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# ITRW 321 VEC

## DATABASES II

Faculty of Natural and Agricultural Sciences

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North-West University



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## Module Information

We wish to extend a hearty word of welcome to you at this module. We do hope that you will find the module useful and that we will be able to work together to the satisfaction of both students and lecturers!

The ITRW321 module is presented by the School of Information Technology.

<b>Module code</b>	ITRW321
<b>Module Credits</b>	16 Credits
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## Objective of this Module

At the end of this module, the learner should have a basic knowledge of, and insight into, transaction management, concurrency control, distributed database management systems, object-oriented databases, client/server systems, data warehouses, databases and the Internet, and database administration (theory as well as practical applications with MySQL/Oracle). The learner will have to prove that he/she is able to apply the knowledge and insight acquired in solving problems in this subject field and application fields after completion of this module.

## Module Prerequisites

ITRW311 – Databases I

## Module Outcomes

**On completion of this module students should possess:**

- Discuss/Understand/Analyse/Adapt the functioning of transactions and transaction management;
- Discuss/Understand/Analyse/Adapt concurrency control;
- Discuss/Understand/Analyse/Adapt distributed database management systems and the control of these systems;

- Discuss/Understand/Analyse/Adapt BI, data warehouses, data extraction, and the functioning of these; and
- Discuss/Understand/Analyse/Adapt database administration and practically apply it using MySQL/Oracle.

## Module Resources

### Textbook:

**Database Systems:** Design, Implementation and Management, 2017. 12th edition. Coronel, C. & Morris, S. ISBN: 978-1-305-62748-2. Cengage Learning. (Referred to in this guide as DSDIM)

### Oracle Guides:

Oracle Database 11g: Administration Workshop I Volume I & II (Referred to in this guide as ORAC)

### Software:

MySQL Server Community

MySQL Workbench

Oracle SQL Developer

Oracle 11XE

## Icons



Time allocation



Study material



Individual exercise



Example



Learning outcomes



Assessment  
Assignments



Group Activity



Reflection

## Warning against plagiarism

**ASSIGNMENTS ARE INDIVIDUAL TASKS AND NOT GROUP ACTIVITIES. (UNLESS EXPLICITLY INDICATED AS GROUP ACTIVITIES)**

**Copying** of text from other learners or from other sources (for instance the study guide, prescribed material or directly from the internet) is **not allowed** – only brief quotations are allowed and then only if indicated as such.

You should **reformulate** existing text and use your **own words** to explain what you have read. It is not acceptable to retype existing text and just acknowledge the source in a footnote – you should be able to relate the idea or concept, without repeating the original author to the letter.

The aim of the assignments is not the reproduction of existing material, but to ascertain whether you have the ability to integrate existing texts, add your own interpretation and/or critique of the texts and offer a creative solution to existing problems.

**Be warned: students who submit copied text will obtain a mark of zero for the assignment and disciplinary steps may be taken by the Faculty and/or University. It is also unacceptable to do somebody else's work, to lend your work to them or to make your work available to them to copy – be careful and do not make your work available to anyone!**

For the NWU link for plagiarism, go to [http://www.nwu.ac.za/webfm\\_send/25355](http://www.nwu.ac.za/webfm_send/25355)

# Study unit 1

## TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL

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Transactions depict real-world events, and the execution and management of transactions are important database activities.

This study unit deals with transactions, the features of transactions, the management of transactions, and concurrency control.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Learn about database transactions and their properties
- Determine what concurrency control is and what role it plays in maintaining the database's integrity
- Illustrate what locking methods are and how they work
- Learn how stamping methods are used for concurrency control
- Learn how optimistic methods are used for concurrency control
- Learn how database recovery management is used to maintain database integrity

### Study material



- DSDIM Chapter 10.
- ORAC Chapter 1-3.

# Study unit 2

## DATABASE PERFORMANCE TUNING AND QUERY OPTIMIZATION

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This study unit deals with the tools that the DBA has to perform when doing database performance tuning and writing good SQL statements.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Understand the basic database performance-tuning concepts
- Learn how a DBMS processes SQL queries
- Create and show the importance of indexes in query processing
- Learn about the types of decisions the query optimizer has to make
- Illustrate some common practices used to write efficient SQL code
- Show how to formulate queries and tune the DBMS for optimal performance

### Study material



- DSDIM Chapter 11.
- ORAC Chapter 4-6.



# Study unit 3

## DISTRIBUTED DATABASE MANAGEMENT SYSTEMS

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In this study unit, you will learn that a single database can be split into different parts that may be saved on different computers. Processing may also be divided between different network codes.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Learn about distributed database management systems (DDBMSs) and their components
- Show how database implementation is affected by different levels of data and process distribution
- Understand how transactions are managed in a distributed database environment
- Understand How distributed database design draws on data partitioning and replication to balance performance, scalability, and availability
- Learn about the trade-offs of implementing a distributed data system

### Study material



- DSDIM Chapter 12.
- ORAC Chapter 7-9.

# Study unit 4

## BUSINESS INTELLIGENCE AND DATA WAREHOUSES

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In this study unit, we focus on modern development regarding data warehouses. Databases play an important role in the saving and managing of data, which, in turn, may lead to the creation of information. Information forms the basis for decision-making. Decision support systems (DSS) originated in order to support decisions. Data warehouses and the technology for these were developed to support decision support systems.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Learn how business intelligence provides a comprehensive business decision support framework
- Learn about business intelligence architecture, its evolution, and reporting styles
- Learn about the relationship and differences between operational data and decision support data
- Create a data warehouse and show how to prepare data for one
- Design star schemas and show how they are constructed
- Learn about data analytics
- Learn about online analytical processing (OLAP)
- Show how SQL extensions are used to support OLAP-type data manipulations

### Study material



- DSDIM Chapter 13.
- ORAC Chapter 10-12.

# Study unit 5

## BIG DATA ANALYTICS AND NoSQL

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This study unit investigates the new big data en NoSQL phenomenon. You'll be introduced to new data models of these new database systems.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Understand what Big Data is and why it is important in modern business
- Discuss the primary characteristics of Big Data and how these go beyond the traditional “3 Vs”
- Discuss the how the core components of the Hadoop framework, HDFS and MapReduce, operate
- Show what the major components of the Hadoop ecosystem are
- Illustrate the four major approaches of the NoSQL data model and how they differ from the relational model
- Learn about data analytics, including data mining and predictive analytics

### Study material



- DSDIM Chapter 14.
- ORAC Chapter 13-15.

# Study unit 6

## DATABASE CONNECTIVITY AND WEB TECHNOLOGIES

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This study unit deals with connecting, integrating and handling connecting problems.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Learn about database connectivity fundamentals
- Learn about various database connectivity technologies: ODBC, OLE, ADO.NET, JDBC
- Illustrate how web-to-database middleware is used to integrate databases with the Internet
- Create services that are provided by web application servers
- Create/Read/Understand what Extensible Markup Language (XML) is and why it is important for web database development
- Learn about cloud computing and how it enables the database-as-a-service model

### Study material



- DSDIM Chapter 15.
- ORAC Chapter 16-18.

# Study unit 7

## DATABASE ADMINISTRATION AND SECURITY

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When creating a database, a variety of files are prepared (at operating system level). The DBA has to decide on aspects such as the size of a database block and the character set to be used. This study unit deals with the functions that the DBA has to perform when creating a database and database dictionary views.

### Study hours



You need approximately eight (8) hours to master this study unit properly.

### Learning outcomes



- Illustrate that data is a valuable business asset requiring careful management
- Understand how a database plays a critical role in an organization
- Learn about the database administrator's managerial and technical roles
- Learn about data security, database security, and the information security framework
- Learn about several database administration tools and strategies
- Show how cloud-based data services impact the DBA's role
- Show how various technical tasks of database administration are performed with Oracle

### Study material



- DSDIM Chapter 16.

### Oracle Assessment

At the end of the semester you will have to complete an Oracles Assessment test based on the chapters you have studied of ORAC Chapter 1-18 throughout the semester.

## Study hours



You need approximately four (4) hours per week to study each of the chapters with regards to ORAC.

## Learning outcomes



- You will need to illustrate a thorough knowledge base of the ORAC manual to provide comprehensive insight into Oracle Databases and its operations.

## Study material



- ORAC Chapter 1-18.

## Semester Project

At the end of the semester you will have to complete and demonstrate a database system project.

## Study hours



You need approximately four (4) hours per week to on your project to successfully complete it.

## Learning outcomes



- You will need to illustrate a thorough knowledge base of the understanding of database systems, its implementation and the solving of abstract database related problems.
- Understand the goal/objective/ use of a NoSQL database.
- Understand the goal/objective/ use of a Relational database.
- Make use and understand a web crawler for data gathering.
- Understand the concept of BI, data analysis, ETL and a dashboard.
- Intergrate all these system to utilize each other.

## Study material



- Make use of all concepts studied in DSDIM Chapter 1 – 16.