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**DAVANGERE UNIVERSITY**

Syllabus for **Bachelor of Science (Computer Science)**

3<sup>rd</sup> and 4<sup>th</sup> Semester


[According to SEP (State Education Policy): 2024-25]

WEF: 2025-26 & onwards

DEPARTMENT OF STUDIES IN COMPUTER SCIENCE,  
DAVANAGERE UNIVERSITY, DAVANAGERE - 577007

  
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**Bachelor of Science(BSc[CS]) Semester Scheme curriculum structure for  
UnderGraduate(UG) Programme**

Semester	Paper Code	Title of the Paper	Subject Category	Teaching Hours/Week	Semester End Exam	Internal Assessment	Total Marks	Credits	Examination Duration
3	24-MC-III	DataBase Management Systems	MC-T	04	80	20	100	03	3Hrs
	Practical-III	SQL Lab	MC-P	04	40	10	50	02	3Hrs
	Open Elective / Optional-1	Computer Science Programming and Fundamentals	OE / OP-I	02	40	10	50	02	2Hrs
	<b>Total</b>			<b>10</b>	<b>160</b>	<b>40</b>	<b>200</b>	<b>07</b>	<b>--</b>
	24-MC-IV	Object Oriented Programming with Java	MC-T	04	80	20	100	03	3Hrs
4									
	Practical-IV	Java Programming Lab	MC-P	04	40	10	50	02	3Hrs
	Open Elective / Optional-2	Fundamentals of AI	OE / OP-II	02	40	10	50	02	2Hrs
	<b>Total</b>			<b>10</b>	<b>160</b>	<b>40</b>	<b>200</b>	<b>07</b>	<b>--</b>



<b>BSc 3<sup>rd</sup> Semester</b>		<b>DataBase Management Systems</b>	
Subject Code :	24-MC-III	Total Teaching Hours :	56
IA Marks :	20	Teaching Hours/Week :	04
Exam Marks :	80	Examination Hours :	03
Credits:	3		

### Course Learning Objectives

1. Understand the Fundamentals of Database Systems: Gain a comprehensive understanding of the purpose, applications, and architecture of database systems, including the roles of database users and administrators.
2. Master the Relational Model and SQL: Develop proficiency in the structure of relational databases, relational algebra, and the use of SQL for data definition, querying, and manipulation.
3. Apply Database Design Principles: Learn to design databases using the Entity-Relationship (E-R) model, including identifying entities, relationships, and constraints, and translating them into relational schemas.
4. Evaluate and Optimize Relational Database Designs: Explore the principles of good relational design, normalization techniques, and functional dependencies to create efficient and reliable database structures.
5. Comprehend Transaction Management: Understand the concepts of transactions, including
6. Atomicity, durability, isolation, and serializability, and their role in maintaining database integrity.

### Learning Outcomes

1. Explain Database Concepts: Students will be able to articulate the purpose, components, and historical evolution of database systems, as well as differentiate between various database languages and architectures.
2. Construct and Query Databases Using SQL: Students will demonstrate the ability to write SQL queries, define database schemas, and perform operations such as joins, set operations, and modifications while handling integrity constraints.
3. Design Effective Database Schemas: Students will create Entity-Relationship diagrams and map them to relational schemas, incorporating complex attributes, cardinalities, and primary keys effectively.
4. Normalize and Decompose Relational Designs: Students will apply normalization techniques and functional dependency theory to evaluate and refine database designs, ensuring they meet desired normal forms.
5. Analyze Transaction Properties: Students will assess transaction models and explain how atomicity, durability, and isolation contribute to reliable database operations.

### Course Chapters:

#### 1. Introduction: 14Hrs

Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators, History of Database Systems. **Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, The Relational Algebra.

#### 2. SQL: : 14Hrs

Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, Authorization.

#### 3. Database Design Using the E-R Model: 14Hrs

Functional dependency theory to evaluate forms, transaction properties: Students will understand isolation and serializability



Overview of the Design Process, The Entity-Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Extended E-R Features, Entity-Relationship Design Issues, Alternative Notations for Modeling Data.

#### 4. Relational Database Design: :

14Hrs

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition Using Functional Dependencies, Decomposition Using Multivalued Dependencies, More Normal Forms. **Transactions:** Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability.

#### Text book:

1. Database System Concepts, 7th Edition-Abraham Silberschatz, Henry F. Korth, S. Sudarshan
2. "Database Management Systems", A Practical Approach (DBMS) by Rajiv Chopra.
3. Oracle Database SQL Language Quick Reference - Oracle

#### References:

1. Navathe and Elmarri "fundamentals of database Systems"-Addison Wesley-200.
2. C.j. Date "introduction to Database systems" Addison-wesley.
3. Ullman "Principals of Data base systems" computer science press".
4. Bipin C Desai "Introduction to Data base system" Galotia.





BSc 3 <sup>rd</sup> Semester		SQL Lab	
Subject Code :	Practical-III	Total Teaching Hours :	56
IA Marks:	10	Teaching Hours/Week :	04
Exam Marks:	40	Examination Hours :	03
Credits:	2		

Consider the following database :

1. employee(emp\_id, first\_name, last\_name, job\_id, doj, salary, dept\_id, manager\_id)
2. departments (dept\_id, dept\_name, manager\_id)
3. customer (cust\_id, first\_name, last\_name, address, city, phone, email)
4. salgrade (grade, highsal, lowsal)

Insert values into tables depending on the requirements for the queries. Each of these Following Subtopics should have at least 4 Queries Each.

1. Working with Table and data using another table.
2. Modifying table structure and updating data.
3. Queries adding deleting and verifying Keys.
4. Using Where Clause(Comparison, between and set comparison).
5. Using Where Clause(Matching Characters and NULL values).
6. Using Where Clause (Using Logical operators to join more than one conditions).
7. Formatting the output Result by putting Column aliases, using expressions and ordering the Data.
8. Using SubQueries in where Clause. (Set Membership, Set comparison, Test for Empty Relations)
9. Sub Queries in From Clause.
10. Aggregate Functions.
11. Joining Tables using SQL Joins (Inner Join, Outer Joins).
12. Set Operators.
13. Creating and working with views.
14. Using Group By & having clause and Order by clause.
15. Using Inner queries / Sub queries

#### Examination:

- Implementation may be done in any Database software Like Oracle, MySQL depending on the availability.
- No Graphical Query design is allowed in the examination, all queries must be through commands only.
- Any Two questions may be given to student for examination, Required tables has to be created by the student during examination, At least 5 rows or as required for generating output of the queries.

#### Examination:

- Two Questions has to be given from the above list
- Student has to write and execute both of the programs

#### Marks Distribution:

Practical Proper	Writing & Execution of both of the Programs	30(Each 15 marks)
	Total	30 marks
	Viva	10 marks
	Total	40 marks



BSc 3 <sup>rd</sup> Semester		Computer Science Programming and Fundamentals(OE)	
Subject Code:	OE/OP -01	Total Teaching Hours:	32
IA Marks:	10	Teaching Hours/Week:	02 Hrs
Exam Marks:	40	Examination Hours:	02
Credits:	2		

### Course Learning Objectives (CLOs):

1. To introduce students to the fundamentals of computer systems, including their evolution, architecture, hardware, software, memory organization, and number systems.
2. To develop problem-solving skills using algorithms and flowcharts, and introduce the structured programming approach in C.
3. To introduce C programming concepts, including data types, control structures, functions, arrays, pointers, and strings.

### Course Outcomes (COs):

1. Explain the fundamental concepts of computers – including their history, generations, structure, memory, input/output devices, and number systems.
2. Develop basic problem-solving techniques using algorithms, flowcharts, and pseudo code.
3. Demonstrate proficiency in C programming, implementing fundamental concepts like data types, operators, control structures, and loops.

### Unit 1: Introduction to Computer Systems

14Hrs

Evolution of Computers: History of Computers, Abacus, Pascaline, Analytical Engine, ENIAC, and EDVAC. Computer Generation: First Generation: Vacuum Tubes, Second Generation: Transistors, Third Generation: Integrated Circuits, Fourth Generation: Microprocessors, Fifth Generation (Present & Beyond): AI & Quantum Computing. Basic Structure of a Computer: Block Diagram of a Computer, Functions of CPU, ALU, and Control Unit, Hardware vs. Software: Types of Hardware (Input, Output, Storage, Processing), Software Classification (System, Application, Utility, Firmware), Input & Output Devices: Keyboard, Mouse, Scanner, Joystick, MICR, OCR, Monitor (CRT, LCD, LED, OLED), Printers (Impact, Non-Impact), Memory Units: Primary Memory (RAM, ROM, Cache, Registers), Secondary Memory (HDD, SSD, CD/DVD, USB), Virtual Memory & Cache Memory, Number Systems & Conversions: Binary, Decimal, Octal, Hexadecimal, Conversion between Number Systems.

### Unit 2: Introduction to C Programming Basics

14 Hours

Basics of Problem Solving: Algorithm vs. Flowchart, Characteristics of a Good Algorithm, Algorithm Design Techniques: Pseudo Code Representation, examples of Basic Algorithms. Introduction to C Language: History of C, Features & Structure of a C Program, Data Types & Operators: Keywords, Constants, Variables, Arithmetic, Relational, Logical, Bitwise Operators, Control Structures: If-Else, Switch Case, Loops (For, While, Do-While).

### Text Book:

1. Computer Concepts and C Programming Techniques: A.M. Padmareddy.

### Reference Books:

1. P.K. Sinha & Priti Sinha – "Computer Fundamentals" (BPB Publications)
2. E. Balagurusamy – "Programming in ANSI C" (McGraw Hill)
3. Ashok N. Kamthane – "C Programming" (Pearson)



BSc 4 <sup>th</sup> Semester		Object Oriented Programming with Java	
Subject Code :	24MC-IV	Total Teaching Hours :	56
IA Marks:	20	Teaching Hours/Week :	04
Exam Marks:	80	Examination Hours :	03
Credits:	3		

**Course Learning Objectives:** Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and understand the principles of inheritance, packages and interfaces, exception handling mechanisms and applets and Graphical User Interface.

**Course Outcomes:** On successful completion of the course, the students will be able to

- Implement Object Oriented programming concept using basic syntaxes of control structures, strings and function for developing skills of logic building activity.
- Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
- Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
- Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

<b>Syllabus structure for Each Core Course (Paper)</b>	<b>56 Hours</b>
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<b>Unit-I</b>	<b>14 Hrs.</b>
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**Basic concepts of OOP's,** Object-oriented paradigm, Basic concepts of object-oriented programming, Benefits of OOP, Application of OOP, JVM.

**Java Fundamentals** Features of Java, Java Features, overview of java language, Constants, Variables, Data types, operators and Expressions, Decision making and Branching, Decision making and looping, Arrays-types of arrays,

<b>Unit-II</b>	<b>14 Hrs.</b>
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**Objects and Classes** Defining a class, Adding Variables, Adding Methods, creating objects, Accessing Class members, Constructors, finalize() method, Method Overloading, Overriding Methods, Final Variables and methods, Final Classes, Abstract classes and methods, Visibility control, Strings, and Vectors, Abstract classes, Static classes, Wrapper classes, This, Super,

<b>Unit-III</b>	<b>14 Hrs.</b>
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**Inheritance, Exception handling and Multi-threaded Programming:**

Defining inheritance, types of inheritance, extending a Class, Multiple inheritance, interfaces, packages: Java API Packages, Creating Packages, accessing a package, using a package.

**Exception handling:** Exception as objects, Exception hierarchy Try, catch, finally, Throw.

**Multi-threading:** Thread Life cycle, multi-threading advantages and issues, Simple thread program, Thread synchronization.

<b>Unit-IV</b>	<b>14 Hrs.</b>
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**Java Server Pages:** JSP: Introduction, Architecture of JSP, Life Cycle of JSP, Scripting elements (Scriptlets, JSP Declarations, JSP Expression), Directive Elements (page, include, taglib), JSP Actions (include, setproperty, getproperty, forward, text), Implicit objects (request,



response, out, page, Exception), including HTML in JSP. Introduction to JDBC.

**Text Books:**

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies

**Reference:**

1. The complete reference JAVA, Herbert Scheldt, TMH
2. Herbert Schildt, The Complete Reference Java2.0, Fifth edition, TATA McGraw-Hill Company.
3. Debasish Jana, Java and Object-Oriented programming Paradigm, PHI.
4. Jana, Java and Object Oriented Programming Paradigm, PHI (2007).





BSc 4 <sup>th</sup> Semester		Java Programming Lab	
Subject Code:	Practical-IV	Total Teaching Hours: 39	
IA Marks:	10	Teaching Hours/Week:	04
Exam Marks:	40	Examination Hours:	03
Credits:	2		
JAVA PROGRAMMING LAB			
PART-A			
<ol style="list-style-type: none"> <li>1. Programs Using Different Control Structures (Switch, If, While, Do, For etc.,)</li> <li>2. Programs Using Arrays.</li> <li>3. Programs Using Strings, String Buffer Classes. And Vectors.</li> <li>4. Programs using constructor and destructor</li> <li>5. Creation of classes and use of different types of functions</li> <li>6. Count the number of objects created for a class using static member function</li> <li>7. Write programs on interfaces</li> <li>8. Write programs on packages</li> <li>9. Write programs using function overloading</li> <li>10. Programs using inheritance</li> </ol>			
PART-B			
<ol style="list-style-type: none"> <li>1. Write a program using exception handling mechanism.</li> <li>2. Java Program to Handle multiple exception.</li> <li>3. Java Program to Display Dates in following Format: Tuesday, 03 Nov 2025</li> <li>4. Java program to multiply two matrices.</li> <li>5. Java program to demonstrate thread states.</li> <li>6. JSP program to print current date &amp; time.</li> <li>7. JSP Program to validate username and password.</li> <li>8. JSP Program to select record from database.</li> <li>9. JSP Program to display given number in words.</li> <li>10. Write an application that displays deadlock between threads. Program to display data from database table using JDBC.</li> </ol>			

Examination:		
<ul style="list-style-type: none"> <li>• Two Questions has to be given from the above list A and B(one each).</li> <li>• Student has to write and execute both of the programs</li> </ul>		
Marks Distribution:		
	Criteria	Marks
Practical Proper	Writing & Execution of Program one from PART-A & one from PART-B	Questions from The List 30 (Each 15 marks)
	JSP Program to validate username and password	30
	JSP Program to select record from database	10
	<b>Total</b>	<b>40</b>



BSc 4 <sup>th</sup> Semester		Fundamentals of AI(OE)	
Subject Code	EL/OP-II	Total Teaching Hours :	32
IA Marks:	10	Teaching Hours/Week :	2 Hrs
Exam Marks:	40	Examination Hours :	02
Credits:	2		

#### Course Learning Objectives:

- Define AI and explain its evolution.
- Differentiate between AI, machine learning, and deep learning.
- Apply basic ML techniques and understand advanced AI methods.
- Analyze real-world AI applications while assessing ethical challenges and future trends.

#### Course Outcomes: On successful completion of the course, the students will be able to

- Introduce foundational concepts and history of AI.
- Build core skills in machine learning and pattern recognition.
- Explore specialized AI techniques like expert systems and NLP.
- Examine practical AI applications and discuss ethical considerations.

#### Total Course Marks

50 Marks

#### Unit-I

14Hrs

Introduction to Artificial Intelligence: Definition & History of AI ,Applications of AI in Various Fields (Healthcare, Finance, education, etc.) Types of AI (Weak AI, Strong AI, General AI) Fundamental AI Techniques (Machine Learning, Knowledge Representation, Rule-Based Systems) Ethical Considerations & Challenges in AI.

#### Unit-II

14Hrs

Basics of Machine Learning & AI Models Difference Between AI, Machine Learning & Deep Learning How Machines Learn – Concept of Data & Patterns Introduction to Supervised & Unsupervised Learning Common AI Applications (Speech Recognition, Image Processing, Recommendation Systems) Hands-on Examples of AI in Daily Life.

#### Text Books:

- Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig
- Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow by Aurélien Géron
- Speech and Language Processing by Daniel Jurafsky and James H. Martin

#### Reference:

- Artificial Intelligence: A Guide for Thinking Humans by Melanie Mitchell
- Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville



**Main Examination Question Paper Pattern**  
**Third/Fourth Semester BSc Degree Examinations-2025**

**COMPUTER SCIENCE**

**Paper :< Subject>**

**Time: 3 Hours**

**Max. Marks: 80**

**SECTION-A**

**Answer all of the following questions:**

**(2×10= 20)**

1.

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.
- i.
- j.

**SECTION-B**

**Answer any Six of the following:**

**(5×6= 30)**


2. From Unit-1
3. From Unit-1
4. From Unit-2
5. From Unit-2
6. From Unit-3
7. From Unit-3
8. From Unit-4
9. From Unit-4

**PART-C**

**Answer any Three of the following:**

**(10×3= 30)**

10. From Unit-1
11. From Unit-2
12. From Unit-3
13. From Unit-4

  
By BCS Chairman  
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**Main Examination Question Paper Pattern**  
**Third/Fourth Semester BSc Degree Examinations-2025**

**COMPUTER SCIENCE**

**Paper :< Subject>**

**Time: 2 Hours**

**Max. Marks: 40**

**SECTION-A**

**Answer all of the following questions:**

**(2×5= 10)**

1.

2.

3.

4.

5.


**SECTION-B**

**Answer any Six of the following:**

**(5×6= 30)**

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4

  
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