R.P. Gogate College of Arts & Science and R.V. Jogalekar College of Commerce (Autonomous), Ratnagiri

Bachelor of Science (Computer Science) (B.Sc. CS) Programme Three Year Integrated Programme- Six Semesters

Course Structure

S.Y.B.Sc. Sem-III & IV

Under Choice Based Credit System (CBCS)

To be implemented from Academic Year 2024-25 progressively

Preamble

The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the proposed Autonomy constraints. The focus is on current industry needs in terms of skills sets demanded under the new technological environment. It also endeavors to align the programme structure and course curriculum with student aspirations and corporate expectations. The proposed curriculum is more contextual, industry friendly and suitable to cater the needs of society and nation in the present day context.

The Core Subjects offer to develop strong theoretical foundations in Computer Science to build computational thinking, analytical, and problem solving skills. A Principle of Operating Systems course provides an overview of computer operating systems, their functionalities, processes, and computing resource management. Linear Algebra course covers concepts crucial to many areas of computer science, relevant to Linear Algebra concepts like Vectors, Vector space, Matrix, Dimension, Gaussian elimination, etc. The Advanced Database Concepts course touches on the security, recovery, and transaction aspects of databases. Theory of Computation course helps to develop capabilities to design and develop formulations for computing models and identify its applications in diverse areas. Computer Networks courses include topics such as application layer protocols, Internet protocols, network interfaces, local and wide area networks, wireless networks, bridging and routing, among other current topics. The Software Engineering course embodies an engineering approach to the development of software. It discusses the nature of software and software projects, software development models, software process maturity, project planning, management, and estimations along with topics on software testing and quality assurance. The course on IoT Technologies will definitely open a future area as Embedded Engineer, involvement in IoT projects, Robotics and many more.

Skill Enhancement courses such as Java based Application Development, Web Technologies, Android Application Development and Advanced Application Development cater to present day needs of web and mobile based platforms and applications. These courses aim to produce skilled graduates with a creative mind-set who can recognize a computational problem either in the IT industry or society, and develop effective solutions.

The Open Elective courses offer the students the option to explore disciplines of interest beyond the choices they make in Core and Discipline Specific Elective papers. The course on Multimedia and Digital Marketing, Office Automation and Cyber safety prepares students to comprehend, refine, and strengthen their digital platform knowledge and enter the industry with enhanced skill and substantial competence.

We sincerely believe that the student enrolled into this programme will get a very strong foundation and exposure to basics, advanced and emerging trends of the subject.

We wholeheartedly thank all experts who shared their valuable feedback and suggestions in order to improvise the contents; we have sincerely attempted to incorporate each of them. We further thank the Chairperson and members of the Board of Studies for having faith in us.

Special thanks to the Department of Computer Science, Gogate Jogalekar College(Autonomous), Ratnagiri and all honorable members of the Board of Studies of Computer Science, who volunteered or have directly or indirectly, helped design certain specialized courses and the syllabus as a whole.

Name of Programme	**B Sc Computer Science**
Level	UG
No of Semesters	06
Year of Implementation	**2024-25**
Programme Specific Outcomes (PSO)	1. To formulate, model, design solutions, procedure and to use software tools to solve real world problems. 2. To design and develop computer programs/computer -based systems in the areas such as networking, web design, security, cloud computing, IoT, data science and other emerging technologies. 3. To familiarize with the modern-day trends in industry and research based settings and thereby innovate novel solutions to existing problems. 4. To apply concepts, principles, and theories relating to computer science to new situations. 5. To use current techniques, skills, and tools necessary for computing practice 6. To apply standard Software Engineering practices and strategies in real-time software project development 7. To pursue higher studies of specialization and to take up technical employment. 8. To work independently or collaboratively as an effective team member on a substantial software project. 9. To communicate and present their work effectively and coherently. 10. To display an ethical code of conduct in usage of Internet and Cyber systems. 11. To engage in independent and life-long learning in the background of rapid changing IT industry
Relevance of PSOs to the local, regional, national, and global developmental needs (200 words)	The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the National Education Policy(NEP) along with the proposed Autonomy constraints. The focus is on current industry needs in terms of skills sets demanded under the new technological environment. It also endeavors to align the programme structure and course curriculum with student aspirations and corporate expectations. The proposed curriculum is more contextual, industry friendly and suitable to cater the needs of society and nation in the present day context. As the world is heading towards digitalization, the syllabus is framed by concentrating on such needs. With the help of basic programming skills and designing technique, a student is able to make small workable projects which can be beneficial for local vendors. To make these projects strong, various concepts of project management, database management are involved. Various industries need IT support at local or across the country. Students having the skills of computers are able to sustain in the IT industry at various locations. Development in thought processes can lead one in a research area to contribute to an upcoming trend. Students can become

	entrepreneurs since the techniques of management and entrepreneurship are taught to them. Due to the learning of cyber safety, ethical hacking, students can become ethical hackers where students can contribute to national security. Students can make community awareness due to learning about cyber safety. Continuous growth in trends requires students updated which will help them mercurial. This will help in sustaining the IT industry and become employable.

B.Sc. Programme

Under Choice Based Credit System (CBCS)

Course Structure (Autonomous)

Department of Computer Science

No. of Courses	Semester III	Credits	No. of Courses	Semester IV	Credits
	Discipline Specific Course (DSC)			***Discipline Specific Course (DSC)***	
	Major			***Major***	
24_USCS301	Principles of Operating System.(T)	**02**	24_USCS401	Software Engineering.(T)	**02**
24_USCS302	Java based Application Development.(T)	**02**	24_USCS402	Introduction to IOT.(T)	**02**
24_USCS303	Advance Database Concepts.(T)	**02**	24_USCS403	Computer Networks.(T)	**02**
24_USCS304	Hands on Java and Database System.(P)	**02**	24_USCS404	IoT and Computer Network Practical.(P)	**02**
	Minor			***Minor***	
24_USCS305	Analysis and Designing of Algorithm Practical. (P)	**02**	24_USCS405	Theory of Computation. (T)	**02**
24_USCS306	Linear Algebra using Python.(T)	**02**	24_USCS406	Computer Graphics Practical.(P)	**02**
	Generic / Open Elective			***Generic / Open Elective***	
	Any one course from the Table 2 given below	**02**		Any one course from the Table 2 given below	**02**
	Any one course from the Table 2 given below	**02**			
	Skill Enhancement Course (SEC)			***Skill Enhancement Course (SEC)***	
	Any one course from the Table 3 given below	**02**		Any one course from the Table 3 given below	**02**
	Ability Enhancement Course (AEC) Any 1			***Ability Enhancement Course (AEC) Any 1***	
24_UAAECMAR301	Marathi: Communication Skill-I		24_UAAECMAR401	Marathi: Communication Skill-II	
24_UAAECHIN302	Hindi: Communication Skill-I		24_UAAECHIN402	Hindi: Communication Skill-II	
24_UAAECSAN303	Sanskrit: Communication Skill-I		24_UAAECSAN403	Sanskrit: Communication Skill-II	
24_UAAECURD304	Urdu: Communication Skill-I	**02**	24_UAAECURD404	Urdu: Communication Skill-II	**02**
	Co-Curricular			***Co-Curricular***	
	Any one course from the Table 1 given below	**02**		Any one course from the Table 1 given below	**02**

			24_USCSC408	***Community Engagement Program (CEP)***	***02***
Total Credits		**22**	**Total Credits**		**22**

Table 1. Co-curricular Activities

SEM III		SEM IV	
24_GJCC301	National Social Service (NSS)	24_GJCC401	National Social Service (NSS)
24_GJCC302	National Cadet Corps (NCC)	24_GJCC402	National Cadet Corps (NCC)
24_GJCC303	Sports & Yoga	24_GJCC403	Sports
24_GJCC304	Cultural	24_GJCC404	Cultural
24_GJCC305	Career Katta	24_GJCC405	Yoga
24_GJCC306	Life Long Learning	24_GJCC406	Life Long Learning
24_GJCC307	Research Club	24_GJCC407	Shodhvedh
24_GJCC308	Science Association	24_GJCC408	Publications
24_GJCC309	Film Club	24_GJCC409	Science Association
24_GJCC310	Infosys courses	24_GJCC410	Infosys courses

Table 2. Open Electives

SEM III		SEM IV	
24_USOEMT305	Commercial Mathematics (2) (T)	24_USOEMT405	Financial Mathematics (2) (T)
24_USBCHOE301	Nutrition and diet management (2) (T)	24_USOEMT406	Research Analyst in Stock Market (2) (T)
24_USOEPH307	Physics in everyday Life I (4) (T)	24_USOEPH405	Physics in everyday Life II (2) (T)
24_USZOOE308	Global Environmental Issues (2) (T)	24_USZOOE408	Neurobiology and behavior (2) (T)
24_USOECS305	Multimedia and Digital Marketing(2)(T)	24_USOECS402	Cyber Safety (2)(T)
24_USOECS306	Office Automation (2) (T)	24_USOEPH406	General Physics(2)(T)
24_USOEBT308	Entrepreneurship Development (2) (T)	24_UCOEBE401	Business Economics(2) (T)
24_USOEBT309	Research Methodology (2) (T)		

Table 3. Skill Enhancement Courses for Science, IT, BT, CS Faculty

SEM III		SEM IV	
24_USCH307	Skills in Classical Methods of Analysis II(P)	24_USCH407	Industrial Organic Chemistry(P)
24_USZOSEC307	Hematological techniques (P)	24_USZOSEC407	Beekeeping(P)
24_USBOTSEC2	Propagation of Horticultural Plants -II (P)	24_USBOTSEC3	Propagation of Horticultural Plants -III(P)
24_USPHS307	Digital Computer Electronics and Microprocessor 8085-I(P)	24_USPHS407	Digital Computer Electronics and Microprocessor 8085 -II(P)
24_USMT307	Set theory & logic(P)	24_USMT407	Computational Geometry
24_USMBS307	Microbiology Skills I(P)	24_USMBS407	Microbiology Skills II(P)
24_USBCHS307	Clinical Biochemistry(P)	24_USBCHS407	Soil and water analysis(P)
24_USCSS307	Web Designing(P)	24_USCSS407	.Net Technologies(P)
24_USITS307	Computer skills -3 Practical(P)	24_USITS407	Computer skills -3 Practical(P)
24_USBTS307	Molecular Diagnostics(P)		

Vocational Skill Course	
USBTV407	Bioinformatics

(To be implemented from Academic Year- 2024-25)

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Semester III

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Course

Nomenclature of the Course	**Principles of Operating Systems**
Class	S.Y.B.Sc
Semester	III
Course Code	24_USCS301
No. of Credits	2
Nature	Theory
Type	Major

Course Outcomes:

The learner will be able to :

CO1: To understand users interact with the operating system and communication with the operating system kernel.

CO2: To understand techniques for Deadlock Prevention, Deadlock Avoidance, Deadlock Detection.

CO3: To understand the concept of main memory (RAM) and its role in computer systems.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction to Operating-Systems, Operating-System Structures, Processes, Threads**	**Introduction to Operating-Systems** :- Definition of Operating System, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments. **Operating-System Structures**:- Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure **Processes**:-Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication, **Threads: -** Overview of Threads, Multicore Programming, Multithreading Models.
	CPU Scheduling, Deadlocks	**CPU Scheduling:-** Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR), Thread Scheduling, System Model,

2		**Deadlocks**: - Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
3	**Main Memory, Virtual Memory, File-System Interface, File-System Implementation**	**Main Memory, Virtual Memory** :- Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table **File-System Interface, File-System Implementation** :- File Concept, Access Methods, Directory and Disk Structure, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods , Free-Space Management , Disk Structure, Disk Scheduling, Disk Management.

Prescribed Text/s (If any):

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley, 2021

Other Learning Resources recommended:

1. Achyut S. Godbole, AtulKahate, Operating Systems, Tata McGraw Hill, 2017
2. Naresh Chauhan, Principles of Operating Systems, Oxford Press, 2014

Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction to Operating-Systems, Operating-System Structures, Processes, Threads	Classroom Teaching and ICT	10
2	CPU Scheduling, Deadlocks	Classroom Teaching and ICT	10
3	Main Memory, Virtual Memory, File-System Interface, File-System Implementation.	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Course

Nomenclature of the Course	**Java based Application Development**
Class	S.Y.B.Sc
Semester	III
Course Code	24_USCS302
No. of Credits	2
Nature	Theory
Type	Major

Course Outcomes:

The learner will be able to :
CO1: To understand the basic syntax of Java programming language.
CO2: To create GUI applications using Java Swing or JavaFX.
CO3: To build web applications using Java-based technologies like Servlets and JSP.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction, Packages, Exception Handling, Threads.**	**Introduction, Packages: -** History, Features of Java, Java Development Kit, Java Application Programming Interface, Java Virtual Machine Java Program Structure. **Exception Handling: -** Introduction to Exception Handling, Pre-Defined Exceptions, try-catch-finally, throws, throw, User Defined Exceptions. **Threads :-** Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, wait() notify() notify all() methods
2	**Introduction to JFC and Swing, Event Handling , JDBC .**	**Introduction to JFC and Swing :-** Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Toolbars, Implementing Action interface, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components, Colors and File Choosers, Tables and Trees **Event Handling:-** Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes.

		JDBC:- Introduction, JDBC Architecture, JDBC Drivers, JDBC , Connectivity Model, java.sql package, Using Statement, Prepared Statement, Callable Statement, ResultSet, Scrollable and Updatable ResultSet.
3	**Servlets, Java Server Pages (JSP), JSON .**	**Servlets** :- Introduction to Servlet, Servlet Life Cycle, Types of Servlet, Servlet Configuration with Deployment Descriptor, Working with ServletContext and ServletConfig Object, Attributes in Servlet, **Java Server Pages (JSP):-**Introduction to JSP , Comparison with Servlet, JSP Architecture, JSP Life Cycle, JSP Scripting Elements, JSP Directives, JSP Action, JSP Implicit Objects, JSP Expression Language, JSP Standard Tag Libraries, JSP Custom Tag **JSON:-**Overview of JSON, Syntax, Data Types, Objects, Schema, Comparison with XML, JSON with Java

Prescribed Text/s (If any):

1. Herbert Schildt, Java the Complete Reference, Eleventh Edition, McGraw-Hill Education, 2020
2. Bryan Basham, Kathy Sierra, Bert Bates, Head First Servlets and JSP, O'reilly (SPD), 2018
3. Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR, 2004
4. Ivan Bayross, Web Enabled Commercial Applications Development Using Java 2, BPB Publications
5. Java XML and JSON: Document Processing for Java SE by Jeff Friesen January 2019, Apress

Other Learning Resources recommended:

1. E. Balagurusamy, Programming with Java- A Primer, Tata McGraw-Hill Education India, 2014
2. Programming in JAVA, 2nd Ed, Sachin Malhotra & SaurabhChoudhary , Oxford Press, 2018
3. Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD)
4. Eric Jendrock, Jennifer Ball, D Carson and others, The Java EE 5 Tutorial, Pearson Education
5. The Java Tutorials: http://docs.oracle.com/javase/tutorial/
6. Java Parsing Collection XML JSON: Map List XML JSON Transform by Yang Hu, 2019

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction, Packages, Exception Handling, Multithreading, Collection Framework , Threads.	Classroom Teaching and ICT	10
2	Introduction to JFC and Swing, Event Handling , JDBC .	Classroom Teaching and ICT	10
3	Servlets, Java Server Pages (JSP),JSON.	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Course

Nomenclature of the Course	**Advanced Database Concepts**
Class	SYBSC
Semester	III
Course Code	24_USCS303
No. of Credits	2
Nature	Theory
Type	Major

Course Outcomes:

Learners will be able to

CO1 : To understand the Basics of PL/SQL along with the program flow statements and Stored Procedures and Functions

CO2 : To use efficiently Sequences ,Arrays ,Records and Cursors with its implementation in PL/SQL.

CO3 : To understand concept of Packages and transaction management.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction to PL/SQL and control statements**	**Overview and Fundamentals of PL/SQL:** Advantages of PL/SQL, Main Features of PL/SQL,Identifiers, References to Identifiers, Scope and Visibility of Identifiers, Assigning Values to Variables, Expressions, Data Types. **Control Statements:** Conditional Selection Statements, LOOP Statements, Sequential Control Statements, GOTO, and NULL Statements. **Stored Procedures and Functions:** Procedures: Types and benefits of stored procedures, creating, executing, altering and viewing stored procedures. Functions: Calling function and recursion function.
2	**Sequences Arrays ,Records and Cursors**	**Sequences:** creating sequences, referencing, altering, and dropping a sequence. **Arrays and Records:** Associative Arrays, Varrays (Variable-Size Arrays), Nested Tables, Record Variables, Assigning Values to Record Variables.

		Cursors: Overview of Cursor, Types of cursors, Invalid cursor Exception.
3	**Packages and Transaction Management**	**Packages:** Overview of a Package. Need of Packages, Package Specification, Package Body, Package Instantiation and Initialization. **Transaction Management:** ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol.

Prescribed Text/s:

1. Mastering PL/SQL Through Illustrations: From Learning Fundamentals to Developing Efficient PL/SQL Blocks, Dr. B. Chandra, BPB Publication, 2020
2. Oracle Pl/Sql Training Guide., Training guide, BPB Publications, 2016
3. Raghu Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill,3rd Edition, 2014
4. Abraham Silberschatz, Henry F. Korth,S.Sudarshan , Database System Concepts, 6th Edition 2019

Other Learning Resources recommended:

1. Ivan Bayross, "SQL, PL/SQL -The Programming language of Oracle", B.P.B. Publications 2009
2. Ramez Elmasri &Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education, 2008
3. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction to PL/SQL and control statements	Classroom Teaching and ICT	10
2	Sequences Arrays ,Records and Cursors	Classroom Teaching and ICT	10
3	Packages and Transaction Management	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Practical

Nomenclature of the Course	**Hands on Java and Database System**
Class	S.Y.B.Sc
Semester	III
Course Code	24_USCS304
No. of Credits	2
Nature	Practical
Type	Major- Practical

Course Outcomes:

The learner will be able to :

CO1: To understanding of the Java programming language, including its syntax, features and object-oriented principles.

CO2: To integrate Java applications with databases using technologies like JDBC (Java Database Connectivity) for data storage and retrieval.

CO3: To understand of Java web technologies such as Servlets, JSP (JavaServer Pages),

CO4: To understand the fundamental concepts of databases, including relational database management systems (RDBMS), tables, rows, columns, and relationships.

CO5: To proficient in writing stored procedures and functions using PL/SQL.

CO6: To understand the purpose and functionality of triggers in PL/SQL.

The following practical's will be implemented using NetBeans and Oracle 11g
Minimum 20 practical's to be completed as a journal work.

Syllabus:

Sr. No.	Aim of the Practical
1	a.Write a program to create a class and implement the concepts of Constructor Overloading, Method Overloading, Static methods. b.Write a program to implement the concept of Inheritance and Method Overriding
2	a.Write a program to implement the concepts of Abstract classes and methods b. Write a program to implement the concept of interfaces.
3	Write a program to define user defined exceptions and raise them as per the requirements.
4	Write a program to demonstrate the methods of: a. List interface b. Set interface c. Map interface
5	Write a program using various swing components design Java application to accept a student's resume. (Design form).
6	a. Write a JDBC program that displays the data of a given table b. Write a JDBC program to return the data of a specified record from a given table c. Write a JDBC program to insert / update / delete records into a given table
7	a. Construct a simple calculator using the JAVA Swings with minimum functionality.

	b. Construct a GUI using JAVA Swings to accept details of a record of a given table and submit it to the database using JDBC technology on the click of a button.
8	a. Write a Servlet that accepts a User Name from a HTML form and stores it as a cookie. Write another Servlet that returns the value of this cookie and displays it. b. Write a Servlet that displays the names and values of the cookie stored on the client. c. Write a Servlet that accepts a User Name from a HTML form and stores it as a session variable. Write another Servlet that returns the value of this session variable and displays it.
9	a. Write a registration Servlet that accepts the data for a given table and stores it in the database. b. Write a Servlet that displays all the records of a table.
10	a. Write a JSP that accepts a User Name from a HTML form and stores it as a cookie. Write another JSP that returns the value of this cookie and displays it. b. Write a JSP that displays the names and values of the cookie stored on the client. c. Write a JSP that accepts a User Name from a HTML form and stores it as a session variable. Write another JSP that returns the value of this session variable and displays it.
11	a. Write a JSP code that accepts username and password from HTML file and validates the user from the database. b. Write a registration JSP that accept the data for a given table and stores it in the database. c. Write a JSP that displays all the records of a table.
12	Write Java application to encoding and decoding JSON in Java.
13	Writing PL/SQL Blocks with basic programming constructs by including following: a. Sequential Statements b. unconstrained loop
14	a. Creating simple Sequences with clauses like START WITH, INCREMENT BY,MAXVALUE, MINVALUE, CYCLE | NOCYCLE, CACHE | NOCACHE, ORDER | NOORECER. b. Creating and using Sequences for tables.
15	Writing PL/SQL Blocks with basic programming constructs by including following: a. If...then...Else, IF...ELSEIF...ELSE... END IF b .Case statement
16	Writing PL/SQL Blocks with basic programming constructs for following Iterative Structure: a. While-loop Statements b. For-loop Statements.
17	Writing PL/SQL Blocks with basic programming constructs by including a GOTO to jump out of a loop and NULL as a statement inside IF.
18	Writing Procedures in PL/SQL Block a. Create an empty procedure, replace a procedure and call procedure b. Create a stored procedure and call it c. Define procedure to insert data d. A forward declaration of procedure

19	Writing Functions in PL/SQL Block. a. Define and call a function b. Define and use function in select clause, c. Call function in dbms_output.put_line d. Recursive function e. Count Employee from a function and return value back f. Call function and store the return value to a variable.
20	Creating and working with Record variables and assigning values to record variables.
21	Write an Implicit and explicit cursor to complete the task.
22	Create packages and use it in SQL black to complete the task.
23	Writing Arrays for Associative Arrays, Varrays (Variable-Size Arrays) and Nested Tables

Prescribed Text/s (If any):

1. "Java: A Beginner's Guide" by Herbert Schildt
2. "Core Java Volume I -- Fundamentals" by Cay S. Horstmann and Gary Cornell
3. "Core Java Volume II -- Advanced Features" by Cay S. Horstmann and Gary Cornell
4. "Effective Java" by Joshua Bloch
5. "Java Concurrency in Practice" by Brian Goetz, Tim Peierls, Joshua Bloch, Joseph Bowbeer, David Holmes, and Doug Lea

Other Learning Resources recommended

1. "Java EE 8: The Big Picture" by Dr. Danny Coward:
2. Mastering PL/SQL Through Illustrations: From Learning Fundamentals to Developing Efficient PL/SQL Blocks, Dr. B. Chandra, BPB Publication, 2020
3. Oracle Pl/Sql Training Guide., Training guide, BPB Publications, 2016
4. Raghu Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill,3rd Edition, 2014
5. Abraham Silberschatz, Henry F. Korth,S.Sudarshan , Database System Concepts, 6th Edition 2019

Teaching Plan:

Practicals	Unit Title	Teaching Methods	No. of Lectures
All	All Practical's	Lab Session with ICT	60

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Minor Practical

Nomenclature of the Course	**Analysis and Design of Algorithm**
Class	SYBSC
Semester	III
Course Code	24_USCS305
No. of Credits	02
Nature	Practical
Type	Minor

Course Outcomes:

The learner will be able to
CO1: Students will be able to calculate the time complexity of the algorithm.
CO2: Students will be able to sort the given numbers using various sorting algorithms.
CO3: Students will be able to write programs for the problems using Divide and Conquer.
CO4: Students will be able to write programs for the problems using the Greedy Method.
CO5: Apply branch and bound method to solve 0/1 knapsack problem.

The following practical's will be implemented using Python
Minimum 20 practical's to be completed as a journal work.

Syllabus:

Sr. No.	Aim of Practical	Literature
1	Develop algorithms for given pseudo code	What is algorithm, analysis of algorithm, Types of complexity, running time analysis, How to Compare Algorithms
2	Calculating and implementing time complexity for algorithms to check primality of given numbers.	Understand concept of Asymptotic Notation, understand the technique Big-O Notation problems
3	Calculating and implementing time complexity for linear search algorithm.	Understand concept of understand the technique Omega-Ω Notation Problems
4	calculate space complexity of given algorithms or problems or mathematical equations.	Understand the concept of space complexity and how to calculate it.
5	calculate time complexity of given algorithms or problems or mathematical equations.	understand the concept of time complexity and types of complexity
6	Calculating and implementing time complexity in binary search algorithms.	Understand concept of Asymptotic Notation, understand the technique Theta-Θ Notation Problems

7	Write a Python program to perform matrix multiplication. Discuss the complexity of algorithms used.	Understand the concept of Array like 1D array and 2D array with mathematical matrix operations.
8	Write a Python program to sort n names using the Quick sort algorithm. Discuss the complexity of algorithms used.	Understanding the concept partition exchange sort and time and space complexity.
9	Write a Python program to sort n names using the Insertion sort algorithm. Discuss the complexity of algorithms used.	Understanding the Insertion sort algorithm and its implementation, including how it works and its time complexity.
10	Write a Python program to sort n names using the Selection sort algorithm. Discuss the complexity of algorithms used.	Understand the technique Selection by Sorting, Partition-based Selection Algorithm
11	Write Python program to sort n numbers using Merge sort algorithm. Discuss the complexity of algorithms used.	Understand the technique of divide-and-conquer algorithm
12	Write Python program to sort n numbers using Count sort algorithm. Discuss the complexity of algorithms used.	Understanding Concept of Counting sort is an integer sorting algorithm used in computer science to collect objects according to keys that are small positive integers.
13	Write Python program for finding the smallest and largest elements in an array A of size n using Selection algorithm. Discuss Time complexity.	Understanding Linear Selection Algorithm - Median of Medians Algorithm Finding the K Smallest Elements in Sorted Order
14	Write Python program for finding the second largest element in an array A of size n using Tournament Method. Discuss Time complexity.	Understanding Linear Selection Algorithm - Finding the K Smallest Elements in Sorted Order
15	Write Python program for implementing Strassen's Matrix multiplication using Divide and Conquer method. Discuss the complexity of algorithm.	Understanding concept of array and and Divide and Conquer method
16	Write a python program to find a solution for the knapsack problem using greedy methods.	Understanding greedy strategy, Concept of Optimization Problem techniques

17	Implement minimum spanning tree using Prim's algorithm and analyze its time complexity	Understanding Concept of greedy algorithm that finds a minimum spanning tree for a weighted undirected graph
18	Implementing LCS calculation	Understanding Concept longest Common subsequence all sequences in a set of sequences (often just two sequences). concept of longest common substring: unlike substrings, subsequences are not required to occupy consecutive positions within the original sequences
19	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.	Understanding concept of Greedy algorithm that makes use of the fact that the edges of a minimum spanning tree must form a subset of the edges of any other spanning tree
20	Apply dynamic programming methodology to find all pairs shortest path of a directed graph using Floyd's algorithm.	Understanding the concept of Floyd's cycle detection algorithm is a pointer algorithm Concept of only two pointers, moving through the sequence at different speeds.
21	Design threaded binary tree for the imputed binary tree	Understanding the Concept threaded binary tree
22	Design expression tree for the imputed mathematical expression	Understanding the Concept of expression tree

Prescribed Text/s (If any):

1. Data Structure and Algorithm Using Python", Rance D. Necaise, Wiley India Edition, 2016.
2. "Data Structures and Algorithms Made Easy", NarasimhaKarumanchi, CareerMonk Publications, 2016.
3. "Introduction to Algorithms", Thomas H. Cormen, 3rd Edition, PHI.

Additional References:

1. "Introduction to the Design and Analysis of Algorithms", Anany Levitin, Pearson, 3rd Edition, 2011.
2. "Design and Analysis of Algorithms", S. Sridhar, Oxford University Press, 2014.

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
All	**All Practical's**	**Lab Session with ICT**	**60**

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Minor Course

Nomenclature of the Course	**Linear Algebra using Python**
Class	SY. BSc.
Semester	III
Course Code	24_USCS306
No. of Credits	2
Nature	Theory
Type	Minor

Course Outcomes:

The learner will be able to

CO1: To demonstrate proficiency in analyzing vectors and matrices, including their linear spanning properties, geometric interpretations, and applications in solving linear systems

CO2: To demonstrate a comprehensive understanding of fundamental concepts in linear algebra, including basis, dimension, and Gaussian elimination techniques

CO3: To possess a thorough understanding of inner product, orthogonalization, and eigenvalues/eigenvectors, empowering them to proficiently analyze and solve problems. involving vector spaces

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction to Vectors**	**Vector**: Linear independence of vectors. Basis and dimension of a vector space. Orthogonal vectors and subspaces. The Gram-Schmidt orthogonalisation. **The Vector Space**: Linear combination, Span, The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous. **Matrix**: Matrices as vectors, Column space and row space, vector-matrix multiplication in terms of linear combinations, Matrix vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions , Inner product and outer product, From function inverse to matrix inverse
2	**Basics in Co-ordinated System**	**Basis**: Coordinate systems, two greedy algorithms for finding a set of generators, Linear dependence, Basis, Unique

		representation, Change of basis, first look, Computational problems involving finding a basis **Dimension**: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator **Gaussian elimination**: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination
3	**Eigenvalues and eigenvectors**	**Inner Product**: The inner product for vectors over the reals, Orthogonally. **Orthogonalization**: Projection orthogonal to multiple vectors, projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, orthogonal complement. **Eigenvalues and Eigenvectors**: Characteristic Polynomials of degree 2 and 3, Eigenvalues and eigenvectors, Properties of eigenvalues and eigenvectors, Cayley–Hamilton Theorem, Minimal Polynomial. Coordinate representation in terms of eigenvectors, The Internet worm, Markov Chains, Google Page Rank algorithm.

Prescribed Text/s (If any):

1. Coding the Matrix Linear Algebra through Applications to Computer Science, First Edition, Philip N. Klein, Newtonian Press 2013
2. Schaum's Outline of Linear Algebra, Sixth Edition by Seymour Lipschutz, Marc Lipson, McGraw Hill 2017

Other Learning Resources recommended:

1. Linear Algebra and Probability for Computer Science Applications, First Edition, Ernest Davis, A K Peters/CRC Press, 2012.
2. Linear Algebra and Its Applications, Gilbert Strang, Cengage Learning, 4th Edition, 2007
3. Linear Algebra and Its Applications, David C Lay, Pearson Education India; 3rd Edition, 2002
4. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction to Vectors	Regular teaching and ICT	10
2	Basics in Co-ordinated System	Regular teaching and ICT	10
3	Eigenvalues and eigenvectors	Regular teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Generic / Open Elective (OE) Course

Nomenclature of the Course	**Multimedia and Digital Marketing**
Class	SYBSC
Semester	III
Course Code	24_USOECS305
No. of Credits	2
Nature	Theory
Type	Open Elective

Course Outcomes:

The learner will be able to

CO1: To master the fundamentals of multimedia design, and management, integrating principles of graphic design.

CO2: To develop a foundational understanding of fundamentals of multimedia production and digital marketing concepts, strategies, and techniques

CO3: To master diverse aspects of digital marketing, including content strategy, influencer partnerships, data analytics and mobile optimization.

Syllabus:

Unit No.	**Unit Title**	**Sub Titles (Learning Points)**
1	**Multimedia Design**	**Introduction to Multimedia**: Definition and characteristics of multimedia, Elements of multimedia: text, images, audio, video, animation, Multimedia applications and industries **Graphic Design**: Principles of graphic design, Design elements: color theory, typography & layout, Image editing tools and software **Animation**: Principles of animation, 2D and 3D animation techniques, Animation software
2	**Multimedia Production and Digital Marketing Fundamentals**	**Audio and Video Production**: Basics of audio and video recording, Editing and post-production techniques, Audio and video compression formats **Introduction to Digital Marketing**: Definition and scope of digital marketing, Evolution of digital marketing, Importance and advantages of digital marketing **Digital Marketing Strategy**: Setting marketing objectives, Developing a digital marketing plan
3	**Digital Marketing Dynamics**	**Content Marketing**: Content strategy and planning, Blogging and content creation, Content distribution and promotion

		Influencer Marketing: Identifying influencers in the industry, Building partnerships with influencers, Measuring the impact of influencer campaigns **Mobile Marketing**: Mobile advertising, Responsive design and mobile optimization, Mobile apps and their role in marketing

Prescribed Text/s (If any):

1. Introduction to Multimedia Communications: Applications, Middleware, Networking by Kamisetty Rao
2. The Non-Designer's Design Book by Robin Williams
3. Digital Marketing For Dummies by Ryan Deiss and Russ Henneberry.
4. Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses by Joe Pulizzi
5. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content by Ann Handley

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Multimedia Design	Regular teaching and ICT	10
2	Multimedia Production and Digital Marketing Fundamentals	Regular teaching and ICT	10
3	Digital Marketing Dynamics	Regular teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Generic / Open Elective (OE) Course

Nomenclature of the Course	**Office Automation**
Class	S.Y.B.Sc
Semester	III
Course Code	24_USOECS306
No. of Credits	2
Nature	Theory
Type	Open Elective

Course Outcomes:

The learner will be able to :

CO1 : To learn the use of Microsoft Word for document creation, editing, formatting of the document.

CO2 : To create, design, and deliver effective presentations using Microsoft PowerPoint.

CO3 : To do the online transaction efficiently and navigate the Internet effectively and utilize web browsers efficiently

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction to MS Office - MS Word**	**Working with Documents** -Opening & Saving files, Editing text documents, Inserting, Deleting, learning Edit menu , Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, Adding images to document **Formatting Documents** - Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. **Setting Page style** - Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page. **Creating Tables**- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, Drawing - Inserting ClipArt's, Pictures/Files etc.

		Printing Documents – Shortcut keys.
2	**Introduction to MS Office-MS Power Point**	**Introduction to presentation** – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts. **Creating a presentation** - Setting Presentation style, Adding text to the Presentation. **Formatting a Presentation** - Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw. **Adding Effects to the Presentation**- Setting Animation & transition effect. Printing Handouts, Generating Standalone Presentation viewer.
3	**Internet And Electronic Payment System**	**What is Internet?** Browsers and its types, Search engine, Creating an account with google, downloading and uploading the content on YouTube. **What is e-payment?** Types of e-payment System; E-cash, e-cheques,credit cards, smart cards, electronic purses & debit cards , e-Wallet. **Online Transactions: -** Internet Banking, Mobile Banking, Phone Banking, NPCI, NEFT, RTGS, IMPS, UPI – BHIM and Other UPI Apps.

Learning Resources recommended:

1. Microsoft Office 2007 Bible- John Walkenbach, Herb Tyson, Faithe Wempen, Cary N. Prague, Michael R. Groh, Peter G. Atiken and Lisa A. Bucki- Wiley India Pvt. Ltd.
2. Data Communications and Networking- Behrouz A. Forouzan, 2nd Edition- McGraw Hill Education
3. https://en.wikipedia.org

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction to MS Office - MS Word	Classroom Teaching and ICT	10
2	Introduction to MS Office-MS Power Point	Classroom Teaching and ICT	10
3	Internet And Electronic Payment System	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester III
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Skill Enhancement Course

Nomenclature of the Course	**Web Designing**
Class	SYBSC
Semester	III
Course Code	24_USCSS307
No. of Credits	02
Nature	Practical
Type	SEC

Course Outcomes:

Learners will be able to

CO1: To Design interactive web pages using HTML/CSS, integrate multimedia, and create effective interactive forms.

CO2: To Adeptly use JavaScript for web interactivity and master XML structure and transformations for data presentation.

CO3: To Proficiently develop interactive web applications using AJAX, JavaScript, and advanced DOM manipulation techniques.

The following practical's will be implemented using Notepad, Web Browser, XAMPP Server. Minimum 20 practical's to be completed as a journal work.

Syllabus:

Sr. No.	Aim of Practical	Literature
1	Design a webpage that makes use of Document Structure Tags	Fundamental Elements of HTML.
2	Design a webpage that makes use of Various Text Formatting Tags.	Fundamental Text Formating of HTML.
3	Design a webpage that makes use of List Tags	Organizing Text in HTML.
4	Design a webpage that makes use of Image and Image Maps	Images on a Web Page, Image Formats, Image Maps
5	Design a webpage that makes use of a.Table tags. b.Navigation across multiple pages	Tables in HTML, Links and URLs in HTML
6	Design a webpage that makes use of Form Tags.	FORMs in HTML, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page

7	Design a webpage that make use of Cascading Style Sheets with CSS properties to change the background of a Page and CSS properties for positioning an element	Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page,CSS properties for positioning an element
8	Design a webpage that make use of Cascading Style Sheets with CSS properties to change Fonts and Text Styles	CSS properties to work with Fonts and Text Styles,
9	Write JavaScript code for Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range	Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes,
10	Write JavaScript code for Performing various mathematical operations such as Evaluating Expressions / Calculating reverse of a number	Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes,
11	Write JavaScript code for demonstrating Storing and Retrieving Cookies.	Functions – Defining and Invoking a Function, Defining Function arguments, Defining a Return Statement, Calling Functions
12	Write a PHP script for retrieving data from HTML forms.	Introduction to PHP, Variables and Operators.
13	Write PHP scripts for Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range	Introduction to Loops, Conditional statement & expression in PHP.
14	Write PHP script for Working with Files (Reading / Writing).	Introduction to Working with Files in PHP
15	Write a PHP script for Working with Databases (Storing Records / Reprieving Records and Display them).	Introduction to Working with Databases in PHP
16	Write a PHP script for working with arrays.	Introduction to Arrays.
17	Write a PHP script for Storing and Retrieving Cookies.	How to store and retrieve cookies using PHP
18	Write PHP script for Storing and Retrieving Sessions.	Sessions and Headers in PHP
19	Design a webpage with various jQuery animation effects	Introduction to jQuery, Selectors, methods to access HTML attributes, methods for traversing, manipulators, effects.

20	Create an XML file with Internal / External DTD	Structure of an XML Document, XML Entity References, DTD
21	Design a webpage to handle asynchronous requests using AJAX on button click.	AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX using mouseover
22	Design a webpage to handle asynchronous requests using AJAX and XML on button click.	AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX using button click

Prescribed Text/s (If any):

1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press, 2016
2. Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India, 2018
3. PHP: A Beginners Guide, VikramVaswani, TMH

Other Learning Resources recommended:

1. HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY, 2011
2. Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly, 2018
3. PHP, MySQL, JavaScript & HTML5 All-in-one for Dummies, Steve Suehring, Janet Valade Wiley, 2018

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
All	All Practical's	Lab Session with ICT	60

Semester IV

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Course

Nomenclature of the Course	**Software Engineering**
Class	SYBSC
Semester	IV
Course Code	24_USCS401
No. of Credits	2
Nature	Theory
Type	Major

Course Outcomes:

Learners will be able to

CO1: To Learn and understand the basics of Software Engineering with Software Development Life Cycle.

CO2: To Apply and calculate the project management and analysis principles to software project development.

CO3: To Apply the design & testing principles to software project development.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction, Requirement Analysis and System Modeling**	**Introduction:**-The Nature of Software, Software Engineering, Layered Technology, Assessment Prescriptive Models: Waterfall Model, Incremental, RAD Models, Evolutionary Process Models: Prototyping, Spiral, Agile Development- Agility, Agile Process, Extreme Programming **Requirement Analysis and System Modeling** :- Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS, Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram.

2	**System Design, Software Measurement and Metrics, Software Project Management, Project Scheduling**	**System/Software Design**:-Architectural Design, Low-Level Design Coupling and Cohesion. **Software Measurement and Metrics: -** Process Metrics and Project Metrics, Software Measurement, Software Project Estimation,, LOC based, FP based. **Software Project Management, Project Scheduling:-** Estimation in Project Planning Process, –Software Scope and Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II,Time-Line Charts
3	**Risk Management, Software Quality Assurance**, **Software Testing**	**Risk Management, Software Quality Assurance**: - Risk strategies, Software risks, Risk Identification, projection, RMMM Quality Concepts, SQA activities, SQA plan, Software Configuration Management, elements of SCM, SCM Process, Capability Maturity Model. **Software Testing**:-Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives White-Box Testing/Structural Testing, Functional/Black-Box Testing.

Prescribed Text/s:

1. Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2018.
2. Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2018.

Other Learning Resources recommended:

1. Computer Network, Bhushan Trivedi, Oxford University Press, 2016
2. Data and Computer Communication, William Stallings, PHI, 2017

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction, Requirement Analysis and System Modeling.	Classroom Teaching and ICT	10
2	System Design, Software Measurement and Metrics, Software Project Management, Project Scheduling.	Classroom Teaching and ICT	10
3	Risk Management, Software Quality Assurance, Software Testing.	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Course

Nomenclature of the Course	**Introduction to IoT**
Class	S.Y.B.Sc
Semester	IV
Course Code	24_USCS402
No. of Credits	2
Nature	Theory
Type	Major

Course Outcomes:

The learner will be able to

CO1: To Understand IoT, SoC basics, architectures, components, M2M, and distinguish Raspberry Pi, Arduino, Node MCU, ARM Architecture-based platforms.

CO2: To Use different types of IoT Platforms and interfaces

CO3: To learn IoT web integration, data exchange, cloud deployment, Node-RED, M2M protocols, WSN basics, diverse IoT applications, and edge computing.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Fundamentals of IoT, System on Chip, Types of IoT/SoC Platforms**	**Fundamentals of IoT: -** Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M. **System on Chip: -** What is System on chip? Structure of System on Chip. SoCElements: FPGA, GPU, APU, Compute Units. **Types of IoT/SoC Platforms :-** Introduction to Raspberry Pi, Arduino & Node MCU, Introduction to SoC-ARM Architecture
2	**Interfacing with IoT Platforms, Using Sensor & Actuators, IoT Protocols And Security**	**Interfacing with IoT Platforms :-** Basic hardware components like LED, Button, Camera, 8X8 LED Grid, Motor etc and interfacing them for input/output with IoT devices using PWM, UART, GPIO, I2C, SPI **Using Sensor & Actuators :-** Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor, Level Sensors, Ultrasonic sensors, Interfacing of Actuators, Interfacing of Relay Switch and Servo Motor

		IoT Protocols And Security:- HTTP, UPnP, CoAP, MQTT, XMPP, Privacy and Security Issues in IoT.
3	**IoT& Web, IoT Applications, Edge Computing**	**IoT& Web** :- Web server for IoT, Sending/Receiving data between web server &IoT device, Cloud for IoT, Node RED, M2M vs IoT Communication Protocols, Basics of WSNs, WSN architecture and types. **IoT Applications:-** Modern IoT case studies / applications used in the areas of transportation, agriculture, health care etc. **Edge Computing:**-Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.

Prescribed Text/s (If any):

1. Introduction to IoT Paperback by SudipMisra , Anandarup Mukherjee , Arijit Roy , Cambridge Press, 2022
2. Jain, Prof. Satish, Singh, Shashi, ―Internet of Things and its Applications‖, 1st Edition, BPB, 2020.
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, Internet of Things, Wiley, India, 2019
4. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher:
5. PacktPublishing, 2020

Other Learning Resources recommended:

1. Internet of Things by VinayakShinde, SYBGEN Learning India Pvt. Ltd, 2020
2. Internet of things, Dr. KamleshLakhwani, Dr. HemantkumarGianey, Josef Kofi Wireko,KamalkantHiran, BPB Publication, 2020
3. Arduino, Raspberry Pi, NodeMCU Simple projects in easy way by Anbazhagan k and AmbikaParameswari k, 2019.
4. IoT based Projects: Realization with Raspberry Pi, NodeMCU Paperback – February 2020, by Rajesh Singh Anita Gehlot, 2020
5. Mastering the Raspberry Pi, Warren Gay, Apress, 2014

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Fundamentals of IoT, System on Chip, Types of IoT/SoC Platforms	Classroom Teaching and ICT	10
2	Interfacing with IoT Platforms, Using Sensor & Actuators, IoT Protocols And Security.	Classroom Teaching and ICT	10

3	IoT& Web, IoT Applications, Edge Computing	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Course

Nomenclature of the Course	**Computer Networks**
Class	SYBSC
Semester	IV
Course Code	24_USCS403
No. of Credits	2
Nature	Theory
Type	Major

Course Outcomes:

Learners will be able to

CO1: Learn the fundamental concepts of computer networking, including protocols, architectures, and communication models and roles and responsibilities of the physical layer.

CO2: Explain the concepts of framing, error detection and error correction and different protocols used in data link layer and network layer.

CO3: Understand the roles and responsibilities of transport layer and application layer along with different protocols used in it.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Introduction, Network Models, Introduction to Physical layer.**	**Introduction:-**Networking standards and Administrations, networks, network types – LAN, MAN, WAN. **Network Models:** The OSI model, TCP/IP protocol suite, Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance, Multiplexing. **Introduction to Physical layer:-**Guided Media, Unguided Media.
2	**Introduction to Data Link Layer.**	**Introduction to Data Link Layer.** Link layer addressing, Data Link Layer Design Issues. Block coding, cyclic codes, checksum, forward error correction, error correcting codes, and error detecting codes. DLC services, data link layer protocols, HDLC, IPv4 addressing , forwarding of IP packets, Internet Protocol, ICMPv4.

3	**Introduction to the Transport Layer And Introduction to Application Layer.**	**Introduction to the Transport Layer:-**Introduction, IPv6 addressing ,TCP ,UDP , IPv4 protocol,IPv6 protocol. **Introduction to Application Layer :-** User Datagram Protocol,WWW, HTTP, FTP, Electronic Mail, TELNET,DNS, SNMP

Prescribed Text/s:

1. Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2018.
2. Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2018.

Other Learning Resources recommended:

1. Computer Network, Bhushan Trivedi, Oxford University Press, 2016
2. Data and Computer Communication, William Stallings, PHI, 2017

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction, Network Models, Introduction to Physical layer.	Classroom Teaching and ICT	10
2	Introduction to Data Link Layer.	Classroom Teaching and ICT	10
3	Introduction to the Transport Layer And Introduction to Application Layer.	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Major Practical

Nomenclature of the Course	**IoT and Computer Network Practical**
Class	S.Y.B.Sc
Semester	IV
Course Code	24_USCS404
No. of Credits	2
Nature	Practical
Type	Major- Practical

Course Outcomes:

The learner will be able to
CO1: Learn Raspberry Pi hardware setup, Linux commands, and GPIO control with Python.
CO2: Learn to Integrate Node-RED for IoT LED control, including Proteus simulation.
CO3: Understand effective project documentation to comprehensively grasp the IoT development process.
CO4: Implement basic networking concepts and grasp network layer architecture.
CO5: Implement routing algorithms, and familiarize themselves with various networking protocols.

The following practical's will be implemented using
Raspberry pi, Arduino UNO, Proteus, CISCO Packet Tracer
Minimum 20 practicals should be submitted as Journal work.

Syllabus:

Sr. No.	Aim of the Practical
1	Preparing Raspberry Pi: Hardware preparation and Installation.
2	Using Terminal, execute basic linux commands.
3	GPIO: Light the LED with Python using Raspberry Pi.
4	Node RED: Connect LED to Internet of Things.
5	Control LED with Raspberry pi using Proteus simulator.
6	Simulation of LCD and Temperature sensor with raspberry pi in proteus.
7	Raspberry Pi Interface with DC Motor Using L293D in proteus.
8	Raspberry Pi Simulation with LCD 16x2 in proteus using python.
9	Arduino UNO: Automatic Lighting Controller Simulation using proteus.
10	LED Turn ON and OFF with an Arduino using proteus.
11	Soil moisture sensor with raspberry pi using proteus.
12	Using, linux-terminal or Windows-cmd, execute following networking commands and note the output: ping, traceroute, netstat, arp, ipconfig, Getmac, hostname, NSLookUp, pathping, SystemInfo
13	Understand the crimping of twisted pair cable with RJ45 Connector for Straight

	through ,Cross over and Rollover cable..
14	Understand the working of NIC Cards,Ethernet/Fast Ethernet /Gigabit Ethernet.
15	Using Packet Tracer, create a basic network of two computers using appropriate network wire. Use Static IP address allocation and show connectivity
16	Using Packet Tracer, create a basic network of One server and two computers using appropriate network wire. Use Dynamic IP address allocation and show connectivity
17	Using Packet Tracer, create a basic network of One server and two computers and two mobile / movable devices using appropriate network wire. Show connectivity
18	Using Packet Tracer, create a network with three routers with RIPv1 and each router associated network will have minimum three PC. Show Connectivity
19	Using Packet Tracer, create a network with three routers with RIPv2 and each router associated network will have minimum three PC. Show Connectivity
20	Using Packet Tracer, create a network with three routers with OSPF and each router associated network will have minimum three PC. Show Connectivity
21	Using Packet Tracer, create a network with three routers with BGP and each router associated network will have minimum three PC. Show Connectivity
22	Using Packet Tracer, create a wireless network of multiple PCs using appropriate access points
23	Using Wireshark, network analyzer, set the filter for ICMP, TCP, HTTP, UDP, FTP and perform respective protocol transactions to show/prove that the network analyzer is working

Prescribed Text/s (If any):

1. Introduction to IoT Paperback by SudipMisra , Anandarup Mukherjee , Arijit Roy , Cambridge Press, 2022
2. Jain, Prof. Satish, Singh, Shashi, ―Internet of Things and its Applications‖, 1st Edition, BPB, 2020.
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, Internet of Things, Wiley, India, 2019
4. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: PacktPublishing, 2020
5. Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2018.
6. Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2018.

Teaching Plan:

Practicals	Unit Title	Teaching Methods	No. of Lectures
All	All Practical's	Lab Session with ICT	60

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Minor Course

Nomenclature of the Course	**Theory of Computation**
Class	S.Y.B.Sc
Semester	IV
Course Code	24_USCS405
No. of Credits	2
Nature	Theory
Type	Minor

Course Outcomes:

The learner will be able to :

CO1: To understand the principles and applications of automata theory and formal language theory.

CO2: To familiarize Regular grammars, context free grammar

CO3: To understand proficiently comprehend the theoretical foundations and computational capabilities of Turing machines and Linear Bounded Automata.

Syllabus:

Unit No.	Unit Title	Sub Titles (Learning Points)
1	**Automata theory, Formal language**	**Automata Theory:** Defining Automaton, Finite Automaton, Transitions and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Minimizing Automata. **Formal languages :** Defining Grammar, Derivations, Languages generated by Grammar, Chomsky Classification of Grammar and Languages, Operations on Languages, Languages and Automata
2	**Regular Grammar, Context Free Grammar, Push down automata**	**Regular Grammar:** Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma for Regular Grammar. **Context Free Grammar:** Context-free Languages, Derivation Tree, Ambiguity of Grammar, Pumping Lemma for CFG. **Push down automata :** Definition of PDA, Acceptance by PDA, PDA and CFG
3	**Turing machine, Linear Bounded Automata**	**Linear Bounded Automata:** The Linear Bounded Automata Model, Linear Bounded Automata and Languages.

		Turing machine : Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine

Prescribed Text/s (If any):

1. Theory of Computer Science, K. L. P Mishra, Chandrasekharan, PHI,3rd Edition 2019
2. Introduction to Computer Theory, Daniel Cohen, Wiley,2nd Edition, 2007
3. Introductory Theory of Computer Science, E.V. Krishnamurthy, Affiliated East-West Press, 2009

Other Learning Resources recommended:

1. Theory of Computation, Kavi Mahesh, Wiley India, 2018
2. Elements of The Theory of Computation, Lewis, Papadimitriou, PHI, 2015
3. Introduction to Languages and the Theory of Computation, John E Martin, McGraw-Hill Education, 2010
4. Introduction to Theory of Computation, Michel Sipser, Thomson
5. Introduction to Automata Theory, Languages and Computation, John E. Hopcroft, Pearson Education, 2014

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Automata theory, Formal language	Classroom Teaching and ICT	10
2	Regular Grammar, Context Free Grammar, Push down automata	Classroom Teaching and ICT	10
3	Turing machine, Linear Bounded Automata	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Minor Course

Nomenclature of the Course	**Computer Graphics Practical**
Class	SYBSC
Semester	IV
Course Code	24_USCS406
No. of Credits	2
Nature	Practical
Type	Minor

Course Outcomes:

Learners will be able to

CO1: Understand the principles of pixel formation and recognize different types of graphics systems with analysis and implementation of different line drawing algorithms.

CO2: Gain proficiency in implementing circle and ellipse drawing algorithms, as well as understanding and applying 2D transformation concepts using matrices for any graphical shape.

CO3: Explore the concept and application areas of 2D and 3D animation and also gain insights into viewing, clipping, curves, surfaces and object rendering.

The following practical's will be implemented using Python
Minimum 20 practical's to be completed as a journal work.

Syllabus:

Sr No.	Aim of the Practical	Literature
1	Introduction to Computer Graphics	Introduction to Computer Graphics, Applications of Computer Graphics.
2	Introduction to Graphics Systems	Understanding of pixel formation, different types of graphics systems.
3	Illustration of graphics functions.	Syntax of different graphics functions in Python.
4	Designing of simple pictures using python graphics functions.	Using different graphics functions design shapes like vehicles, flowers, fruits, flower pots.
5	Implementation of Stretch Band effects (Freehand Drawing)	Use of different functions and events to draw free hand drawing.
6	Implementation of DDA line drawing algorithm.	Understanding and tracing of DDA line drawing algorithm.
7	Implementation of Bressenham's line drawing algorithm	Understanding and tracing of Bressenham's line drawing algorithm.

8	Implementation of Midpoint line drawing algorithm	Understanding and tracing of Midpoint line drawing algorithm.
9	Implementation of Midpoint circle drawing algorithm	Understanding and tracing of the Midpoint circle drawing algorithm.
10	Implementation of Bressenham's circle drawing algorithm	Understanding and tracing of Bressenham's circle drawing algorithm.
11	Implementation of Ellipse drawing algorithm	Understanding and tracing the Ellipse drawing algorithm.
12	Implementation of 2D transformation- Translation	Concept of translation, translation of points and objects, translation matrix, Implementation of 2D translation for any graphical shape.
13	Implementation of 2D transformation- Rotation	Concept of Rotation, Rotation of object, Rotation matrix, Implementation of 2D rotation for any graphical shape.
14	Implementation of 2D transformation- Scaling	Concept of Scaling, Scaling of object, Scaling matrix, implementation of 2D Scaling.
15	Illustration of 2D Animations with its Applications and Functions	Concept of 2D animation, application areas of 2D animation, animation functions programs for creating simple 2D animations.
16	Implementation of 2D animation using simple graphics functions	Python programs to implement the concept of 2D animation. 1. Simple Animations like change in shape, size, color or structure of an object. 2. Animations like Bouncing ball, Rotating a ball along the wall, linear graph animation, Bar plot race animation, Scatter plot animations.
17	Understanding the concept 3D Animation	Concept of 3D animation with 3D Geometry and some models.
18	Understanding the concept 3D transformations	Concept of 3D transformations like translation, rotation and scaling.
19	Illustration of 2D Viewing	2D Viewing, window to viewport transformation.
20	Illustration of 2D Clipping	Concept of clipping, clipping of various graphical shapes like point, line, polygon.
21	Understanding the concept of Curves	Introduction to Curves and its different types.
22	Understanding the concept of Surfaces	Introduction to surfaces to represent 2D and 3D objects.
23	Illustration to the concept of Object Rendering	Introduction to Object Rendering with its uses and different features.

Prescribed Text/s:

1. "Computer Graphics: Principles and Practice" by John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner

2. "Computer Graphics Through OpenGL: From Theory to Experiments" by Sumanta Guha
3. "Interactive Computer Graphics: A Top-Down Approach with WebGL" by Edward Angel, Dave Shreiner
4. “Python Graphics A reference for creating 2D and 3D images” By B.J.Korites

Other Learning Resources recommended:

1. https://www.geeksforgeeks.org
2. https://babavoss.pythonanywhere.com
3. https://py.processing.org/tutorials
4. https://www.javatpoint.com
5. https://www.tutorialandexample.com

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
All	All practical	Lab sessions with ICT	60

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Generic / Open Elective Course

Nomenclature of the Course	**Cyber Safety**
Class	S.Y.B.Sc
Semester	IV
Course Code	24_USOECS402
No. of Credits	2
Nature	Theory
Type	Open Elective

Course Outcomes:

The learner will be able to

CO1: To understand the familiarity with internet history, cybercrime, information security, computer ethics, and security policies.

CO2: To learn strategies for cyber safety exercises, incident handling, assurance, mobile banking, debit/credit card security, UPI, micro ATMs, e-wallets, and safer social networking practices.

CO3: To learn about social engineering, cybercriminal tactics, prevention methods, cyber security threats and techniques, IT Act compliance, hacker behaviors, web app security, information recovery, and data destruction.

Syllabus:

Unit No.	Unit Title	Subtitles (Learning Points)
1	**Introduction to Cyber Space and Security**	**Introduction to Cyber Space and Security** :- History of Internet, Cyber Crime, Information Security, Computer Ethics and Security Policies, Guidelines to choose web browsers, Securing web browser, Antivirus, Email security, Secure password, Two-steps authentication, Password Manager, Wi-Fi Security, social media security, Basic Security for Windows, User Account Password, Smartphone Security.
2	**Cyber Safety Initiatives in India**	**Cyber Safety Initiatives in India :-** Cyber Safety Exercise, Cyber Safety Incident Handling, Cyber Safety Assurance, Mobile Banking Security, Security of Debit and Credit Card,UPI Security, Security of Micro ATMs, e-wallet Security, Tips and best practices for Safer Social Networking.

3	**Social Engineering, Threats, IT Laws, Data Tools**	**Social Engineering :-** Social Engineering, Types of Social Engineering, How Cyber Criminal Works? How to prevent being a victim of Cyber Crime? **IT Laws :-** Cyber Security Threat and types, Cyber Security Techniques, IT Act. **Data Tools :-** Hackers-Attack-Countermeasures, Web Application Security, Recovering from Information Loss, Destroying Sensitive Information.

Prescribed Text/s (If any):

1. Introduction to Cyber Security, Dr. Jeetendra Pande, Uttarakhand Open University, Haldwani
2. Fundamentals of Information Security, Mr. Manish Koranga,Mr. Ashutosh Bahuguna,Mr. Sani Abhilash, Uttarakhand Open University, Haldwani

Other Learning Resources recommended:

1. "Cyber Attacks and Counter Measures" User Perspective Mr. Rajendra Goswami, ICT Cell, Uttarakhand Open University, Haldwani Er. Samarth Sharma Security Consultant, Wipro Technologies, Bangalore Er. Charanjeet Singh Chawla Wing Commander, Indian Air Force, Ministry of Defence Dr. Jeetendra Pande Assistant Professor, School of CS & IT, Uttarakhand Open University, Haldwani.

Teaching Plan:

Unit No.	Unit Title	Teaching Methods	No. of Lectures
1	Introduction to Cyber Space and Security	Classroom Teaching and ICT	10
2	Cyber Safety Initiatives in India	Classroom Teaching and ICT	10
3	Social Engineering, Threats, IT Laws, Data Tools	Classroom Teaching and ICT	10

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester IV
with Effect from the Academic Year 2024-2025
Discipline Specific Course (DSC)
Skill Enhancement Course

Nomenclature of the Course	**.Net Technologies**
Class	S.Y.B.Sc
Semester	IV
Course Code	24_USCSS407
No. of Credits	2
Nature	Practical
Type	SEC

Course Outcomes:

The learner will be able to :

CO1: To understand Variables ,Data Types, Loops , Methods in C# programing.

CO2: To implement both client-side and server-side validation using validation controls to ensure data integrity and security in web forms.

CO3: To understand the concept of master pages in ASP.NET and their significance in providing a consistent layout and structure across multiple pages within a web application.

The following practical's will be implemented using Visual Studio
Minimum 20 practical's to be completed as a journal work.

Syllabus:

Sr. No.	Aim of the Practical	Literature
1	Write C# programs for understanding C# basics involving a) Variables and Data Types b) Object-Based Manipulation	Understanding of Variables ,Data Types.
2	Write C# programs for understanding C# basics involving a) Conditional Logic b) Loops c) Methods	Understanding of Loops , Methods.
3	Create a simple web page with various server controls to demonstrate setting and use of their properties. (Example : AutoPostBack)	Understanding of various server controls
4	Demonstrate the use of Calendar control to perform following operations.	Concept of Calendar control.

	a) Display messages in a calendar control b) Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference between two calendar dates	
5	Demonstrate the use of Treeview control perform following operations. a) Treeview control and datalist b) Treeview operations	Concept of Treeview control
6	Create an application which will ask the user to input his name and a message, display the two items concatenated in a label, and change the format of the label using radio buttons and check boxes for selection , the user can make the label text bold ,underlined or italic and change its color . include buttons to display the message in the label, clear the text boxes and label and exit.	Introduction of different controls like Radio Buttons, Check Boxes label and TextBox
7	List of employees is available in listbox. Write an application to add selected or all records from listbox (assume multi-line property of textbox is true).	Understanding Listbox.
8	Design ASP.NET page and perform validation using various Validation Controls.	Understanding of Validation Controls.
9	Create Web Form to demonstrate use of Website Navigation controls and Site Map	Introduction of Web Form.
10	Create Web Form to demonstrate use of Ad rotator Control with five advertisements.	Understanding of Ad rotator
11	Performing ADO.NET data access in ASP.NET for Simple Data Binding	Understanding of ADO.NET and Simple Data Binding
12	Design an APS.NET master web page and use it other (at least 2-3) content pages.	Concept of master web page
13	Design and use AJAX based ASP.NET pages.	Concept of AJAX.
14	Illustrate Scripting, Client & Server Side Scripting	Understanding of Client & Server Side Scripting.
15	Discuss What is ASP.net, ASP.NET Features.	Introduction to ASP.NET Features
16	Illustrate Web Form Concept , Standard Controls, Hyperlink, web Server Controls.	Concept of Web Form Control.
17	Discuss Response, Request, About Cookies, Application object, Session Object.	Understanding of Response, Request, About Cookies.

18	Discuss GridView Control.	Introduction to GridView Control.
19	Illustrate Web Services in detail.	Concept of Web Services.
20	Discuss Navigation controls.	Introduction to Navigation controls.
21	Illustrate Menu Control , Treeview Control , SiteMap Path Control.	Concept of Menu Control , Treeview Control , SiteMap Path Control.
22	Discuss what is Web Hosting.	Introduction to Web Hosting.
23	Illustrate how to Deploy ASP.Net application	Steps of deploying ASP.Net application.

Prescribed Text/s (If any):

1. "ASP.NET Core 5 and React: Modern full-stack web development using .NET 5, React 17, and TypeScript 4" by Carl Rippon - This book covers building modern web applications using ASP.NET Core and React.
2. "Pro ASP.NET Core MVC 2" by Adam Freeman - This book is a comprehensive guide to building web applications using ASP.NET Core MVC 2.
3. "ASP.NET Core in Action" by Andrew Lock - This book provides a hands-on guide to building web applications with ASP.NET Core.
4. "ASP.NET Core Application Development: Building an application in four sprints" by James Chambers, David Paquette, and Simon Timms - This book takes a project-based approach to teaching ASP.NET Core development.
5. "Professional ASP.NET Core 3" by Jason De Oliveira, Michel Bruchet, and Antonio Liccardi - This book covers ASP.NET Core 3 and is suitable for both beginners and experienced developers.

Teaching Plan:

Practicals	Unit Title	Teaching Methods	No. of Lectures
All	All Practical's	Lab Session with ICT	60

Evaluation Scheme

For 2 Credit Theory Course:

The allocation of marks for the Internal Assessment and Semester End Examinations are as follows

Evaluation for the course will be of 50 marks conducted in a 30:20 pattern. 30 marks will be for semester end examination and 20 marks will be for internal evaluation.

Internal Evaluation: 20 Marks (40%)

Method	Marks
Mid-Term Class Test ● It should be conducted using any **learning management system** such as **Moodle**(Modular object-oriented dynamic learning environment) ● The test should have **20 MCQ's** which should be solved in a time duration of **40 minutes.**	10
Assignment/ Case study/ Presentations ● Assignment / Case Study Report / Presentation can be uploaded on any **learning management system**.	05
Attendance and behavior	05

Semester End Evaluation: 30 Marks (60%)

Duration: 1 Hour

	All questions are compulsory.			
Question	**Based on**	**Sub-Question**	**Options**	**Marks**
Q.1	Unit I	A	*Any 2 out of 4*	6
		B	*Any 1 out of 2*	4
Q.2	Unit II	A	*Any 2 out of 4*	6
		B	*Any 1 out of 2*	4
Q.3	Unit III	A	*Any 2 out of 4*	6
		B	*Any 1 out of 2*	4

Evaluation Scheme

For Practical Course:

The allocation of marks for the Internal Assessment and Semester End Examinations are as follows

Evaluation for the course will be of 50 marks conducted in a 60: 40 pattern. 30 marks will be for semester end examination and 20 marks will be for internal evaluation.

Evaluation Pattern

Internal Examination: 20 Marks (40%)

Sr No	Criterion	Marks
1	Journals containing minimum 10 practical's which are timely completed with desired output	10
2	Attendance & Practical Performance	10

Semester End Examination: 30 Marks (60%)

Sr No	Criterion	Marks
1	One Practical Question **OR** Combination of Practical Questions **OR** Combination of Practical Question and Theory Question **Duration : 2 Hours**	25
2	Viva	05

Standard of Passing

The learner to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment & Semester End Examination. The learner shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 out of 60) separately, to pass the course and minimum of Letter Grade "P" in the project component, wherever applicable to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment & Semester End Examination together.

Performance Grading:

Letter Grades and Grade Points

Semester GPA/ Program CGPA Semester/Program	**% of Marks**	**Alpha-Sign / Letter Grade Result**
9.00-10.00	90.0 -100	0 (Outstanding)
8.00 ≤ 9.00	80.0 ≤ 90.0	A+ (Excellent)
7.00 ≤ 8.00	70.0 ≤ 80.0	A (Very Good)
6.00 ≤ 7.00	60.0 ≤ 70.0	B+ (Good)
5.50 ≤ 6.00	55.0 ≤ 60.0	B (Above Average)
5.00 ≤ 5.50	50.0 ≤ 55.0	C (Average)
4.00 ≤ 5.00	40.0 ≤ 50.0	P (Pass)
Below 4.00	Below 40	F (Fail)
Ab (Absent)	-	Absent

Date: 04/04/2025 **The Chairperson**

Place:-Ratnagiri **BoS of Computer Science**