Computer Science Department cs.salemstate.edu

CSC 263 Database Systems **4 cr.**

Instructor: TBA **Office:** location **Phone:** (978) 542-extension
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Section	Time	Room	Final Exam
nn	days and times	location	date and time

Catalog description:

This course is an in-depth study of the underlying principles of database systems. Topics include data modeling and reduction, physical representations of data and access paths, and the semantics and theory of several major approaches to database organization, including relational and object relational. Extensive discussion of query generation and optimization is included for at least one database system. Four lecture hours per week, plus programming work outside of class.

Prerequisite: **CSC 115. Not open to students who have received credit for ITE 320.**

Goals:

The purpose of the course is to develop students understanding of the theory and application of modern database management systems. The goals of this course are:

CG01: to develop an understanding of data and database modeling methodologies and techniques
CG02: to develop the skills necessary to interact with a modern DBMS in a software development environment

Objectives:

Upon successful completion of the course, student will be able to:

CO01: explain and justify the benefits and costs associated with modern, robust DBMS's;
CO02: properly utilize database modeling methodologies and techniques;
CO03: utilize standard SQL;
CO04: use a modern database system to implement and test a database design.

In addition, students will have:

CO05: practiced database design and implementation;
CO06: gained significant experience with query generation and analysis;
CO07: participated in at least one group project involving: problem analysis; solution modeling, design and selection; and implementation, testing and evaluation of a database.

Student Outcome (SO) vs. Course Objectives matrix

Student Outcome	CO01	CO02	CO03	CO04	CO05	CO06	CO07
SO-1	✓	✓	✓	✓	✓	✓	✓
SO-2	✓	✓	✓	✓	✓	✓	✓
SO-3	✓	✓			✓		✓
SO-4	✓				✓		✓
SO-5							✓

SO-6	✓	✓	✓	✓	✓	✓	✓

Notes:

SO-1: Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

SO-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.

SO-3: Communicate effectively in a variety of professional contexts.

SO-4: Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

SO-5: Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline. Apply computer science theory and software development fundamentals to produce computing-based solutions.

SO-6: Apply computer science theory and software development fundamentals to produce computing-based solutions.

Topics:

- Basic concepts of information systems **IM1(2), SP2(.5), SP4(1), SP6(.5)**
- Overview of database management **IM2(2), SP5(.5), SP7(2) SP9(.5) (not core)**
- Database system architecture **IM2(1)**
- Data modeling **IM3(3)**
- Overview of the relational model **IM3(1)**
- Integrity rules **IM4(3) (not core)**
- Relational database design **IM6(3) (not core)**
  Normalization rules
- Description of a sample relational system
- Schema (data) definition **IM5(1) (not core)**
- Queries and data manipulation **IM5(2) (not core)**
- Subschema (view) definition and manipulation **IM5(1) (not core)**
- Query (data manipulation) optimization **IM5(2) (not core)**
- Embedded queries **IM5(1) (not core)**
- Distributed database concepts **IM8(1) (not core)**
- Recovery and concurrency concepts **IM7(2) (not core)**
- Security and integrity **IM7(1) (not core)**
- Transaction processing **IM7(3) (not core)**
- Overview of the object and object-relational models **IM3(1)**
- Physical database design and implementation **OS8(1), IM9(3) (not core)**
- Overview of the network model
- Current research developments

The emphasis of this course is on the thorough understanding of the precepts and underlying mechanisms of database systems. These systems are investigated from two points of view: the internal (design) view, where such topics as physical storage and underlying retrieval algorithms are considered, and the external (user) view, where such topics as query simplicity and ease of use are discussed. Extensive homework and classroom discussion of query design and implementation serve to acquaint the student with typical applications considerations.

Projects:

Three categories of projects will be assigned:

- **Design exercises,** wherein a set of user requirements is provided, and a database is designed and created
- **Query exercises**, wherein data retrieval and manipulation specifications are provided, and appropriate SQL queries are designed, coded and verified
- **Programming exercises,** wherein an application in the Computer Science Department s introductory language is designed and implemented in order to provide programmatic access to a database and its data.

All programs must conform to departmental guidelines for algorithm design and implementation. Reports must conform to the written guidelines supplied by the instructor. Regardless of numeric average or individual grades on assignments or

examinations, a student will not be eligible for a passing grade in the course unless he or she has submitted a report for every programming assignment, within the timeframe specified by the instructor.

Written homework:

Periodic assignments from the textbook and/or specified by the instructor will be designed to reinforce vocabulary, design concepts, and the ability to explain design choices.

Exams and quizzes:

There will be a midterm examination and a comprehensive written two-hour final examination.

Final grades will be determined on the basis of the following approximate weights: examinations - 45%; programming assignments, homework - 55%.

Course Objective / Assessment Mechanism matrix

	Test / Quiz Questions	Homework Problems	Programming Projects	Group Projects
CO01	✓	✓		
CO02	✓	✓	✓	✓
CO03	✓	✓	✓	✓
CO04	✓	✓	✓	✓
CO05	✓	✓	✓	✓
CO06	✓	✓	✓	✓
CO07		✓		✓

Bibliography:

General texts:

- **Database Systems: Design, Implementation, & Management.** Carlos Coronel, Steven Morris**. 13th Edition. Cengage. 2019**
- **Database System Concepts.** Silberschatz, Korth and Sudarshan**. Seventh Edition.**McGrow-Hill,**2020**
- **Fundamentals of Database Systems.** Ramez Elmasri and Shamkant B. Navathe. **Seventh Edition**.Pearson **2017.**
- **Database Systems: The Complete Book.**Garcia-Molina, Hector; Ullman, Jeffrey; Widom, Jennifer. **Second Edition.** Prentice-Hall, **2009**.
- **A First Course in Database Systems**. Ullman,Jeffrey; Widom, Jennifer**. Third Edition.** Prentice-Hall, **2008**.
- **An Introduction to Database Systems. Eighth Edition.** Date, C. J. Addison-Wesley, 2003.
- **Database System Implementation.** Garcia-Molina, Hector; Ullman, Jeffrey; Widom, Jennifer. Prentice-Hall, **2000**.

Technical Support Resources:

- **Solving Business Problems using sql: a definitive guide for beginners who want to be proficient in database design and writing sql.** Hafizur Rahman. **2019**
- **Visual QuickStart Guide SQL**. **Third Edition**. Fehily, Chris. Peachpit Press, **2008**.
- **Oracle11g: The Complete Reference**. Loney, Kevin. McGraw-Hill Osborne Media, **2008**.

Academic Integrity Statement:

"Salem State University assumes that all students come to the University with serious educational intent and expects them to be mature, responsible individuals who will exhibit high standards of honesty and personal conduct in their academic

life. All forms of academic dishonesty are considered to be serious offences against the University community. The University will apply sanctions when student conduct interferes with the University primary responsibility of ensuring its educational objectives." Consult the University catalog for further details on Academic Integrity Regulations and, in particular, the University definition of academic dishonesty.

The Academic Integrity Policy and Regulations can be found in the University Catalog and on the University website (http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the University's Policy* and will be dealt with according to the University's formal Procedures. *Copying without attribution is considered cheating in an academic environment - simply put,* ***do not do it!***

University-Declared Critical Emergency Statement:

In the event of a university-declared emergency, Salem State University reserves the right to alter this course plan. Students should refer to www.salemstate.edu for further information and updates. The course attendance policy stays in effect until there is a university-declared critical emergency.

In the event of an emergency, please refer to the alternative educational plans for this course, which will be distributed via standing class communication protocols. Students should review the plans and act accordingly. Any required material that may be necessary will have been previously distributed to students electronically or will be made available as needed via email and/or Internet access.

Equal Access Statement:

"Salem State University is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. **Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately.** Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with the Office for Students with Disabilities and obtain appropriate services."

Note: This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via email.