Principles of distributed database systems

M. Tamer Özsu

COURSE OUTLINE

SCHOOL: School of Engineering Technology and Applied Science

DEPARTMENT: Information and Communication Engineering Technology (ICET)

PROGRAM: Bachelor of Applied Information Sciences –
Software Systems Design

COURSE TITLE: Database Programming II (Distributed Databases)

COURSE CODE: SWS312

TOTAL COURSE HOURS: 60

PRE-REQUISITES/CO-REQUISITES: SWS121, SWS212, MTH220

**COURSE ELIGIBILITY FOR PRIOR
LEARNING ASSESSMENT AND
RECOGNITION (PLAR):** Yes

ORIGINATED BY: Narendra Pershad/ Iqbal Khan (July 2007)

REVISED BY: Narendra Pershad/ Iqbal Khan

DATE: August 2008

APPROVED BY:

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Chairperson/Dean

Academic year: 2008 - 2009

Students should keep all course outlines for each course taken at Centennial College. These may be used to apply for transfer of credit to other educational institutions. A fee may be charged for additional or replacement copies.

COURSE DESCRIPTION:

Because of the continual decrease in storage cost and an obsession with data acquisition, databases have started to grow explosively. Storage is no longer centralized but distributed. It is now possible or preferable to have centralized access to information that is distributed amongst several high performance nodes.
This course builds upon Database Programming-I and lays the foundation to tackle topics like distributed Database Architecture, Queries, Transaction Management and Concurrency Controls. This course also covers parallel DBMS and database interoperability

COURSE LEARNING OUTCOMES:

- Examine the basic components of a Distributed Database System.
- Validate the Types and Properties of Transactions.
- Evaluate Concurrency Control Algorithms.
- Understand reliability concepts and measures in the context of Distributed Databases.
- Explain the generic Architecture of a Parallel Database and an Object Database System.
- Construct an interface for a database application.

ESSENTIAL EMPLOYABILITY SKILLS (EES):
This course supports the students' ability to:

- Respond to written, spoken, or visual messages in a manner that ensures effective communication.
- Execute mathematical operations accurately.
- Apply a systematic approach to solve problems.
- Locate, select, organize, and document information using appropriate technology and information systems.
- Analyze, evaluate, and apply relevant information from a variety of sources.
- Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
- Take responsibility for one's own actions, decisions, and consequences.

PRIOR LEARNING ASSESSMENT & RECOGNITION PROCESS (ES):
This course is eligible for PLAR through the Registrar and SETAS offices. Assessment of portfolio and/or testing may be discussed with faculty

EVALUATION & GRADING SYSTEM:

Labs	20%
Assignments	10%
Mid Term Test	20%
Projects	20%
Final Exams	30%
Total	100%

An overall score of 50% is required in order to pass this course.

STUDENT ACCOMMODATION:

All students have the right to study in an environment that is free from discrimination and/or harassment. It is College Policy to provide accommodation based on grounds defined in the *Ontario Human Rights Code.* Accommodation may include changes or modifications to standard practices.

Students with disabilities who require academic accommodations must register with the Centre for Student with Disabilities. Please see the Centre for Students with Disabilities for details.

Students requiring accommodation based on human rights grounds should talk with their professors as early as possible. Details are available on the Centennial College website (www.centennialcollege.ca).

If students are unable to write an examination due to a medical problem or unforeseen family problems, they should immediately contact their professor or program Chair for advice. In exceptional and well documented circumstances (e.g. unexpected family problems, serious illness, or death of a close family member), students should be able to write a make-up examination to replace an examination missed.

TEXT AND OTHER INSTRUCTIONAL/LEARNING MATERIALS:

Title: Principles Of Distributed Database Systems: Second Edition
Author: M. Tamer Özsu, Patrick Valduriez
Publisher: Prentice Hall
ISBN: 0-13-659707-6

USE OF DICTIONARIES

Use of Dictionary in any form, printed or electronic. is not permitted in test or examination settings.

POLICY STATEMENTS

College Policies

The following statements are selected from Centennial College policies approved by the Board of Governors.

Student Responsibilities
Students are expected to know the contents of the course outline and to discuss with the professor any areas where clarification is required.

Students should keep all course outlines for each course taken at Centennial College. These may be used to apply for transfer of credit to other educational institutions. A fee may be charged for additional or replacement copies.

Other Policies
Students should familiarize themselves with all College Policies that cover students' rights, responsibilities, and the Academic Appeal process. For further information, consult the Academic Matters Section in the full-time and Continuing Education calendars. The Academic Appeal Application form is available from any Enrolment Services Office.

Proof of Student Status
Students must produce official photo identification at any time during the semester when requested to do so by any professor. (The official piece is the Centennial Student Card.) Continuing Education students do not have Centennial Student Cards, and so they may use other forms of photo identification, such as a driver's license, health card, or other government-issued photo identification.

Final Examinations
When writing a test or examination, students must put their official photo-ID cards in full view for review by the invigilator. Students who do not have official photo-ID will be permitted to write the examination with a substitute photo-ID, but they will be required to produce photo-ID at the program or department office within 24 hours or the next business day following the examination, or else the examination results will be void.

More Final Examination Policies are available at http://my.centennialcollege.ca.

Academic Progression Policy for Diploma and Certificate Programs:
College Academic Standings will be applied. Please see Academic Policies and Procedures, Full-Time Calendar.

Faculty Consultation
Professors are available to see students outside of class time. Students can contact professors via voice mail, email, or through their program or department office. Information regarding how to contact teachers will be provided at the beginning of the course and is also available in the program or department office.

Human Rights Statement
It is the policy of the College that all programs will strive for a learning, teaching, and working environment that promotes inclusion, understanding, and respect for all students and employees, consistent with the *Ontario Human Rights Code* and Centennial College's *Statement of Diversity*.

WEEK	TOPIC/CONTENT	READINGS	INSTRUCTIONAL STRATEGIES USED	COURSE EVALUATIONS (TESTS & ASSIGNMENTS USED)

1	Introduction
	   Distributed Data Processing
	   What is a DDMS
	   Promises of DDBM's
	   Complicating Factors
	   Problem Areas
	Overview of Relational DBMS
	   Relational DB Concepts
	   Normalization
	   Integrity Rules
	   Relational Data Language
		Chapters 1 & 2	Lecture
			Demo
			Discussion
			Lab
				Lab1

2	Distributed DBMS Architecture
	   DBMS Standardization
	   Architectural Models for DDBM's
		Chapter 4	Lecture
			Demo
			Discussion
			Lab
				Lab 2

3	Distributed Database Design
	   Alternative Design Strategies
	   Design issues
	   Fragmentation
	   Allocation
		Chapter 5	Lecture
			Demo
			Discussion
			Lab
				Lab 3
				Assignment 1

4	Semantic Data Control
	   View Management
	   Security
	   Integrity Control
		Chapter 6	Lecture
			Demo
			Discussion
			Lab
				Lab 4

5	Overview of Query Processing
	   Processing Problems
	   Complexity of relational
	   Characterization of Query Processors
	   Layers of Query Processing
		Chapter 7	Lecture
			Demo
			Discussion
			Lab
				Lab 5

6	Query Decomposition
	   Query Decomposition
	   Localization of Distributed Queries
		Chapter 8	Lecture
			Demo
			Discussion
			Lab
				Lab 6

7	Optimization of Distributed Queries
	   Query Optimization
	   Centralized Optimization
	   Join Ordering in Fragment Queries
	   Optimization Algorithms
		Chapter 9	Lecture
			Demo
			Discussion
			Lab
				Lab 7
				Assignment 2

8	Midterm			
9	Introduction to Transaction Management	Chapters 10 & 11	Lecture	Lab 8

WEEK	TOPIC/CONTENT	READINGS	INSTRUCTIONAL STRATEGIES USED	COURSE EVALUATIONS (TESTS & ASSIGNMENTS USED)

	Definition of a Transaction
	Properties of Transactions
	Types of Transactions
	Distributed Concurrency Control
	   Serialization Theory
	   Control Mechanism
	   Control Algorithms
	   Parallel Execution for Hierarchical Architecture
	   Deadlock Management
	   Relaxed Concurrency Control
			Demo
			Discussion
			Lab	

10	Distributed DBMS Reliability
	   Reliability Concepts and Measures
	   Failures and Fault Tolerance
	   Reliability Protocols
	   Distributed Reliability Protocols
	   Dealing with Failures
	   Network Partitioning
	   Architectural Considerations
		Chapter 12	Lecture
			Demo
			Discussion
			Lab
				Lab 9
				Assignment 3

11	Parallel Database Systems
	   Database Servers
	   Parallel Architectures
	   Parallel DBMS Techniques
	   Parallel Execution Problems
	   Parallel Execution for Hierarchical Architecture
		Chapter 13	Lecture
			Demo
			Discussion
			Lab
				Lab 10

12	Distributed Objects Database Management Systems
	   Fundamental Object Concepts and Models
	   Object Distributions Design
	   Architectural Issues
	   Object Management
	   Distributed Object Storage
	   Object Query Processing
	   Transaction Management
		Chapter 14	Lecture
			Demo
			Discussion
			Lab
				Lab 11

13	Database Interoperability
	   Database Integration
	   Query Processing
	   Transaction Management
	   Object Orientation and Interoperability
		Chapter 15	Lecture
			Demo
			Discussion
			Lab
				Lab 12
				Assignment 4

14	Revision			
15	Final Examination			