conceptual, Logical, and Physical) and implementation – populate tables with at least 20 rows per table.

50%

2. Reports, Queries on database with evidence of **joins** of tables; proper structure, data, **20%** primary, foreign keys.

3. Testing of Database – may refer to code in 2. For things like referential integrity, proper **20%** keys, no redundancy, security

4. User Manual **10%**

Information Systems 3B (database 3) Star Schema 2015

You must create a Star Schema University Attendance database for the following situation: The database must record attendance of students in classes, the time of the lecture, the lecturer who taught the class, the room that was used and the subject for that lecture. For each subject you must record the total number of classes timetabled for the semester – this will be used to calculate Student attendance percentage and Lecturer attendance percentage. An attendance fact must always contain a valid lecturer-id; we assume if one lecturer is absent then another will take his/her place.

You may assume maximum room usage is $11 \times 5 = 55$ periods a week.

You can work out the primary key of the fact table from the above specification.

The following criteria must be met:

- 1) This is an individual assignment.
- 2) You must write SQL statements to enter the data; Try not to repeatedly enter the same thing for one class.
- 3) You will need reports to provide:
 - a) % usage of rooms
 - b) % attendance of students
 - c) % attendance of lecturers
 - d) At least 2 other reports of interest
- 4) You must enter at least 30 fact records (this is a factless fact table); in all 10 students, 5 different lecturers, 3 different rooms, 2 subjects and 10 date/time slots as your initial prototype system.
- 5) (Optional). You must load your fact table from an operational database in **batch** mode – e.g. a file with values

St No	Lect -Id	Room	Subj	Date	Time
1	1	1	2	20110718	1130
2	1	1	2	20110718	1130
6	1	1	2	20110718	1130

...

Or (1, 2, 6) 1 1 2 110718 1130 - much shorter

etc. showing all students attending a given class

You will be evaluated to check system meets all practical requirements (works properly):

- Check star schema structure (7)
- Check fact table for suitable data (6)
- Check entry of data (14)
- Check reports (13)

- Demonstration (10)
- (Optional) Batch entry of data

Total marks: 50. [Mark schedule may change a little]

After creating you have to make a documentation of the entire project in a PDF and upload it via the link provided in BB not late than midnight 19th June 2015.05.13

Marks will be made available by the end of 3rd Term.

YOU MAY NEED TO COME AND PRESENT YOUR WORK