INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE DESCRIPTOR

Course Title	**FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS**				
Course Code	ACS553				
Programme	B.Tech				
Semester	VII	EEE | ME			
Course Type	Elective				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Ms. K Radhika, Assistant Professor				
Course Faculty	Ms. P Navya, Assistant Professor				

I. COURSE OVERVIEW:

This course introduces the core principles and techniques required in the design and implementation of database systems. This introductory application-oriented course covers the relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS002	II	Data Structures	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Database Management Systems	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✔	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE modules and each module carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory			Total Marks
Type of Assessment	CIE Exam	Quiz	AAT	
CIA Marks	20	05	05	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz - Online Examination

Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

Alternative Assessment Tool (AAT)

This AAT enables faculty to design own assessment patterns during the CIA. The AAT converts the classroom into an effective learning centre. The AAT may include tutorial hours/classes, seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), five minutes video, MOOCs etc.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignment /Quiz
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 3	**Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Mini Project
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern	3	Seminar

Program Outcomes (POs)		Strength	Proficiency assessed by
	engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.		

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	2	Seminar
PSO 2	**Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	2	Assignment / Quiz
PSO 3	**Successful Career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	3	Mini Project

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES :

The course should enable the students to:	
I	Understand the role of database management system in an organization and learn the database concepts.
II	Design databases using data modelling and data normalization techniques.
III	Construct database queries using relational algebra and calculus.
IV	Understand the concept of a database transaction and related database facilities.
V	Learn how to evaluate set of queries in query processing.

IX. COURSE OUTCOMES (COs):--

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	To understand the features of database management systems and Relational database.	CLO 1	Define the terminology, features, and characteristics of database system
		CLO 2	Differentiate database systems from file systems
		CLO 3	Describe Data Models, Schemas, Instances, Three Schema Architecture and DBMS Component Modules
		CLO 4	Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram.
		CLO 5	Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.
CO 2	Design databases using data modelling	CLO 6	Describe basics of the relational data model.
		CLO 7	Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.
		CLO 8	Formulate solutions to a broad range of query problems using relational algebra.
		CLO 9	Apply relational calculus to solve broad range of query problems.
CO 3	To use SQL- the standard language of relational databases.	CLO 10	Demonstrate SQL queries with correlated subqueries
		CLO 11	Illustrate the Functional Dependencies , Inference Rules, Minimal Sets of FDs
		CLO 12	Understand normalization theory and improve the design by normalization.
CO 4	To understand the concept of Transaction and Query processing.	CLO 13	Understand the properties of transaction(ACID)
		CLO 14	Demonstrate serializability by taking various schedules
		CLO 15	Gain knowledge on transaction processing to maintain consistency and integrity of data in database systems.
		CLO 16	Describe concurrency control techniques to implement data integrity in database systems.
		CLO 17	Illustrate various backup and recovery techniques for database systems.
CO 5	Learn how to evaluate time stamp based protocols and paging	CLO 18	Illustrate various lock based protocols
		CLO 19	Analyze various time stamp based protocols
		CLO 20	Understand the concepts of update and shadow paging

X. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS553.01	CLO 1	Define the terminology, features, and characteristics of database system	PO 1	3
ACS553.02	CLO 2	Differentiate database systems from file systems	PO 1,PO 2	3
ACS553.03	CLO 3	Describe Data Models, Schemas, Instances, Three Schema Architecture and DBMS Component Modules	PO 1	3
ACS553.04	CLO 4	Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram.	PO 2, PO 3	3
ACS553.05	CLO 5	Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.	PO 2, PO 3 PO 5	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS553.06	CLO 6	Describe basics of the relational data model.	PO 1	3
ACS553.07	CLO 7	Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.	PO 2, PO 3	2
ACS553.08	CLO 8	Formulate solutions to a broad range of query problems using relational algebra.	PO 2, PO 3	3
ACS553.09	CLO 9	Apply relational calculus to solve broad range of query problems.	PO 2, PO 3	3
ACS553.10	CLO 10	Illustrate the Functional Dependencies , Inference Rules, Minimal Sets of FDs	PO 1, PO 2	2
ACS553.11	CLO 11	Understand normalization theory and improve the design by normalization.	PO 2, PO 3	2
ACS553.12	CLO 12	Understand the properties of transaction(ACID)	PO 1	2
ACS553.13	CLO 13	Demonstrate serializability by taking various schedules	PO 1	3
ACS553.14	CLO 14	Gain knowledge on transaction processing to maintain consistency and integrity of data in database systems.	PO 1, PO 2	2
ACS553.15	CLO 15	Describe concurrency control techniques to implement data integrity in database systems.	PO 1, PO 2	2
ACS553.16	CLO 16	Illustrate various backup and recovery techniques for database systems.	PO 1, PO 2	2
ACS553.17	CLO 17	Analyze transaction processing , concurrency control, Database recovery techniques	PO 1, PO 2	3
ACS553.18	CLO 18	Illustrate various lock based protocols	PO 1	3
ACS553.19	CLO 19	Analyze various time stamp based protocols	PO 1,PO 2	3
ACS553.20	CLO 20	Understand the concepts of update and shadow paging	PO 1, PO 2	3

3= High; 2 = Medium; 1 = Low

XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

Course Outcomes (COs)	Program Outcomes (POs)				Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 5	PSO1	PSO2	PSO3
CO 1	3						
CO 2		2		2			
CO 3		3				3	
CO 4	3	2					
CO 5		2				2	

XII. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2		3													
CLO 3	3												2		
CLO 4	3		3												
CLO 5			2		3									2	1
CLO 6	3														
CLO 7			2											2	
CLO 8			3											2	
CLO 9			3											3	
CLO 10		2													
CLO 11			2											2	
CLO 12	2														
CLO 13	3														
CLO 14		2											2		
CLO 15		2												2	
CLO 16		2												2	
CLO 17		3													
CLO 18	3												2		
CLO 19		3											2		
CLO 20		3													

3 = High; 2 = Medium; 1 = Low

XIII. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1, PO2, PO3,PO5, PSO1	SEE Exams	PO1, PO2, PO3,PO5, PSO1	Assignments	PO1, PO2, PO3, PSO1	Seminars	PO1, PO2, PO3,PO5, PSO1
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO1, PO2, PO3,PO5, PSO1						

XIV. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XV. SYLLABUS

UNIT-I	CONCEPTUAL MODELING
Introduction to file and database systems: Database system structure, data models, introduction to network and hierarchical models, ER model, relational model.	
UNIT -II	**RELATIONAL APPROACH**
Relational algebra and calculus: Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus, tuple relational calculus	
UNIT -III	**BASIC SQL QUERY AND NORMALIZATION**
SQL data definition; Queries in SQL: updates, views, integrity and security, relational database design. Normal Forms: 1NF, 2NF, 3NF and BCNF.	
UNIT -IV	**TRANSACTION MANAGEMENT**
Transaction processing: Introduction, need for concurrency control, desirable properties of transaction, schedule and recoverability, serializability and schedules	
UNIT -V	**CONCURRENCY CONTROL**
Concurrency control; Types of locks: Two phases locking, deadlock, timestamp based concurrency control, recovery techniques, concepts, immediate update, deferred update, shadow paging.	
Text Books:	
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw- Hill, 4th Edition, 2002.	
Reference Books:	
1. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 3rd Edition, 2003. 2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2003. 3. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States, 1st Edition, 2000. 4. Peter Rob, Corlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003.	

XV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-3	Introduction, Data base System Applications, Purpose of data base Systems, View of Data – Data Abstraction, Instances and Schemas Data Models,, Database Languages, Data base access for applications Programs	CLO 1	T2: 1.1- 1.5
4-6	Transaction Management component of DB architecture, Data base users, History of database systems, Database design, ER Diagrams.	CLO 2	T2: 1. 6-1.8,1.10, T1: 2.1

7-9	Entities, Attributes and entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual design with ER model, Conceptual design for large enterprises	CLO 3, CLO4, CLO5	T1: 2.2-2.6
10-13	Relational Model: Introduction to the Relational Model – Integrity Constraint Over relations, Enforcing Integrity constraints –Querying relational data	CLO 6, CLO 7, CLO 8	T1: 3.1-3.7
14-16	Relational Algebra and Calculus: Relational Algebra – Selection and projection –set operations – renaming, Joins – Division	CLO 8, CLO 9	T1: 4.1,4.2.2
17-19	Relational calculus – Tuple relational Calculus	CLO 10	T1:4.3, 4.4
20-24	Form of Basic SQL Query – Examples of Basic SQL Queries Comparison Operators – Aggregative Operators, NULL values , Logical connectivity's – AND, OR and NOT, Integrity Constraints in SQL	CLO 14, CLO 15	T1: 5.2-5.5
25-27	Introduction to Nested Queries – Correlated Nested Queries Set Comparison Operators – Aggregative Operators, Triggers and Active Data bases	CLO 16, CLO 17	T1: 5.6- 5.8
28-30	Introduction to Schema refinement – Problems Caused by redundancy ,Decompositions – Problem related to decomposition	CLO 11	T1: 19.1,19.1.3
31-33	Functional dependencies, reasoning about FDS ,Lossless join Decomposition , Dependency preserving decomposition	CLO 12	T2: 19.4-19.8
34-37	Schema refinement in Data base Design, Normal Forms, MVDs, JDs	CLO 13, CLO 14	T2: 19.8-19..9
38-41	Transaction Management: Transaction Concept-Transaction State- Implementation of atomicity and Durability, Concurrent Executions, Serializability , Recoverability, Implementation of Isolation, Testing for Serializability.	CLO 18	T2: 15.1-15.29
42-43	Concurrency control; Types of locks: Two phases locking, deadlock, timestamp based concurrency control	CLO 18	T2: 16.1,16.2 T2: 16.3,16.4
44-45	Recovery techniques, concepts, immediate update, deferred update, shadow paging.	CLO 19, CLO 20	T2: 17.1 -17.10

XVII. GAPS IN THE SYLLABUS-TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POS	RELEVANCE WITH PSOS
1	Conversion of ER model	Seminars / Guest Lecture	PO 2, PO 12	PSO 1
2	Practical Implementation of triggers and assertions using PL/SQL	Assignments/ Lab experiments	PO 3, PO 5,	PSO 2
3	Implementation of Transaction and security restriction using SQL.	Assignments/ Lab experiments	PO 2, PO 5,	PSO 2

Prepared by:
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