



**Bangladesh University of Business and Technology (BUBT)**  
**Faculty of Engineering & Applied Sciences (FEAS)**  
**Department of Computer Science and Engineering (CSE)**

**THEORY COURSE OUTLINE**

1	Program	B.Sc. Engg. in CSE		
2	Course Code	CSE 417		
3	Course Title	Distributed Database Management Systems		
4	Course Type	Advanced course		
5	Academic Session	Spring 2021		
6	Credit Hour	3.0		
7	Intake	38		
8	Section	1		
9	Pre-requisites	CSE 207 Database Systems		
10	Campus	Permanent Campus		
11	Course Teacher	Name: Mohammad Zaeed		Designation: Lecturer
		Specialization: Software Engineering, Image Processing, Natural Language Processing		
		Room No. 314/B1	Email: mohammad_zaeed@bubt.edu.bd	Cell No. 01991592404
12	Class Schedule			
		Class Day	Class Hours	Class Room
		Tuesday	01:20 PM – 02:50 PM	910 (B-2)
	Wednesday	11:30 AM – 01:00 PM	910 (B-2)	
13	Counselling Schedule			
		Class Day	Class Hours	Class Room
		Sunday	1:20 PM – 2.40 PM	314(B-1)
	Tuesday	3:00 PM – 4.20 PM	314(B-1)	
14	Course Objectives	The aim of the course is to enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies. This also shows the needs for distributed database technology to tackle deficiencies of the centralized database systems. Students will able to introduce with implementation techniques and design strategies of distributed database systems as well as they familiarize with distributed query processing phases. This course emphasized on finding out the optimal query execution strategies.		
15	Course Synopsis	Introduction to distributed database management, Promises of distributed database, Distributed database design challenges, Distributed DBMS architectures, Top-down design process, Distribution design issue, Fragmentation, Allocation, View Management, Data Security, Semantic integrity control, Objectives of query processing, Layers of query processing, Query decomposing and data localization, Distributed query processing and optimization, Transactions management: taxonomy, types and properties.		
16	Text Book	1. Principles of Distributed Database Systems, Third Edition - M. Tamer Oezsu, Patrick Valduriez		



21	Lecture Plan (Weekly Schedule)						
	Week	Lecture #	Selected Topics	Chapter #	COs	Assessment	
	1	1	Introduction: Distributed Data Processing, Distributed Database System, Data Delivery Alternatives, Promises of DDBSs, Transparent Management of Distributed and Replicated Data, Reliability Through Distributed Transactions, Performance, System Expansion	Chapter 1	CO1	<b>Mid Term Exam</b>  <b>30</b>	
		2	Complications Introduced by Distribution, Distributed Database Design, Distributed Directory Management, Distributed Query Processing, Distributed Concurrency Control, Distributed Deadlock, Reliability of Distributed, Replication, Relationship among Problems, Additional Issues, Distributed DBMS Architecture	Chapter 1	CO1		
	2	3	A Generic Centralized DBMS Architecture, Architectural Models for Distributed DBMSs, Autonomy, Distribution, Heterogeneity, Architectural Alternatives, Client/Server Systems, Peer-to-Peer Systems, Multi-database System Architecture	Chapter 1	CO1		
		4	Overview: Relational database & anomalies, Database normalization review	Chapter 2	CO2		
	3	5	Distributed Database Design: Top-Down Design Process, Distribution Design Issues	Chapter 3	CO2		
		6	Reasons for Fragmentation, Fragmentation Alternatives, Degree of Fragmentation, Correctness Rules of Fragmentation	Chapter 3	CO2		
	4	7	Allocation Alternatives, Information Requirement, Fragmentation, Horizontal Fragmentation	Chapter 3	CO2		
		8	Vertical Fragmentation, Hybrid Fragmentation, Allocation, Allocation Problem, Information Requirements for Fragmentation	Chapter 3	CO2		
	5	9	Allocation Model, Solution Methods, Data Directory	Chapter 3	CO2		
		10	Data and Access Control: View Management, Views in Centralized DBMSs, Views in Distributed DBMSs, Maintenance of Materialized Views, Data Security	Chapter 5	CO2		
	6	11	Discretionary Access Control, Multilevel Access Control, Distributed Access Control	Chapter 5	CO2		
		12	Semantic Integrity Control, Centralized Semantic Integrity Control, Distributed Semantic Integrity Control	Chapter 5	CO2		
	7	13	Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processors, Languages, Types of Optimization, Optimization Timing, Statistics	Chapter 6	CO4		
		14	Decision Sites, Exploitation of the Network, Exploitation of Replicated Fragments, Use of Semi joins, Layers of Query Processing: Query Decomposition, Data Localization, Global Query Optimization, Distributed Query Execution	Chapter 6	CO4		
	8	Midterm Examination					
	9	15	Localization of Distributed Data, Reduction for Primary Horizontal Fragmentation, Reduction for Vertical Fragmentation, Reduction for Derived Fragmentation, Reduction for Hybrid Fragmentation	Chapter 7	CO4		
		16	Query Decomposition and Data Localization, Query Decomposition, Normalization, Elimination of Redundancy, Rewriting	Chapter 7	CO4		
	10	17	Optimization of Distributed Queries: Search Space, Search Strategy, Distributed Cost Model	Chapter 8	CO4		

		18	Centralized Query Optimization, Dynamic Query Optimization, Static Query Optimization, Hybrid Query Optimization, Join Ordering in Distributed Queries	Chapter 8	CO4	<b>Final Exam</b>  <b>40</b>		
	11	19	Distributed Query Optimization	Chapter 8	CO4			
		20	Dynamic Approach, Static Approach, Semi join-based Approach, Hybrid Approach	Chapter 8	CO4			
	12	21	Introduction to Transaction Management: Serializability, Taxonomy of concurrency control, Termination Conditions of Transactions, Characterization of Transactions	Chapter 10	CO1			
		22	Formalization of the Transaction Concept, Properties of Transactions	Chapter 10	CO1			
	13	23	Types of Transactions, Flat Transactions, Nested Transactions, Workflows Architecture Revisited	Chapter 10	CO1			
		24	Review class for Semester Final Examination	Chapter 10	CO1			
	14	25	Real world problem solving					
		26	Final Exam Review Class					
	15	Final Exam						
22	Overall CO Assessment Criteria	Assessment methods of COs are given below:						
		Assessment Area	CO				Assessment Area Mark	
			CO1	CO2	CO3	CO4		
		Class Participation						
		Assignment/Presentation						
		Class Test						
		Midterm Exam	15	15			30	
		Final Exam	10		15	15	40	
		Total Mark	25	15	15	15	70	
23	Rubrics	COs (Bloom's Level)	Excellent (80%-100%)	Good (70%-79%)	Satisfactory (60%-69%)	Poor (40%-59%)	Unsatisfactory (0-39%)	Marks (70)
		CO1 (Understanding)	Answer is complete and sufficient detail provided to support issues related to the question. And also deals fully with the entire question.	Answer is brief with sufficient detail provided to support issues were introduced. And most of the basic details are included but some are missing.	Answer is brief with insufficient detail provided to support issues were introduced.	Answer is incomplete and excessive discussion of unrelated issues. And serious gaps in the basic details.	None of the relevant details were included or didn't answer.	
		CO2 (Understanding)	Answer is complete and sufficient detail provided to support issues related to the question. And also deals fully with the entire question.	Answer is brief with sufficient detail provided to support issues were introduced. And most of the basic details are included but some are missing.	Answer is brief with insufficient detail provided to support issues were introduced.	Answer is incomplete and excessive discussion of unrelated issues. And serious gaps in the basic details.	None of the relevant details were included or didn't answer.	



Bloom's Taxonomy is a set of three hierarchical models used to classify educational learning objectives into levels of complexity and specificity. The three lists cover the learning objectives in Cognitive, Affective and Psychomotor domains. The Cognitive domain list has been the primary focus of most education and is frequently used to structure curriculum learning objectives, assessments and activities. The three domains and respective levels are illustrated below.

<b>Cognitive [C]</b> (Knowledge-based)	<b>Affective [A]</b> (Emotion-based)	<b>Psychomotor [P]</b> (Action-based)
1. Remembering	1. Receiving	1. Imitating
2. Understanding	2. Responding	2. Manipulating
3. Applying	3. Valuing	3. Précising
4. Analyzing	4. Organizing	4. Articulating
5. Evaluating	5. Characterizing	5. Naturalizing
6. Creating	-----	-----

**28 Descriptions of Cognitive Domain (Anderson and Krathwohl's Taxonomy 2001):**  
**The cognitive domain** involves the development of our mental skills and the acquisition of knowledge.

<b>Level</b>	<b>Category</b>	<b>Meaning</b>	<b>Keywords</b>
C1	Remembering	Recognizing or recalling knowledge from memory. Remembering is when memory is used to produce or retrieve definitions, facts, or lists, or to recite previously learned information.	Define, describe, draw, find, identify, label, list, match, name, quote, recall, recite, tell, write
C2	Understanding	Constructing meaning from different types of functions be they written or graphic messages or activities like interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining.	Classify, compare, exemplify, conclude, demonstrate, discuss, explain, identify, illustrate, interpret, paraphrase, predict, report
C3	Applying	Carrying out or using a procedure through executing, or implementing. Applying relates to or refers to situations where learned material is used through products like models, presentations, interviews or simulations.	Apply, change, choose, compute, dramatize, implement, interview, prepare, produce, role play, select, show, transfer, use
C4	Analyzing	Breaking materials or concepts into parts, determining how the parts relate to one another or how they interrelate, or how the parts relate to an overall structure or purpose. Mental actions included in this function are differentiating, organizing, and attributing, as well as being able to distinguish between the components or parts. When one is analyzing, he/she can illustrate this mental function by creating spreadsheets, surveys, charts, or diagrams, or graphic representations.	Analyze, characterize, classify, compare, contrast, debate, deconstruct, deduce, differentiate, discriminate, distinguish, examine, organize, outline, relate, research, separate, structure
C5	Evaluating	Making judgments based on criteria and standards through checking and critiquing. Critiques, recommendations, and reports are some of the products that can be created to demonstrate the processes of evaluation.	Appraise, argue, assess, choose, conclude, critique, decide, evaluate, judge, justify, predict, prioritize, prove, rank, rate, select, Monitor
C6	Creating	Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a new way, or synthesize parts into something new and different creating a new form or product. This process is the most difficult mental function.	Construct, design, develop, generate, hypothesize, invent, plan, produce, compose, create, make, perform, plan, produce



29	Graduate Attributes (Program Outcomes) for B.Sc. in Engineering Program based on Washington Accord					
	<p>Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the Time of graduation. These relate to the knowledge skills and attitudes that students acquire while progressing through the program. The students of the B.Sc. in EEE program are expected to achieve the following graduate attributes or program outcomes at the time of graduation.</p> <p><b>PO1–Engineering knowledge (Cognitive):</b> Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.</p> <p><b>PO2–Problem analysis (Cognitive):</b> Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.</p> <p><b>PO3–Design/development of solutions (Cognitive, Affective):</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.</p> <p><b>PO4–Investigation (Cognitive, Psychomotor):</b> Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.</p> <p><b>PO5–Modern tool usage (Psychomotor, Cognitive):</b> Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.</p> <p><b>PO6–The engineer and society (Affective):</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.</p> <p><b>PO7–Environment and sustainability (Affective, Cognitive):</b> Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.</p> <p><b>PO8–Ethics (Affective):</b> Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.</p> <p><b>PO9–Individual work and teamwork (Psychomotor, Affective):</b> Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.</p> <p><b>PO10–Communication (Psychomotor, Affective):</b> Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.</p> <p><b>PO11–Project management and finance (Cognitive, Psychomotor):</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work as a member or a leader of a team to manage projects in multidisciplinary environments.</p> <p><b>PO12–Life-long learning (Affective, Psychomotor):</b> Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.</p>					
30	Social & Moral Capital					
	<p>Our promises are based on the three cardinal principles: (a) What we do believe (b) What we do practice, and (c) What we will promote</p> <p>However, students are advised to undertake the following commitments for moral development.</p> <table><tr><td>1. To be punctual and attentive in class 2. To maintain inclusive learning environment 3. To ensure mutual respect 4. To be cooperative in group learning. 5. To be innovative and Creative 6. To follow dress code and wearing ID card 7. To be always proactive</td><td>8. Try to follow and review day to day class 9. To avoid conspiracy 10. To prioritize honesty &amp; faith 11. To be motivated for asking question and encourage feedback 12. To develop attitude for speaking in English 13. Do not ignore to carry out any assignments or commitments 14. To be clean and decent in all levels.</td><td>15. To be sincere for class preparation 16. Do not forget to switch-off the cell phone in class 17. Do not forget to carry course pack and learning stuffs in class 18. To maintain loyalty and trust to the university 19. Must avoid unfair means and plagiarism in exam, reports and assignments 20. Must maintain eco-friendly environment in the campus.</td></tr></table>			1. To be punctual and attentive in class 2. To maintain inclusive learning environment 3. To ensure mutual respect 4. To be cooperative in group learning. 5. To be innovative and Creative 6. To follow dress code and wearing ID card 7. To be always proactive	8. Try to follow and review day to day class 9. To avoid conspiracy 10. To prioritize honesty & faith 11. To be motivated for asking question and encourage feedback 12. To develop attitude for speaking in English 13. Do not ignore to carry out any assignments or commitments 14. To be clean and decent in all levels.	15. To be sincere for class preparation 16. Do not forget to switch-off the cell phone in class 17. Do not forget to carry course pack and learning stuffs in class 18. To maintain loyalty and trust to the university 19. Must avoid unfair means and plagiarism in exam, reports and assignments 20. Must maintain eco-friendly environment in the campus.
1. To be punctual and attentive in class 2. To maintain inclusive learning environment 3. To ensure mutual respect 4. To be cooperative in group learning. 5. To be innovative and Creative 6. To follow dress code and wearing ID card 7. To be always proactive	8. Try to follow and review day to day class 9. To avoid conspiracy 10. To prioritize honesty & faith 11. To be motivated for asking question and encourage feedback 12. To develop attitude for speaking in English 13. Do not ignore to carry out any assignments or commitments 14. To be clean and decent in all levels.	15. To be sincere for class preparation 16. Do not forget to switch-off the cell phone in class 17. Do not forget to carry course pack and learning stuffs in class 18. To maintain loyalty and trust to the university 19. Must avoid unfair means and plagiarism in exam, reports and assignments 20. Must maintain eco-friendly environment in the campus.				

**Prepared by:**

**Checked by:**

**Approved by:**