ರಾಯಚೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ **RAICHUR UNIVERSITY**

Under Graduate Curriculum for Degree of

Bachelor of Computer Applications
BCA
(IV Semester)
with effect from 2025-26

BoS(Computer Science) UG meeting
Approval Dated: 06-09-2025

Paper 1	Introduction to Database Management Systems	Credits: 4	Contact Hours: 60	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03hrs

Course Outcomes (COs): At the end of the course, students will be able to:

- Explain the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database
- Identify entities and relationships and draw ER diagram for a given real-worldproblem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques

UNIT 1   **12 Hrs**
Databases and Database Users: Introduction, An Example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach.
Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.

UNIT 2   **12 Hrs**
Data Modeling Using the Entity–Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues.

UNIT 3   **12 Hrs**
Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations.

UNIT 4   **12 Hrs**
Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL.
Relational Algebra: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations.

UNIT 5   **12 Hrs**
Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.
Transaction management and Concurrency control: Transaction management: ACID properties, serializabilityof schedules and concurrency control, Lock based concurrency control (2PL).

Textbook:

1. Fundamentals of Database Systems, RamezElamassri, Shankant B. Navathe, 7th Edition, Pearson,2015

References:

1. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
2. Introduction to Database System, C J Date, Pearson, 1999.
3. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
4. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition,McGraw Hill, 2002

Paper-1Lab	LAB: RDBMS Lab		Credits: 2	Contact Hours: 60	Practical 04 Hrs/week
Internal assessment: 10 marks		Term end exam: 40 marks		Exam duration: 02 hrs	

Assignments based on the subject Paper-1: **Introduction to Database Management Systems** shall be implemented in the lab.

1. Design a Database and create required tables. For e.g. Company database, Bank database, College Database.
    a. Include Constraints definitions on tables: Primary Key, Foreign key, NOT NULL.
2. Write the queries to ALTER,UPDATE and DELETE the tables
3. Write the queries to illustrate nested queries.
4. Write the queries to implement various join operations.
5. Write the query for illustrating SQL aggregate functions
6. Write the query for illustrating SQL set operations.
7. Write the query to illustrate implementation of integrity constraints-various approaches.
8. Write the query to create the views and manipulate the views (updating views, etc).
9. To illustrate triggers.
10. Write the query for creating the users and their role.

Paper 2	Fundamentals of Computer Networks	Credits: 4	Contact Hours: 60	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03hrs

Course Outcomes (COs): At the end of the course, students will be able to:

- Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI

UNIT 1:   12Hrs

Introduction: Use of Computer Networks, Network hardware-LAN, WAN, MAN and network software, The OSI reference model, The TCP/IP reference model, Example networks and network standardization.

UNIT 2:   12Hrs

The Physical Layer: Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching – message switching, Multiplexing.

UNIT 3:   12Hrs

The Data Link Layer: Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction Hamming code, Elementary data link protocols, sliding window protocols

UNIT 4:   12Hrs

The Network Layer: Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, admission control, Hop by Hop choke packets.

UNIT 5:   12Hrs

The Transport Layer and Application Layer: Elements of Transport service, Elements of Transport, protocols, Internet transport protocols (TCP & UDP), DNS, Electronic Mailing, and World Wide Web.
The Application Layer: Domain name system, electronic mail, World Wide Web. Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet

Text Book:
1. Computer Networks, Andrew S. Tanenbaum and David J Wetherall, 5 th Edition, Prentice Hall, 2011.
2. Data Communication & Networking, Behrouza A Forouzan, 4th Edition, 2007

References:
1. Larry Peterson and Bruce Davie. Computer Networks: A Systems Approach, 4th Ed. Morgan Kaufmann,
2. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
3. Data Communication and Computer Networks, Brijendra Singh, 3 rd Edition, PHI, 2012.
4. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India.

5. W. Richard Stevens. unix Network Programming: Networking APIs: Sockets and XTI; Volume 1. Prentice Hall PTR,

Paper-2 Lab	LAB: Communication Networks Lab	Credits: 2	Contact Hours: 60	Practical 04 Hrs/week
Internal assessment: 10 marks		Term end exam: 40 marks		Exam duration: 02 hrs

Assignments based on the subject Paper-2: **Fundamentals of Computer Networks** shall be implemented in the lab.

1. Study of different types of Network cables
2. Study of basic network command and Network configuration commands
3. Write a Program to implement the data link layer farming methods such as i) Characterstuffing ii) bit stuffing
4. Write a Program to implement Sliding window protocol for Goback N.
5. Write a Program to implement Sliding window protocol for Selective repeat.
6. Write a Program to implement Stop and Wait Protocol.
7. Write a program for congestion control using leaky bucket algorithm
8. Write a Program to implement Dijkstra's algorithm to compute the Shortest path througha graph
9. Write a Program to implement Distance vector routing algorithm by obtaining routing table at eachnode (Take an example subnet graph with weights indicating delaybetween nodes)
10. Do the following using NS2 Simulator
    i) NS2 Simulator-Introduction ii) Simulate to Find the Number of Packets Dropped iii) Simulate to Find the Number of Packets Dropped by TCP/UDP iv) Simulate to Find the Number of Packets Dropped due to Congestion v) Simulate to Compare Data Rate& Throughput.

Paper 3	Internet Concepts and Web Design	Credits: 4	Contact Hours: 60	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03hrs

Course Outcomes (COs): At the end of the course, students will be able to:

- Review the current topics in Web & Internet technologies
- Learn the basic working scheme of the Internet and World Wide Web
- Recognize the different Client-side Technologies and tools like, HTML, CSS, JavaScript
- Figure out the various security hazards on the Internet and need of security measures.
- Learn Java Servlets and JDBC CO4 Web Technology for Mobiles and Understand web security.

UNIT 1   12Hrs
Introduction and Web Design: Introduction to Internet,WWW and Web 2.0,Web browsers, Web protocols and Web servers, Web Design Principles and Web site structure, client-server technologies, Client side tools and technologies, Server side Scripting, URL, MIME, search engine, web server- Apache, IIS, proxy server, HTTP protocol. Introductionto HTML. HTML5 Basics tags, Formatting tags in HTML, HTML5 Page layout

and Navigation concepts, Semantic Elements in HTML, List, type of list tags, tables and form tags in HTML, multimedia basics, images, iframe, map tag, embedding audio and video clips on webpage.

UNIT 2   12 Hrs
Introduction to XML: XML Syntax, XML Tree, Elements, Attributes, Namespace, Parser, XSLT DOM, DTD, Schema. Introduction to CSS, CSS syntax, CSS selectors, CSS Background Cursor, CSS text fonts, CSS-List Tables, CSS Box Modeling, Display Positioning, Floats, CSS Gradients, Shadows, 2D and 3 Transform, Transitions, CSS Animations.

UNIT 3   12Hrs
Introduction to JavaScript: JavaScript Data type and Variables, JavaScript Operators, Conditional Statements, Looping Statements, JavaScript Functions, Number, Strings, Arrays, Objects in JavaScript, Window and Frame objects, Event Handling in JavaScript, Exception Handling, Form Object and DOM, JSON, Browser Object Model.

UNIT 4   12Hrs
Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, reading initialization parameters, Handling HTTP Request & Responses, Using Cookies and sessions, connecting to a database using JDBC.

UNIT 5   12Hrs
Web Security: Authentication Techniques, Design Flaws in Authentication, Implementation Flaws in Authentication, Securing Authentication, Path Traversal Attacks. Injecting into Interpreted Contexts, SQL Injection, NoSQL Injection, XPath Injection, LDAP Injection, XML Injection, HTTP Injection, Mail Service Injection. Types of XSS, XSS in Real World, Finding and Exploiting XSS Vulnerabilities, Preventing XSS Attacks.

Text Books:

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech
2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications
3. Java Server Pages – Hans Bergsten, SPD O'Reilly
4. Beginning HTML, XHTML, CSS, and JavaScript, John Duckett, Wiley India

References:

1. Java Script, D.Flanagan, O'Reilly, SPD
2. Beginning Web Programming-Jon Duckett, WROX.
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson `
5. Kogent Learning Solutions Inc. HTML 5 in simple steps, Dreamtech Press

Paper-3 Lab	LAB: Web Design Lab.	Credits: 2	Contact Hours: 60	Practical 04 Hrs/week
Internal assessment: 10 marks		Term end exam: 40 marks		Exam duration: 02 hrs

Assignments based on the subject Paper-3: **Internet Concepts and Web Design** shall be implemented in the lab.

Part A:

1. Create a document with two links to an external document. The first link should lead to the beginning of the external document. The second link should lead to a particular section in the external document.
2. Design a webpage showing the list of courses in your program in which the links for courses should be in the same page reflecting the objectives of the courses and syllabus.
3. Prepare a "resume.html" that might include such information as: a) distinguishing marks b) special interests c) work history d) education and training e) job objective f) relevant skills and experience.
4. Write a HTML code to design Student registrations form for your college Admission
5. Design Web Pages with includes Multi-Media data (Image, Audio, Video, GIFs etc)
6. **Design the form using HTML tags.**
7. Write code in HTML to develop a webpage having two frames that divide the webpage into two equal rows and then divide the row into equal columns fill each frame with a different background color.
8. Write CSS code to Use Inline CSS to format your ID Card.

Part B:

1. Write a JavaScript Program to perform Basic Arithmetic operations
2. Write a JavaScript Program to Check Prime Number
3. Write a JavaScript Program to Create Array and inserting Data into Array
4. Create a an HTML document containing JavaScript code that a) Has a button called check out b) when this button is clicked on , it summons two windows c) Window 1: Have a question that tells user to input value of the item d) Window 2: Have a question that requests the user to input the amount of sales tax Have a sentence that displays the cost of the item, the sales tax, and your final price.
5. Write a JavaScript Program to Validate an Email Address
6. Create a an HTML document with JavaScript code that a) Has three textboxes and a button b) The details to be accepted using textboxes are principal, rate of interest, and duration in years. c) When user clicks the Ok button a message box appears showing the simple interest of principal amount
7. Write a Program for printing System Date & Time using SERVLET
8. Write a server side SERVLET program that accepts number from HTML file and display the same.
9. Write a program to illustrate the Life-Cycle of Servlet Application.

EvaluationSchemeforLab. Term end Examination

AssessmentCriteria		Marks
Program– 1	Writingthe Program	05
	ExecutionandFormatting	05
Program– 2	Writingthe Program	05
	ExecutionandFormatting	05
VivaVoice		05
PracticalRecord book		05
	Total	**40**