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| Jjjj | **COURSE OUTLINE**  nn | |
| 1 | School | Faculty of Science and Engineering (FSE) |
| 2 | Department | Computer Science and Engineering |
| 3 | Programme | B.Sc in Computer Science and Engineering |
| **4** | **Name of Course** | Database System, Database |
| **5** | **Course Code** | CSE 209 |
| **6** | **Trimester** | Spring, 2022 |
| **7** | **Pre-requisites** | CSE 105 |
| **8** | **Status** | System Courses |
| **9** | **Credit Hours** | 3 |
| **10** | **Section** | PC-202D+203D |
| **11** | **Class Hours** |  |
| **12** | **Class Location** | Online |
| **13** | **Course Website** |  |
| **14** | **Instructor** | Farhana Akter Sunny |
| **15** | **Contact** | farhana@cse.green.edu.bd |
| **16** | **Office** | Online |
| **17** | **Counselling Hours** | |  |  | | --- | --- | | **Day** | **Counseling Hours** | | Tuesday | 03:00 PM-04:30 PM | | Thursday | 5:00 PM-6:00 PM | |
| **18** | **Text Book** | 1. Silberschatz, A., Korth, H. F., & Sudarshan, S. (1997). *Database system concepts* (Vol. 4). New York: McGraw-Hill. |
| **19** | **Reference** | 1. Elmasri, R. (2008). *Fundamentals of database systems*. Pearson Education India. 2. Garcia-Molina, H. (2008). *Database systems: the complete book*. Pearson Education India. 3. Video Tutorials on Database Management System 4. https://www.tutorialspoint.com/dbms/ 5. https://beginnersbook.com/2015/04/dbms-tutorial/ 6. https://www.studytonight.com/dbms/ 7. http://www.learndb.com/databases/how-to-convert-er-diagram-to-relational-database |
| **20** | **Equipment & Aids** | Bring your own materials *(calculator, pen, paper, etc.)* to participate effectively in classroom activities. **You are not allowed to borrow from others inside the classroom during class activities.**  ***Besides class note, please keep at least one blank A4 size paper per class with you.*** |
| **21** | **Course Rationale** | Database management has evolved from a specialized computer application to a central component of a modern computing environment, and, as a result, knowledge about database systems has become an essential part of an education in computer science. The fundamental concepts and algorithms covered in the book are often based on those used in existing commercial or experimental database systems. The aim of this course aim to present these concepts and algorithms in a general setting that is not tied to one particular database system. We have also taken into account trends in the teaching of database concepts and made adaptations to facilitate these trends where appropriate. |
| **22** | **Course Description** | Concepts of database systems, Different Types of Databases, Application, Models; Database Architecture-Client-server architecture, parallel architecture, Distributed databases; Relational Databases, E-R design, Strong Entity set and Weak entity set, Specialization, Generalizations; Integrity constraint, DDL, DML, DTL, Introduction to SQL, Syntax, Aggregation function, relational operators, logical operators, string operations, Join functions; Query Processing, Hashing and Indexing, Query Optimization; Database Optimization- Normalization, 1NF, 2NF, 3NF, BCNF; Database transactions-Transaction model, ACID, Serializability, Transaction as SQL statements, database concurrency control-lock based protocol, Dead lock handling, Multiple Granularity; Database Triggers- Row level triggers based on update, insert, delete; basic of datamining and data warehousing. |
| **23** | **Course Outcomes (CO)** | After completing this course students will be able to-  **CO1:** Explain the basic knowledge of database management system and querying issues.  **CO2:** Apply knowledge of relational algebra for cost estimation and complex query solving techniques.  **CO3:** Describe the solutions of data storage using the database design process. |
| **24** | **Teaching Methods** | Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Some class notes will be uploaded on the web. White board will be used for most of the time. For some cases, multimedia projector will be used for the convenience of the students. Students must participate in classroom discussions for case studies, problems solving and project developments. |
| **25** | **Topic Outline**  All topics and problems are from the main text if not specified otherwise. | |
|  | |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Lecture** | **Selected Topics** | **Article**  **(Text-1)** | **Suggested Problems.**  **(Text-1)** | **Outcome** | |  | | | | | | (1) | Introduction to Database-System Applications | 1.1 | 1.1, 1.3, 1.5, 1.8, 1.13 | CO1 | | Purpose of Database Systems | 1.2 | | Database Languages | 1.4 | | Relational Databases | 1.5 | |  | | | | | | (2) | Structure of Relational Databases | 2.1 | 2.1, 2.2, 2.7, 2.8, 2.12, 2.13, 7.14 | CO1 | | Database Schema | 2.2 | | Keys | 2.3 | | Relational Query Languages | 2.5 | |  | | | | | | (3) | Overview of the SQL Query Language | 3.1 | 3.1, 3.3, 3.4 | CO1, CO3 | | SQL Data Definition | 3.2 | | Basic Structure of SQL Queries | 3.3 | | Additional Basic Operations | 3.4 | |  | | | | | | (4) | Set Operations | 3.5 | 3.8, 3.9, 3.11, 3.12 | CO1, CO3 | | Aggregate Functions | 3.6 | | Nested Subqueries | 3.7 | | Modification of the Database | 3.8 | |  | | | | | | (5-6) | Join Expressions | 4.1 | 4.6, 5.4,5.6 | CO1, CO3 | | PL/SQL | 5.2 | | Functions and Procedures | 5.2 | | Triggers | 5.3 | |  | | | | | | (7-9) | The Relational Algebra | 6.1 | 6.5, 6.6, 6.16, 2.6 | CO1,CO3 | | The Tuple Relational Calculus | 6.2 | | The Domain Relational Calculus | 6.3 | |  | | | | | | (10-11) | Overview of the Design Process | 7.1 | 7.1, 7.3, 7.7, 7.12, 7.13, 7.18, 7.19, 7.22 | CO3, CO3 | | The Entity-Relationship Model | 7.2 | | Constraints | 7.3 | | Removing Redundant Attributes in Entity Sets | 7.4 | | Entity-Relationship Diagrams | 7.5 | | Entity-Relationship Design Issues | 7.6 | | Translation of ER Diagram to Relational Schema | Reference-6 | |  | | | | | | (12-13) | Features of Good Relational Designs | 11.1 | 11.3, 11.4, 11.6 | CO2, CO3 | | Ordered Indices | 11.2 | | B+-Tree Index Files | 11.3 | | Static Hashing | 11.6 | | Dynamic Hashing | 11.7 | | Comparison of Ordered Indexing and Hashing | 11.8 | |  | | | | | | (14-15) | Measures of Query Cost | 12.2 | 12.3, 12.10, 13.4, 13.5 | CO2, CO3 | | Selection Operation | 12.3 | | Join Operation | 12.5 | | Estimating Statistics of Expression Results | 13.3 | |  | | | | | | (16) | Transaction Concept | 14.1 | 14.3, 14.4, 14.8 | CO1, CO2 | | A Simple Transaction Model | 14.2 | | Storage Structure | 14.3 | |  | | | | | | (17) | Transaction Atomicity and Durability | 14.4 | 14.12, 14.15, 14.20 | CO1, CO2 | | Transaction Isolation | 14.5 | | Serializability | 14.5 | |  | | | | | | (18-19) | Lock-Based Protocols | 15.1 | 15.20 | CO1, CO2 | | Deadlock Handling | 15.2 | | Timestamp-Based Protocols | 15.4 | |  | | | | | | (20-21) | Centralized and Client–Server Architectures | 17.1 |  | CO1 | | Server System Architectures | 17.2 | | Parallel Systems | 17.3 | | Distributed Systems | 17.4 | |  | | | | | | (22-24) | Decision-Support Systems | 20.1 |  | CO1 | | Data Warehousing | 20.2 | | Data Mining | 20.3 | |  | | | | | | |
| **26** | **Assessment and Marks Distribution:** | Students will be assessed on the basis of their overall performance in all the exams, quizzes, and class participation. Final numeric reward will be the compilation of (tentative):   * Class Tests (15%) * Group Assignment (5%) * Individual Presentation (5%) * Class Attendance (5%) * Mid-Term Test (30%) * Final Exam (40%) |
| **27** | **Assessment Methods of COs** | Assessment methods of COs are given below:   |  |  |  |  | | --- | --- | --- | --- | |  | **Course Outcomes** | | | | **Assessment Methods** | **CO1** | **CO2** | **CO3** | | Class Test | 5% | 5% | 5% | | Group Assignment, Individual Presentation, Attendance |  | 5% | 10% | | Mid-Term Exam | 10% | 20% |  | | Final Exam | 15% | 15% | 10% | | **Total (100%)** | **30%** | **45%** | **25%** | |
| **28** | **Mapping of COs with POs** | Mapping of COs with program outcomes (POs) are given below:   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Program Outcomes (POs)** | | | | | | | | | | | | | | **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | | **CO1** | **√** |  |  |  |  |  |  |  |  |  |  |  | | **CO2** |  | **√** |  |  |  |  |  |  |  |  |  |  | | **CO3** |  |  |  |  |  | **√** |  |  |  |  |  |  | |
| **29** | **Grading Policy** | The following chart will be followed for grading. This has been customized from the guideline provided by the School of Engineering and Computer Science.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **A+** | **A** | **A-** | **B+** | **B** | **B-** | **C+** | **C** | **D** | **F** | | **80 and above** | **75-<80** | **70-<75** | **65-<70** | **60-<65** | **55-<60** | **50-<55** | **45-<50** | **40-<45** | **<40** | |
| **29** | **Additional Course Policies** | |  |  | | --- | --- | | Assignments | There will be four assignments. Average marks of the assignments will be counted. No late homework will be accepted.  ***Any kind of copy in assignment will carry zero mark.***  Two or more copied assignments will carry zero mark in all assignments. Zero tolerance will be shown in this regard. Solutions to assignment problems will be provided through web and on hand. | | Class Test | There will be at least three CTs, best of two will be counted. A CT can be taken with an announcement in prior or without any announcement. | | Exams | Mid-term and final exam will be closed book, closed notes. Mobile is strictly prohibited in exam hall. Please bring your own watch and synchronize time during exam hours. | | Test Policy: | If you are absent from a test, and you have not spoken to the teacher personally beforehand, your grade for the test will be zero. No make-up for class test will be taken because it has alternative (three out of four). No make-up for mid will be entertained without presence and recommendation of guardian and written permission of the department. Make-up test of mid will be much harder than the regular test. | |
| **30** | **Additional Information** | 1. Academic Calendar Summer 2021: http://www.green.edu.bd/academics/academic-calendar. 2. Academic Information and Policies: http://www.green.edu.bd/academics/academic-rules-a-regulations. 3. Grading and Performance Evaluation: http://www.green.edu.bd/academics/academic-rules-a-regulations. 4. Proctorial Rules: http://www.green.edu.bd/administrator/proctors-office. |