Knight Foundation School of Computing and Information Sciences

Course Title: Advanced Database Management   **Date:** 10/5/2020

Course Number: COP 4751

Number of Credits: 3

Subject Area: Database	Subject Area Coordinator: Antonio Bajuelos
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Catalog Description: Design & management of enterprise systems; query optimization, transaction processing; concurrency techniques; web queries; XML interchanges; data warehousing, datamining; OLAP; NOSQL and bigdata.	
Textbook: Fundamentals of Database Systems, 7th Edition Elmasri and Navathe Addison Wesley (ISBN: 0-13-397077-9)	
References:	
Prerequisites Courses: COP 4703 or COP 4710	
Corequisites Courses: None	

Type: Elective for CS [Systems Group], CY, IT [Application Development group]

Prerequisites Topics:

- Database architecture
- Relational algebra
- Design of SQL queries

Course Outcomes:

1. Exposure to an enterprise database system

2. Master query optimization

3. Master transaction processing and concurrency techniques

4. Be familiar with web queries

5. Be familiar with XML and XQueries

6. Be familiar with data mining, data warehouse, and OLAP

7. Be familiar with information retrieval

8. Be familiar with NOSQL and big data

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Association between Student Outcomes and Course Outcomes

BS in Computing: Student Outcomes	Course Outcomes
1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	1, 2, 3
2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.	4, 5
3) Communicate effectively in a variety of professional contexts.	
4) Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.	
5) Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.	

Program Specific Student Outcomes	
6) Apply computer science theory and software development fundamentals to produce computing-based solutions. [CS]	6, 7, 8
6) Apply security principles and practices to maintain operations in the presence of risks and threats. [CY]	6, 7, 8
6) Use systemic approaches to select, develop, apply, integrate, and administer secure computing technologies to accomplish user goals. [IT]	6, 7, 8

Assessment Plan for the Course and how Data in the Course are used to assess Student Outcomes

Student and Instructor Course Outcome Surveys are administered at the conclusion of each offering, and are evaluated as described in the School's Assessment Plan: https://abet.cis.fiu.edu/

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Outline

Topic	Number of Lecture Hours	Outcome

• Enterprise database systems
  o Enterprise server features
  o Enterprise server organization
	2	1

• Query optimization
  o Translation of SQL query to relational algebra
  o Efficient implementation of relational algebra operations
  o General query transformation rules
  o Query cost estimation, tuning queries
  o Semantic query optimization
	6	2

• Concurrency
  o Transaction processing, ACID properties
  o Serializability, equivalence of schedules
  o Locks, two-phase locking
  o Deadlock, time stamp ordering
	6	3

• Internet databases and web queries
  o Web databases
  o PHP database programming
	4	4

• XML and XQueries
  o XML hierarchical tree data model
  o XML documents, DTD, XSD
  o Importing/exporting XML documents
  o XML querying: Xpath, XQuery
	4	5

• Data warehousing and data mining
  o Data modeling for data warehouses
  o Building data warehouses
  o Data mining – support and confidence
  o Association rules algorithms
  o Classification and clustering
	6	6

• Information retrieval and big data
  o Information retrieval concepts
  o Web search and analysis
  o NOSQL systems and CAP theorem
  o Hadoop and HDFS
  o MapReduce algorithm
	8	7, 8

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Course Outcomes Emphasized in Laboratory Projects / Assignments

	Outcome	Number of Weeks
1	Query optimization Outcome: 2	2
2	Serializability of schedules Outcome: 3	2
3	PHP Queries Outcome: 4	2
4	XQueries Outcome: 5	1
5	Data mining – Frequent Itemsets Outcome: 6	1
6	Big data – MapReduce Outcome: 8	2

Oral and Written Communication
No significant coverage

Social and Ethical Implications of Computing Topics
No significant coverage

Theoretical Contents

Topic	Class time
Relational algebra	0.5

Problem Analysis Experiences

1. Analysis of data mining results to derive data patterns

Solution Design Experiences

1. Design of an extended query processing algorithm
2. Optimization of semantic query trees
3. Construction of precedence graphs for schedules