



**FLORIDA INTERNATIONAL UNIVERSITY  
UNIVERSITY CURRICULUM COMMITTEE**  
*Proposal for a New Course*

<b>DO NOT TYPE IN THIS BOX</b>
Bulletin # : <u>6</u>
Academic Year : <u>2019-2020</u>

1. **School/College** Engineering and Computing  
**Div./Dept. in Which Taught** School of Computing and Information Sciences
2. **COP** 4 **3**  
 Alpha Prefix    1st Digit    Last 3 Digits    "C"-lec-lab "L"-Lab    Cr. Hrs.  
**CIP Code (Leave this blank):** \_\_\_\_\_
3. **Grading Method (select one):**  Graded  Pass/Fail
- 4a. **Course Title** Advanced Database Management
- b. **Abbreviated course Title (for computer class schedules, transcripts)** Advanced DB Management  
LIMITED TO 25 Characters (including spaces)
5. **Statewide Course Numbering Subject Matter Area** Computer Programming
6. **Catalog Description/Major Topics (not to exceed 200 characters including spaces)**  
*College of Medicine and College of Law: Attach description not exceeding 1,000 characters including spaces.*
- Design & management of enterprise systems; query optimization, transaction processing; concurrency techniques; web queries; XML interchanges; data warehousing, datamining; OLAP; NOSQL and bigdata.
7. **Attach detailed syllabus course outline and course justification on separate page(s).**
8. **Prerequisite(s):** COP-4703 or COP-4710
9. **Corequisite(s):** None
10. **Objective(s) of Course:**

To educate students in emerging database technologies and enable them to acquire competitive skills that are in high demand.

11. **Does this course duplicate/overlap other courses at FIU?**  No  Yes  
 If yes, please explain: \_\_\_\_\_
12. **What other closely related department(s) have been consulted about this course?**

13. **Is this course used for the assessment of a program or a certificate (if yes, then send a notification to assessment@fiu.edu)?**    No    Yes

**PROPOSAL REQUESTED BY:**

<b>Faculty Contact</b> <u>Nagarajan Prabakar</u>		<u>3</u>	<u>/</u>	<u>19</u>	<u>/</u>	<u>20</u>	<u>20</u>
(Type name)	(Signature)						
<u>prabakar@cis.fiu.edu</u>	<u>305 348-2033</u>						
(Email address)	(Phone number)						
<b>Chairperson (Dept./Div.)</b> <u>S.S. Iyengar</u>		<u>3</u>	<u>/</u>	<u>19</u>	<u>/</u>	<u>20</u>	<u>20</u>
(Type name)	(Signature)						
<b>Chairperson (Curr. Comm.)</b> <u>Wei-Chiang Lin</u>		<u>3</u>	<u>/</u>	<u>25</u>	<u>/</u>	<u>20</u>	<u>20</u>
(Type name)	(Signature)						
<b>College/School Dean</b> <u>John Volakis</u>			<u>/</u>		<u>/</u>	<u>20</u>	<u>20</u>
(Type name)	(Signature)						

Submit one original form. Attach one copy of the course justification and course syllabus, course description, objectives, major topics and textbooks.

## **COP-4xxx Advanced Database Management**

### **New Course Justification**

This advanced database course is an elective for both Computer Science and Information technology majors. Several new topics have evolved in database field over the past decade such as XML, information retrieval, NOSQL, big data, etc. These topics together with standard advanced database topics such as query optimization, transactional processing and concurrency control, form the modules of this course. This course will educate students in emerging technologies and enables them to acquire competitive skills for the industry needs.

The attached detailed syllabus includes appropriate course outcomes relevant to the topics, and a list of projects on advanced database technologies.

## School of Computing and Information Sciences

**Course Title:** Advanced Database Management

**Date:** 3/5/20

**Course Number:** COP 4xxx

**Number of Credits:** 3

<b>Subject Area:</b> Database	<b>Subject Area Coordinator:</b> Nagarajan Prabakar <b>email:</b> <a href="mailto:prabakar@cis.fiu.edu">prabakar@cis.fiu.edu</a>
<b>Catalog Description:</b> Design & management of enterprise systems; query optimization, transaction processing; concurrency techniques; web queries; XML interchanges; data warehousing, datamining; OLAP; NOSQL and bigdata.	
<b>Textbook:</b> Fundamentals of Database Systems, 7 <sup>th</sup> Edition Elmasri and Navathe Addison Wesley (ISBN: 0-13-397077-9)	
<b>References:</b>	
<b>Prerequisites Courses:</b> <a href="#">COP-4703</a> or <a href="#">COP-4710</a>	
<b>Corequisites Courses:</b> None	

Type: Elective

Prerequisites Topics:

- Database architecture
- Relational algebra
- Design of SQL queries

Course Outcomes:

1. Exposure to 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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Advanced Database Management

**Outline**

<b>Topic</b>	<b>Number of Lecture Hours</b>	<b>Outcome</b>
<ul style="list-style-type: none"> <li>• Enterprise database systems               <ul style="list-style-type: none"> <li>○ Enterprise server features</li> <li>○ Enterprise server organization</li> </ul> </li> </ul>	2	1
<ul style="list-style-type: none"> <li>• Query optimization               <ul style="list-style-type: none"> <li>○ Translation of SQL query to relational algebra</li> <li>○ Efficient implementation of relational algebra operations</li> <li>○ General query transformation rules</li> <li>○ Query cost estimation, tuning queries</li> <li>○ Semantic query optimization</li> </ul> </li> </ul>	6	2
<ul style="list-style-type: none"> <li>• Concurrency               <ul style="list-style-type: none"> <li>○ Transaction processing, ACID properties</li> <li>○ Serializability, equivalence of schedules</li> <li>○ Locks, two-phase locking</li> <li>○ Deadlock, time stamp ordering</li> </ul> </li> </ul>	6	3
<ul style="list-style-type: none"> <li>• Internet databases and web queries               <ul style="list-style-type: none"> <li>○ Web databases</li> <li>○ PHP database programming</li> </ul> </li> </ul>	4	4
<ul style="list-style-type: none"> <li>• XML and XQueries               <ul style="list-style-type: none"> <li>○ XML hierarchical tree data model</li> <li>○ XML documents, DTD, XSD</li> <li>○ Importing/exporting XML documents</li> <li>○ XML querying: Xpath, XQuery</li> </ul> </li> </ul>	4	5
<ul style="list-style-type: none"> <li>• Data warehousing and data mining               <ul style="list-style-type: none"> <li>○ Data modeling for data warehouses</li> <li>○ Building data warehouses</li> <li>○ Data mining – support and confidence</li> <li>○ Association rules algorithms</li> <li>○ Classification and clustering</li> </ul> </li> </ul>	6	6
<ul style="list-style-type: none"> <li>• Information retrieval and big data               <ul style="list-style-type: none"> <li>○ Information retrieval concepts</li> <li>○ Web search and analysis</li> <li>○ NOSQL systems and CAP theorem</li> <li>○ Hadoop and HDFS</li> <li>○ MapReduce algorithm</li> </ul> </li> </ul>	8	7, 8

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**Course Outcomes Emphasized in Laboratory Projects / Assignments**

	<b>Outcome</b>	<b>Number of Weeks</b>
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

Number of written reports:

Approximate number of pages for each report:

Number of required oral presentations:

Approximate time for each presentation:

**Social and Ethical Implications of Computing Topics**

No significant coverage

<b>Topic</b>	<b>Class time</b>	<b>Student performance measures</b>

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**Theoretical Contents**

<b>Topic</b>	<b>Class time</b>
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