Template of Course Specification

Faculty: CIT
Department: IT
Program: BIT

I.	**General information about the course :**					
1.	**Course Title:**	Advanced Database Applications				
2.	**Course Code and Number :**	ITE13				
3.	**Credit Hours: 3**	**Lecture**	**Seminar/Tutorial**	**Practical**	**Training**	**Total**
		2		2		4
4.	**Study Level and Semester:**	Level 4 - Semester 7 or 8				
5.	**Pre-requisites (if any):**	CS221 - Database Systems Design				
6.	**Co-requisites (if any) :**	None				
7.	**Program in which the course is offered**	BIT				
8.	**Teaching Language:**	English				
9.	**Study System :**	Semester Based				
0.	**Prepared by :**	Course Facilitator				
1.	**Approval date :**					
2.	**Approved by:**	Department				

II. Course Description:

The goal of the course is to introduce students to EERD model, modern database, and data management systems. The course will be focused on efficient query processing and indexing techniques for spatial, temporal and multimedia databases. Another topic that will be covered is parallel databases, the analysis of large datasets (data mining). In particular, efficient and scalable algorithms for clustering, association rule discovery and classification of very large datasets will be discussed. Students will have to solve some small written and programming assignments that will help them to understand and digest the covered material. This course has prerequisite Database Systems Design.

III. Course Aims

This Course aims to:

1. Demonstrate principles of design, development, and administration
2. Formulate a working definition of database development and administration.
3. Identify the contemporary architecture of database systems.
4. Survey the characteristics of widely used hardware, operating systems.
5. Apply advanced database technology to manage operations
6. Gain a working knowledge of developing and maintaining a small-scale database project.
7. Develop skills in using advanced database techniques and problem solving

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VI. Course Intended Learning Outcomes (CILOs) :

Knowledge and Understanding:

Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)

Knowledge and Understanding PILOs	Knowledge and Understanding CILOs
After completing this program, students would be able to:	After completing this course, students would be able to:
A1. Show knowledge and understanding in computing and mathematics appropriate to the IT discipline	a1. Know the overview of database systems and database models
A2. Understand the professional, ethical, and social responsibilities	a2. Understand query processing/evaluation/optimization and transaction processing & concurrency control including the stages in query processing
A3. Recognize the need for and an ability to engage in continuing professional development	a3. Define indexes, multidimensional data, distributed databases, parallel databases & multimedia databases, data warehouse and data mining

Intellectual Skills :

Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)

Intellectual Skills PILOs	Intellectual Skills CILOs
After completing this program, students would be able to:	After completing this course, students would be able to:
B1. Analyze a problem, and identify and define the computing requirements appropriate to its solution	b1. Recognize & Formulate indexes, multidimensional data, EER model, distributed databases, data warehouse and data mining, query processing, query evaluation and query optimization
B2. Analyze the impact of computing on individuals, organizations, and society, including ethical, legal, security, and global policy issues	
B3. Integrate IT-based solutions into the user environment	b2. Analyze & Integrate transaction processing, concurrency control, multimedia databases and parallel databases
B4. Identify and analyze user needs and take them into account in the selection, creation, and administration of computer-based systems	

Professional and Practical Skills	
Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)	
Professional and Practical Skills PILOs	**Professional and Practical Skills CILOs**
After completing this program, students would be able to:	After completing this course, students would be able to:
C1. Use current techniques, skills, and tools necessary for computing practice	c1. Apply Indexes, EER Model on databases, XML Databases; The XML Query language; Space ontology
C2. Use and apply the current concepts and practices of the core information technologies	c2. Implement the best optimized query processing to improve performance, multimedia databases and parallel databases
C3. Demonstrate the best practices and standards and their application	
C4. Develop, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	c3. Implement optimized transaction processing methods and concurrency control, Spatial Databases: Spatial data and applications, UML for database application design

Transferable (General) Skills :	
Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)	
Transferable (General) Skills PILOs	**Transferable (General) Skills CILOs**
After completing this program, students would be able to:	After completing this course, students would be able to:
D1. Function effectively on teams to accomplish a common goal	d1. Write project - technical report and present projects/assignments
D2. Communicate effectively with a range of audiences	
D3. Assist in the creation of an effective project plan	

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VI. Alignment of CILOs to Teaching and Assessment Strategies

First: Alignment of Knowledge and Understanding CILOs

Knowledge and Understanding CILOs	Teaching Strategies	Assessment Strategies
a1. Know the overview of database systems and database models	Lectures Group Discussions Tutorials Brain Storming	Written Exam Observation Reports/Screen shots Viva/Direct Questions Quizzes
a2. Understand query processing/evaluation/optimization and transaction processing & concurrency control including the stages in query processing		
a3. Define indexes, multidimensional data, distributed databases, parallel databases & multimedia databases, data warehouse and data mining		

Second: Alignment of Intellectual Skills CILOs

Intellectual Skills CILOs	Teaching Strategies	Assessment Strategies
b1. Recognize & Formulate indexes, multidimensional data, EER model, distributed databases, data warehouse and data mining, query processing, query evaluation and query optimization	Lectures Tutorials Case study Assignments	Written test Quizzes Tutorial technical reports Other Reports
b2. Analyze & Integrate transaction processing, concurrency control, multimedia databases and parallel databases		

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Third: Alignment of Professional and Practical Skills CILOs		
Professional and Practical Skills CILOs	**Teaching Strategies**	**Assessment Strategies**
c1. Apply Indexes, EER Model on databases, XML Databases; The XML Query language; Space ontology	**Tutorials** **Homework** **Group Discussions**	**Technical Reports** **Worksheets** **Presentations** **Observations**
c2. Implement the best optimized query processing to improve performance, multimedia databases and parallel databases		
c3. Implement optimized transaction processing methods and concurrency control, Spatial Databases: Spatial data and applications, UML for database application design		

Fourth: Alignment of Transferable (General) Skills CILOs		
Transferable (General) Skills CILOs	**Teaching Strategies**	**Assessment Strategies**
d1. Write project - technical report and present projects/assignments	**Grouping** **Tips** **Notes** **Case Study**	**Presentations** **Observations** **Reports**

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VII. Course topics and sub-topics (theoretical and practical) with contact hours and alignment to CILOs

Topics/Units of Course Contents					
First: Theoretical Aspects					
No.	**Course Topics/Units**	**Sub-topics**	**No. of Weeks**	**Contact Hours**	**CILOs**
1	Introduction: Relational databases overview, data model, evaluation model	Database systems, data model building blocks, degrees of data abstraction	1	2	a1
2	Storage: Indexes, multidimensional data, EER Model	Indexing, multidimensional data analysis, enhanced entity relations super-sub types	1	2	a2, a3, b1
3	Overview of query processing & distributed databases	Steps in query processing, The need for distributed databases, advantages and disadvantages of distributed DBMSs, main issues associated with distributed database design.	2	4	b1, b2
4	Query evaluation	Join evaluation algorithms, execution models, evaluating query	1	2	b1, b2
5	Query optimization	Cost models, search space exploration, randomized optimization, optimized query	1	2	b1, b2
6	Transaction Processing & Concurrency Control	Transaction & system concepts, properties, characterizing schedules, transaction support SQL, Locking techniques, concurrency control, validation	2	4	b2, c3
7	Parallel databases	Parallel versus Distributed Architectures, future directions			c2
8	MID TERM EXAM				
9	Multimedia Databases	Multimedia database concepts, features, uses, content based retrieval	2	4	b2, c3

10	Intro. to Data warehousing & Data Mining; OLTP & OLAP	Technology, characteristics, classification, clustering, applications, functionality, difficulties in implementation	1	2	b2, c2
11	Spatial Databases	Spatial data and applications	1	2	c3
12	Space Ontology	Conceptual modeling of spatial aspects. Manipulation of spatial data with standard SQL	1	2	c1
13	Introducing XML Databases	The XML-Query language. Basis of the language. Base expressions. X-Path expressions. New attributes and elements	1	2	c1
14	Intro. to UML for database application design	What is UML? Different Types of Diagrams in UML. UML in database application design	1	2	c2, c3
15	FINAL EXAM				
Total number of weeks and hours			15	30	

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I. Teaching Strategies
Lectures
Tutorials
Group Discussions
Case study
Assignment
Homework
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Second: Practical/Tutorial/Clinical Aspects				
Write up practical/tutorial/clinical topics				
No.	**Practical/Tutorial/Clinical topics**	**No. of Weeks**	**Contact Hours**	**CILOs**
1	Storage structures, indexes	1	2	b1, c1
2	Query processing examples	1	2	b2, c2
3	Query evaluation, Query optimization examples	2	4	b3, c2, c3
4	Transaction Processing & Concurrency Control; locks and unlocks	2	4	c3
5	Multimedia Databases demo, parallel databases demo	2	4	b2, c1
6	Spatial Databases; Advanced SQL	2	4	c3
7	XML demo	2	4	c1
8	Assessment - Assignment/Project/Presentation Reports	1	2	d1
9	Assessment - Assignment/Project/Presentation Reports	1	2	d1
Total number of weeks and hours		**14**	**28**	

II. Tasks and Assignments :				
No.	**Task/Assignment**	**CILOs**	**Week due**	**Mark**
1	Assignment 1	b1, b2, d1	10	10%
2	Assignment 2	c1,c2,c3, d1	12	10%

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III. Learning Assessment:

No.	Assessment Tasks	Week due	Mark	Proportion of Final Assessment	Aligned CILOs
1	Assignments + Reports	12	20	20%	b1, b2, c1, c2, c3, d1
2	Quiz 1 & Quiz 2	4 & 9	5	5%	a1, a2, a3
3	Midterm exam	7	15	15%	b1 , b2
4	Tutorials		10	10%	c1, c2 , c3
5	Final Exam	15	50	50%	ALL Course ILO's
Total			100		

IV. Learning Resources :

(Author, (Year), Book Title, Edition, Publisher, Country of publishing)

Textbooks-not more than 2

1. Thomas Connolly & Carolyn Begg, (2011), Database Systems, 4th Ed. Addison Wesley (Pearson), USA
2. Coronel-Morris-Rob, (2011), Database Systems, 9th Ed. Cengage Learning, USA

Essential References-not less than 4

1. Richard T. Watson (2003). *Data Management Databases and Organizations (3rd edition).* John Wiley & Sons.
2. A. Silberschatz, H. Korth, (2010), Database System Concepts. 3rd, Edition. McGraw-Hill, USA
3. P. O'Neil and E. O'Neil, (2012), Database: Principles, Programming, and Performance, 2nd Edition. Morgan Kaufmann, USA
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Electronic Materials and Web Sites

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V. Course Policies (To be determined by Faculty Deanship):	
Based on university regulations, the following aspects should be figured out:	
1.	**(**Class Attendance**) :**
2.	**(**Tardy**) :**
3.	**(**Exam Attendance/Punctuality**) :**
4.	**(**Assignments & Projects**) :**
5.	**(**Cheating**) :**
6.	**(**Plagiarism**) :**
7.	**(**Other policies**) :**

Template of Course Syllabus

Faculty : TIC
Department: IT
Program : BIT

I. General information about the course instructor :							
Name	[Course Facilitator]	**Office Hours (3 Hours Weekly)**					
Location & phone number	USTY	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**	**Thu**
Email							

II. General information about the course:						
1.	**Course Title :**	Advanced Database Applications				
2.	**Course Code and Number :**	ITE13				
3.	**Credit Hours :**	**Credit Hours**				**Total**
		Theoretical	**Seminar/Tutorial**	**Practical**	**Training**	
		2		2		4
4.	**Study Level and Semester:**	Level 4 - Semester 7 or 8				
5.	**Pre-requisites (if any):**	CS221 - Database Systems Design				
6.	**Co-requisites (if any):**	None				
7.	**Program in which the course is offered:**	BIT				
8.	**Teaching Language:**	English				
9.	**Instruction location:**	N/A				

I. Course Description

The goal of the course is to introduce students to EERD model, modern database, and data management systems. The course will be focused on efficient query processing and indexing techniques for spatial, temporal and multimedia databases. Another topic that will be covered is parallel databases, the analysis of large datasets (data mining). In particular, efficient and scalable algorithms for clustering, association rule discovery and classification of very large datasets will be discussed. Students will have to solve some small written and programming assignments that will help them to understand and digest the covered material. This course has prerequisite Database Systems Design.

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This course aims to:

1. Demonstrate principles of design, development, and administration
2. Formulate a working definition of database development and administration.
3. Identify the contemporary architecture of database systems.
4. Survey the characteristics of widely used hardware, operating systems.
5. Apply advanced database technology to manage operations
6. Gain a working knowledge of developing and maintaining a small-scale database project.
7. Develop skills in using advanced database techniques and problem solving

III. Course Intended Learning Outcomes (CILOs) :

1. a1. Know the overview of database systems and database models
2. a2. Understand query processing/evaluation/optimization and transaction processing & concurrency control including the stages in query processing
3. a3. Define indexes, multidimensional data, distributed databases, parallel databases & multimedia databases, data warehouse and data mining
4. b1. Recognize & Formulate indexes, multidimensional data, EER model, distributed databases, data warehouse and data mining, query processing, query evaluation and query optimization
5. b2. Analyze & Integrate transaction processing, concurrency control, multimedia databases and parallel databases
6. c1. Apply Indexes, EER Model on databases, XML Databases; The XML Query language; Space ontology
7. c2. Implement the best optimized query processing to improve performance, multimedia databases and parallel databases
8. c3. Implement optimized transaction processing methods and concurrency control, Spatial Databases: Spatial data and applications, UML for database application design
9. d1. Write project - technical report and present projects/assignments

IV. Course Contents

Theoretical Aspect:

No.	Course Units	Sub-topics	Week due	Contact Hours
1.	Unit-1	1) Introduction: Relational databases overview, data model, evaluation model 2) Storage: Indexes, multidimensional data, EER Model 3) Overview of query processing & distributed databases	Week 4	8
2.	Unit-2	4) Query evaluation: Join evaluation algorithms, execution models 5) Query optimization: Cost models, search space exploration, randomized optimization 6) Transaction Processing & Concurrency Control	Week 8	8
3.	Unit-3	7) Parallel databases 8) Multimedia Databases 9) Intro. to Data warehousing & Data Mining; OLTP & OLAP	Week 10	4
4.	Unit-4	10) Spatial Databases: Spatial data and applications. 11) Space ontology. Conceptual modeling of spatial aspects. Manipulation of spatial data with standard SQL	Week 12	4
5.	Unit-5	12) Introducing XML Databases; The XQuery language. Basis of the language. Base expressions. XPath expressions. New attributes and elements 13) Intro. to UML for database application design	Week 14	4
Total number of weeks and hours			14	28

Second: Practical/Tutorial/Clinical Aspects :			
Write up practical/tutorial/clinical topics			
No.	**Practical/Tutorial/Clinical topics**	**No. of Weeks**	**Contact Hours**
1.	Storage structures, indexes	1	2
2.	Query processing examples	1	2
3.	Query evaluation, Query optimization examples	2	4
4.	Transaction Processing & Concurrency Control; locks and unlocks	2	4
5.	Multimedia Databases demo, parallel databases demo	2	4
6.	Spatial Databases; Advanced SQL	2	4
7.	XML demo	2	4
8.	Assessment - Assignment/Project/Presentation Reports	1	2
9.	Assessment - Assignment/Project/Presentation Reports	1	2
Total number of weeks and hours		**14**	**28**

V. Teaching Strategies

1. Lectures
2. Tutorials
3. Group Discussions
4. Case study
5. Assignment
6. Homework

VI. Tasks and Assignments

No.	Task/Assignment	Week due	Mark
1.	Assignment 1	WEEK 10	10
2.	Assignment 2	WEEK 12	10

VII. Learning Assessment:

No.	Assessment Tasks	Assessment day & date	Mark	Weight
1	Quiz 1	WEEK 3	5	5%
2	Quiz 2	WEEK 5		
3	Midterm exam	WEEK 8	15	15%
4	Tutorials	WEEK 10	10	10%
6	Assignments + Reports	WEEK 12 & 13	20	20%
8	Final Exam	WEEK 15	50	50%
	Total			

VIII. Learning Resources

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1. Thomas Connolly & Carolyn Begg, (2011), Database Systems, 4th Ed. Addison Wesley (Pearson), USA
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IX. Course Policies (To be determined by Faculty Deanship)	
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2.	**Tardy :**
3.	**Exam Attendance/Punctuality:**
4.	**Assignments & Projects:**
5.	**Cheating:**
6.	**Plagiarism:**
7.	**Other policies:**