BENGALURU NORTH UNIVERSITY
KOLAR - 563103

State Education Policy - 2024
(Semester Scheme)

Curriculum Structure for Bachelor of Science in Computer Science - B.Sc. (CS)

Syllabus for 3rd and 4th Semesters

With Effect From

Academic Year 2024 - 2025 and onwards

Curriculum Design/Syllabus Framing Committee

The following BOS members were present:

Sl.No.	Name and Address	Designation	Signature
1.	Dr. Murugan K, Associate Professor Department of Computer Science Government First Grade College K R Puram, Bengaluru-560036.	Chairperson	
2	Smt. Rashmi Rao K, Associate Professor Department of Computer Science Government First Grade College Hoskote, Bengaluru (Rural)	Member	
3	Dr. Sumanth S, Associate Professor Department of Computer Science Government College for Women Kolar – 563101	Member	
4	Dr. Rajendirakumar S, Associate Professor Department of Computer Science Government College for Women Kolar – 563101	Member	
5	Dr. Hamela K, Associate Professor Department of Computer Science Government First Grade College Malur, Kolar (Dist)	Member	
6	Mr. Manikandan S, Associate Professor Department of Computer Science Government First Grade College K. R. Puram, Bengaluru	Member	
7	Dr. K. S. Manjunatha, Professor Department of Computer Science, Maharanis Science College for Women JLB Road, Mysore.	Member (External)	

Minutes:

1. The BoS members have approved the course structure and recommended (Theory and Lab).
2. The BoS members unanimously approved the proposed course structure for the newly introduced subjects.
3. The BoS members are accepted the detailed syllabi for the 3rd & 4th Semester

Regulations, Scheme of study and Examination for Bachelor of Science Degree in Computer Science Course Under Choice Based Credit System - Semester System (SEP Scheme (with effect from 2024 -2025)

R1.a) Title of the course: **Bachelor of Science in Computer Science.**

b) Duration of the Course: Durations of the undergraduate programme shall extend SIX semesters (Three academic years) for the regular Bachelor Degree.

c) Scheme of study: **i)** There shall be six theory papers and three practical from first semester to six semester.

d) Medium of Instruction: The medium of instruction shall be English.

e) Scheme of Examination: At the end of each semester there be University Examination of three hours duration in each of the theory paper/practical.

R2. Each semester shall be of 90 working days from the date of commencement of the each Semester.

R3. Attendance: As per Bengaluru North University regulations in force for science degree courses.

R4. A Candidate is allowed to carry over all the previous uncleared (failed) theory papers/Practical to subsequent semesters as per Bengaluru North University regulations in force for science degree courses.

R5. The maximum period for completion of the course shall be as per Bengaluru North University regulations in force for science degree courses.

R6. Eligibility for admission:

a) A candidate who has passed the two years Pre-University Examination conducted by the Pre-University Education Board in Karnataka in science combination with a minimum of 35% of marks.

b) A candidate who has passed Three years Diploma in Engineering of Government of Karnataka or any other examination considered as equivalent thereto shall be eligible for admission with minimum of 35% of marks in aggregate in all the semester /years.

c) Any student who has passed PUC–II in Science combination for other than Karnataka securing with a minimum of 35% of marks.

R7. The total number of students to be admitted to the course shall be decided by the Bengaluru North University.

R8. Results: Results of candidate shall be declared and the classes awarded as per the procedure followed by the Bengaluru North University.

R9. Power to Remove Difficulties

a) If may difficulty arises in giving effect to the provisions of these regulations, the Vice-Chancellor may be order make such provisions not inconsistent with the Act, Statutes, Ordinances or other Regulations, as appears to be necessary to expedient to remove the difficulty.

b) Every order made under this shall be subject to rectification by the appropriate University Authorities.

R10. The question paper pattern for theory paper has three sections. (80 Marks)

1. Section A includes 12 questions, students has to attend 10 questions. Each carries 2 Marks (10 * 2 = 20)
2. Section B includes 8 questions (question may contain sub questions), students has to attend 6 questions. each carries 5 Marks (6 * 5 = 30)
3. Section C includes 4 questions (question may contain sub questions), students has to attend 3 questions. each carries 10 Marks (3 * 10 = 30)

R11. Internal Assessment Scheme for Theory (4 Credits).

Assessment Criteria	Marks
Two test (Each carries 5 marks)	10
Assignment	5
Seminar	5
Total	20

R12. Internal Assessment Scheme for Theory (2 Credits).

Assessment Criteria	Marks
Test	5
Assignment	5
Total	10

R13. Internal Assessment Scheme for Practical (2 Credits).

Assessment Criteria	Marks
Test	5
Record	5
Total	10

R14. Evaluation Scheme for Practical Examination (SEE).

Assessment Criteria	Marks
Write up two programs (one from Section-A and Section-B)	20
Execution and output	15
Viva Voice based on Lab Activities	5
Total	40

Course Content for Bachelor of Science in Computer Science
B.Sc (CS)

Curriculum Structure							
Program: B.Sc.					**Subject: Computer Science**		
Semester	**Course Code**	**Title of the Paper**	**Credits (L+P)**	**No. of Teaching Hours / Per Week**	**Marks**		**Total Credits**
					SEE	**IA**	
III	CS3T	Database Management Systems	4+0	4	80	20	10
	CS3P	DBMS Lab	0+2	4	40	10	
	SEC Generic	Computer Applications	2+0	2	40	10	
	SEC1- M3 (III/IV/V SEM)	Office Automation Lab	0+2	4	40	10	
IV	CS4T	Object Oriented Concepts using JAVA	4+0	4	80	20	6
	CS4P	Java Programming Lab	0+2	4	40	10	

Semester: III

CS3T1: Database Management System

Course Code: CS3T1	Course Title: Database Management System
Course Credits: 04	Teaching Hours/Week: 04
Total Contact Hours: 60	Exam Duration : 3 Hours
Internal Assessment : 20 Marks	Semester End Exam: 80 Marks

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Explain the various database concepts and the need for database systems.
CO2	Identify and define database objects, enforce integrity constraints on a database using DBMS.
CO3	Demonstrate a Data model and Schemas in RDBMS.
CO4	Identify entities and relationships and draw ER diagram for a given real-world problem.
CO5	Convert an ER diagram to a database schema and deduce it to the desired normal form.
CO6	Formulate queries in Relational Algebra, Structured Query Language, (SQL) for database manipulation.
CO7	Explain the transaction processing and concurrency control techniques

Course Content	Hours
Unit-I	15
Introduction to Databases: Database, Characteristics of database approach. Database users. Data models. Database schema. Database architecture. Data independence, interfaces, and classification of DBMS. Advantages of using DBMS. E-R Model: Entity-Relationship model: E-R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	
Unit-II	15
Relational Data Model: Relational model concepts, characteristics of relations. Relational model constraints, Domain constrains, key constraints, primary and foreign key constraints, integrity constraints and null values. SQL: Introduction to SQL, Data types, Types of database languages, DDL, DML, DCL, TCL, Aggregate functions, grouping, nested sub queries, views.	
Unit-III	15
Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations, Join Operation. Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies. Types of normal form, first, second and third normal form. Boyce-Codd normal form. PL/SQL, Introduction, Data types, Syntax of PL/SQL, Variables, Constants, Operators, If and Case statements, Looping, Exception handling, Cursors, Functions, Packages.	
Unit-IV	15
Query Processing Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering. Deadlock & Starvation.	

References:

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

CS3P1: DBMS Lab

Course Code: CS3P1	Course Title: DBMS Lab
Course Credits: 02	Teaching Hours/Week: 04
Total Contact Hours: 60	Exam Duration : 3 Hours
Internal Assessment : 10 Marks	Semester End Exam: 40 Marks

Section-A

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL

Section-B

7. Create views for a particular table
8. Implement Locks for a particular table
9. Write PL/SQL procedure for an application using exception handling.
10. Write PL/SQL procedure for an application using cursors.
11. Write a PL/SQL procedure for an application using functions
12. Write a PL/SQL procedure for an application using package

SEC Generic: Computer Applications

Course Code: SECGE	Course Title: Computer Applications
Course Credits: 02	Teaching Hours/Week: 02
Total Contact Hours: 30	Exam Duration : 1 ½ Hours
Internal Assessment : 10 Marks	Semester End Exam: 40 Marks

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Understand the fundamentals of computers.
CO2	Use of Internet applications and email.
CO3	Understand the concepts of Google Drive and Google Docs.
CO4	Understand the concepts of Google Sheets and Google Slides.

Course Content	Hours
Unit-I	10
Introduction to Computers: Definition, Characteristics of Computers, Applications, Components of Computer System. Internet and email: Features of Internet, Internet applications, client and server computers, web browsers, web servers, search engines, IP address. E-mail: Introduction, creating an email account, sending and receiving emails.	
Unit-II	10
Google Drive: About Google Drive, Uploading Files to Google Drive, Sharing and Collaborating, Google Docs: Creating Google Docs, Text Basics, Formatting Text and Adding Hyperlinks, Using Indents and Tabs, Headers, Footers, Page Breaks, Working with Tables, Inserting Images, Printing Docs.	
Unit-III	10
Google Sheets: Creating Google Sheets, Modifying Columns, Rows and Cells, Formatting Cells, Working with Multiple Sheets, Creating Simple Formulas, Working with Functions, Sorting and Filtering. Google Slides: Slide Basics, Text Basics, Adding Pictures and Shapes, Adding Transitions and Animations, Presenting Slide Show Inserting Videos, Printing and Creating PDF Files.	

References:

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication.
2. Raj Kamal, "Internet and Web Technologies", Mc GrawHill Education,2007.
3. Microsoft Office 2000, Michael Busby, Russell A. Stultz, BPB Publication.
4. Google Apps for Dummies Paperback by Ryan Teeter, Karl Barksdale.
5. https://edu.gcfglobal.org/en/topics/googleapps/
6. https://www.tutorialspoint.com/computer_fundamentals/index.htm

General Guidelines for Offering SEC Generic Course:

1. Eligibility for Teaching: The paper shall be taught by a qualified Post-Graduate teacher from the Department of Computer Science/Computer Applications. If the Computer Science faculties are not available, other faculty from the Arts/Science/Commerce can teach the paper.
2. The question paper pattern for theory paper has two sections. (40 Marks)
    - Section A includes 6 questions, students has to attend 4 questions. Each carries 5 Marks (4 * 5 = 20)
    - Section B includes 3 questions (question may contain sub questions), students has to attend 2 questions. each carries 10 Marks (2 * 10 = 20)
3. Internal Assessment Scheme for Theory (2 Credits).

Assessment Criteria	Marks
Test	5
Assignment	5
Total	10

SEC1: Office Automation Lab

Course Code: SEC1	Course Title: Office Automation Lab
Course Credits: 02	Teaching Hours/Week: 04
Total Contact Hours: 60	Exam Duration : 3 Hours
Internal Assessment : 10 Marks	Semester End Exam: 40 Marks

General Guidelines for Offering Skill Enhancement Course in BSc General Degree

1. SEC practical classes shall be conducted using the same operational framework as regular B.Sc. practical sessions with 0+0+2 credits for 0+0+4 practical hours per week requiring minimum of 60 practical Lab hours per subject per semester.

2. The guidelines issued by the Department of Collegiate Education (DCE) can be followed for making students batches for SEC practicals /for calculating corresponding workload for faculty.

- If the student strength in a single major subject is less than or equal to 15, a single faculty with 4 hours of workload can be assigned,
- If the student's strength is 15-30, two faculty can be assigned with 8 hours of practical workload per major subject in the combination.
- If the student strength exceeds 30 per major subject from all the combinations, the cohort shall be made respectively considering the laboratory capacity.

3. Student Distribution Protocol: For all the students in a batch, three major subject based SEC courses—SEC-M1, SEC-M2, and SEC-M3 are offered on a rotation basis over Semesters III, IV, and V. Here, "M1," "M2," and "M3" follow the standard B.Sc. nomenclature for a three-subject combination: M1 is the first major, M2 the second, and M3 the third. For example, in a B. Sc. PMCS program, Physics is M1, Mathematics is M2, and Computer Science is M3.

4. SEC Generic (Computer Applications) will be offered to all B.A & B.Sc, students as a separate course in Semester III.

5. The batch-wise implementation follows this protocol:

Batch of 90 Students	Paper	PMCS Combination	Semester
Batch A: 30 students (One-third of students)	SEC M1	Physics	Semester III
Batch B: 30 students (One-third of students)	SEC M2	Mathematics	Semester III
Batch C: 30 students (One-third of students)	SEC M3	Computer Science	Semester III

Rotational Schedule Implementation: SEC-M1, SEC-M2, SEC-M3 (0+0+2 credits each): Major-based courses distributed through rotational batch system

Semester	Batch A	Batch B	Batch C
III	Physics SEC	Mathematics SEC	Computer Science SEC
IV	Mathematics SEC	Computer Science SEC	Physics SEC
V	Computer Science SEC	Physics SEC	Mathematics SEC

Parallel Laboratory Provision: When student strength exceeds more than 3 batches, SEC practical classes may be conducted in parallel laboratories in the same semester. The SEC syllabus development and implementation shall follow a standardized framework coordinated by the respective Board of Studies (BOS) with the following components:

Syllabus Structure Requirements:

1. Practical Experiment List: Minimum 10-12 hands-on experiments per SEC course aligned with 0+0+2 credit structure.
2. Mini-Project Component: Individual or group projects (4-5 students maximum) that demonstrate practical skill application

Batch-wise Offering Protocol:

- Each major department develops subject-specific SEC content
- Cross-departmental coordination ensures equivalent skill development value across all three SEC courses
- Laboratory resource sharing agreements established between departments for equipment and space utilization
- Faculty exchange provisions allow subject experts to conduct SEC sessions in related disciplines when beneficial

Implementation Standards:

- All SEC courses maintain equivalent learning outcomes regardless of major subject basis
- Standardized assessment rubrics applied across all batches to ensure fairness
- Regular curriculum review conducted annually to update practical experiments and project titles based on industry relevance and technological advancement
- Academic Equity: All students receive comprehensive skill training across computer applications and major-specific practical competencies
- Administrative Efficiency: Clear batch assignments reduce scheduling complexity and faculty workload concentration
- Quality Assurance: Standardized assessment and curriculum frameworks maintain academic standards across all batches.

List of Experiments

Section - A

1. Write a leave letter to the principal by using different alignments using MS-Word.

2. Create a bio-data using different alignments and use the page border using MS-Word.

3. Create a time table of your class using MS-Word.

4. To create a college day invitation by using MS-Word.

5. To prepare students mark sheet with the fields of Name, Register_Number, Mark1, Mark2, Mark3, Total, Average, Result and Class using MS-Excel.

6. To prepare employees payroll data with the fields of Sl.No. Name, Basic_pay, HRA, DA, PF, Gross_salary and Net_salary.

   a) Calculate HRA (10 % of Basic Pay), DA (25% of Basic Pay), DA (12% of Basic Pay).
   b) Calculate Gross_salary=Basic_pay+HRA+DA.
   c) Calcualte Net_salary=Gross_salary-PF

Section – B

7. Prepare a bar chart and pie chart for analysis of five year results of your college using MS-Excel.

8. Create a line chart and bar chart using its data series using MS-Excel.

9. Create a power-point presentation with minimum 5 slides.

   a. The first slide must contain the topic of the presentation and name of the presentation.

   b. Second slide must contain at least 5 bullets, 5 numbers.

   c. The heading must be, font size:32, font-face: Arial Rounded MT Bold, font-color: blue.

   d. Last slide must contain “Thank you”.

10. Create a power-point presentation with minimum 5 slides.

   a. Use custom animation option to animate the text; the text must move left to right one line at a time.

   b. Use proper transition for the slides.

11. Create a presentation about Computer Generations. The presentation should contain 5 slides, one for each generation. Apply transaction effect and slide advances in every two seconds automatically.

12. To create an organization chart by using PowerPoint.

Note: Internal Assessment (IA) scheme and Semester End Exam (SEE) to be followed as per regular practical examination and BNU guidelines.

Semester: IV

CS4T1: Object Oriented Concepts using JAVA

Course Code: CS4T1	Course Title: Object Oriented Concepts using JAVA
Course Credits: 04	Teaching Hours/Week: 04
Total Contact Hours: 60	Exam Duration : 3 Hours
Internal Assessment : 20 Marks	Semester End Exam: 80 Marks

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Understand the features of Java and the architecture of JVM.
CO2	Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done
CO3	Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance.
CO4	To demonstrate programs based on interfaces and threads, Explain the benefits of Java Exceptional handling mechanism.
CO5	Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

Course Content	Hours
Unit-I	15
Introduction to Java:Java History, Java Features, How Java differs from C, Java and Internet, Java and World Wide Web, Web Browsers, Hardware and Software Requirements, Java Support Systems, Java Environment. Overview of Java Language: Introduction, Structure of Java program, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style. Constants, Variables, and Data Types: Introduction, Tokens, Constants, Variables, Data Types, Declaration of Variables, Giving Values to Variables, Scope of Variables, Symbolic Constants, Type Conversions, Getting Values of Variables, Standard Default Values, Operators and Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Associativity, Mathematical Functions. Decision making and branching: if and switch statements, Decision making and looping: The while, do while and for loops, Jumps in Loops Labeled Loops.	
Unit-II	15
Classes, Objects and Methods: Introduction, Defining a Class, Adding Variables, Adding Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Inheritance: Extending a Class, Types of inheritance, Overriding Methods, Final Variables and Methods, Finalizer methods, Abstract Methods and Classes, Visibility Control. Arrays, Strings and Vectors: Arrays, One-dimensional Arrays, Creating an Array, Two -Dimensional Arrays, Creating an Array, Two – dimensional Arrays, Strings, Vectors, Wrapper Classes.	
Unit-III	15
Interfaces: Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables. Packages: Putting Classes together: Introduction, Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a	

Package, Using a Package, Adding a Class to a Package, Hiding Classes. Multithreaded Programming: Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a thread, Life Cycle of a thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface. Managing Errors and Exception: Introduction, Types of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging.

Unit-IV	15
Applet Programming: Introduction, How Applets Differ from Applications, Preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, running the Applet, More About HTML Tags, Displaying Numerical Values, Getting Input from the User. Graphics programming: Introduction, The Graphics Class, Lines and rectangles, circles, and Ellipses, Drawing Arcs, Drawing Polygons, Lines Graphs, Using Control Loops in Applets, Drawing Bar Charts. Managing Input/Output Files in Java: Introduction, Concept of Streams, Stream Classes, Byte Stream Classes, Character Stream Classes, Using Streams, Other Useful I/O Classes, Using the File Class, Input / Output Exceptions, Creation of Files, Reading / Writing Characters, Reading / Writing Bytes, Handling Primitive Data Types, Concatenating and Buffering Files, Interactive Input and output, Other Stream Classes.	

References:

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall
3. Object Oriented Programming with Java : Somashekara, M.T., Guru, D.S., Manjunatha, K.S
4. Java 2 - The Complete Reference – McGraw Hill publication.
5. Java - The Complete Reference, 7th Edition, By Herbert Schildt– McGraw Hill publication.

CS4P1: Java Programming Lab

Course Code: CS4P1	Course Title: Java Programming Lab
Course Credits: 02	Teaching Hours/Week: 04
Total Contact Hours: 60	Exam Duration : 3 Hours
Internal Assessment : 10 Marks	Semester End Exam: 40 Marks

Section - A

1. Write a program to find factorial of list of number reading input as command line argument.

2. Write a program to display all prime numbers between two limits.

3. Write a program to sort list of elements in ascending and descending order and show the exception handling.

4. Write a program to implement all string operations.

5. Write a program to find area of geometrical figures using method.

6. Write a program to implement constructor overloading by passing different number of parameter of different types.

7. Write a program to create student report using applet, read the input using text boxes and display the o/p using buttons.

8. Write a program to calculate bonus for different departments using method overriding.

9. Write a program to implement thread, applets and graphics by implementing animation of ball moving.

10. Write a program to implement mouse events and keyboard events

Section - B

11. Write a java program to demonstrate the usage of switch case statement.

12. Program to print first N Fibonacci numbers.

13. Write a program to find product of two matrices.

14. Write a program to accept N string and sort in ascending order.

15. Program to demonstrate the usage of classes and objects.

16. Program to implement the concepts of multiple inheritance.

17. Write a program to demonstrate the concepts of multithreaded programming.

18. Write an applet program to find the sum of two integers using user input.

19. Write an applet program to draw human face.

20. Write an applet program to create Bar Charts.