SLIIT Discover Your Future	DEPARTMENT OF INFORMATION TECHNOLOGY FACULTY OF COMPUTING

MODULE OUTLINE				
Module Name	**Database Systems**			
Module Code	IT3020	Version No.	2017 - 0	
Year/Level	3	Semester	1	
Credit Points	04			
Pre-requisites	IT2040, IT1030			
Co-requisites	None			
Methods of Delivery	Lectures (Face-to-face) Tutorials Labs		2 Hours/Week 1 Hours/Week 2 Hours/Week	
Course Web Site	http://courseweb.sliit.lk/			
Date of Original Approval	June, 2017			
Date of Next Review	June, 2019			

MODULE DESCRIPTION		
Introduction	This unit is a continuation of IT2040-Database Management Systems, which extends to object-relational databases, NoSQL, XML integration, database implementation techniques, and database level programming with object-relational databases. Further, topics related to query optimization and database tuning, and transactions and concurrency control techniques are discussed in detail.	
Learning Outcomes	At the end of the module student will be able to:	
	LO1:	Understand the concepts underlying contemporary object-relational database systems as well as design and implement such databases.
	LO2:	Understand the concepts underlying NOSQL and XML database systems.
	LO3:	Estimate the disk capacity for datasets and calculating disk access time

	LO4:	Understand the principles and techniques of query optimization, estimate the cost of query plans and database tuning.
	LO5:	Implement a transaction and concurrency control solutions for database application
	LO6:	Understand crash recovery techniques for RDBMS.
	LO7	Understand the concepts underlying in distributed and parallel database systems and transactions processing in distributed environment.

Assessment Criteria

The following assessments will be held during the semester.

Midterm Test –The online quiz will be based on the practical work, the questions discussed in tutorial sessions, and lecture material covered until the week before it is held. This is one hour close book assessment.

Practical Test – This test will held in week 10 and assess the practical knowledge of Object Relational Model, PL/SQL programming, NoSQL and XML query languages. This is 45 minutes close book assessment.

The final examination will be a comprehensive examination based on the practical work and lecture materials covered during the semester.

Continuous Assessments			
• Midterm Examination	20	%	LO1- LO3
• Practical Test	20	%	LO1- LO2
End Semester Assessment			
• Final Examination	60	%	LO1-LO7
TOTAL	100	%	

Estimated Student Workload

Contact Hours	
• Lecture	26 hours
• Tutorial	13 hours
• Laboratory	26 hours
Time Allocated for Assessments	
• Continuous Assessments	26 hours
• Final Examination	44 hours
Reading and Independent Study	65 hours
TOTAL	200 hours

Module Requirement

To pass this module, students need to obtain a pass mark in both “Continuous Assessments” and “End of the Semester Examination” components which would result in an overall mark that would qualify for a “C” grade or above

Primary References	1. Ramakrishnan, R. and Gehrke, J., *Database Management Systems*, 3rd ed., McGraw-Hill 2. Elmasri, R. and Navathe, S.B., *Fundamentals of Database Systems*, 5th ed., Addison-Wesley. 3. Silberschatz A., Korth H.F. and Sudarchan S., *Database Systems Concepts*, 3rd ed., McGrawHill , 1996 4. Connolly and Begg, *Database Systems: A Practical Approach to design, Implementation and management*, 3rd ed., Addison-Wesley 5. Price J., *Oracle Database 11g SQL (Oracle Press)*, 1st Edition 6. Shashank Tiwari, *Professional NoSQL*, John Wiley & Sons, Inc.

CONTENTS OF THE MODULE

1. **Object Relational Databases**
   - Relational database and limitations
   - Object types and advantages
   - Introduction to Object Relational databases in Oracle®
   - REFs, Co-dependent types
   - V-arrays
   - Nested Tables

2. **Member functions and Inheritance**
   - Implement member functions
   - Object comparison using Map and Order methods
   - Super types and sub types
   - Method overriding and overloading
   - Map Entity Relationship diagram to Object Relational schema

3. **NoSQL Databases**
   - Relational vs NoSQL
   - CAP theorem
   - BASE model
   - Key- value database
   - Column Database
   - Document Database
   - Graph database

4. **XML Databases**
   - Storing XML Data
   - Querying XML Data
   - XPath, XQuery

5. **Data Storage: Disk, RAID and Files**
   - Estimate database capacity and Data Access time
   - Parity schema and RAID Levels
   - Page formats and Record Formats

6. **Indexing Techniques**
   - Properties of indexes
   - Indexing Techniques
   - B+ Tree
   - Extendible Hashing

7. **Query Processing**
   - Query Trees
   - I/O Cost Estimation model
   - Cost estimation for Joining algorithms
   - SNLJ, PONLJ, BNLJ, INLJ, SMJ

8. **Physical Database Design and Database Tuning**
   - Index selection and creation
   - Index-Only Plans
   - Cost Estimation for query plans

9. **Transactions and Concurrency Control**
   - Transaction properties
   - Scheduling Transactions
   - Anomalies with Interleaved Execution
   - Deadlocks
   - Dynamic Databases & Phantoms
   - A Simple Tree Locking Algorithm
   - multiple-granularity locking scheme
   - Lock-Based Concurrency Control

10. **Database Crash Recovery**
    - Stealing Frames & Forcing Pages
    - Write-Ahead Logging
    - ARIES algorithm

11. Distributed Databases

- Distributed Database architecture
- Distributed CC protocols

GENERIC INFORMATION

Any type of plagiarism is not allowed.

Plagiarism: Academic honesty is crucial to a student's credibility and self-esteem, and ultimately reflects the values and morals of the Institute as whole. A student may work together with one or a group of students discussing assignment content, identifying relevant references, and debating issues relevant to the subject. Plagiarism occurs when the work of another person, or persons, is used and presented as one's own.

----------End of Module Outline----------