



Karmaveer Bhaurao Patil University, Satara

**Syllabus for
B. Sc. III Computer Science (Entire)**

**Under
Faculty of Science and Technology
(As per NEP 2020)**

With effect from Academic Year 2026-2027

Syllabus for Bachelor of Science (B. Sc.) Part – III Computer Science (Entire)

1. **TITLE:** Computer Science (Entire)
2. **YEAR OF IMPLEMENTATION:** 2026-2027
3. **DURATION:** 01 Year
4. **PATTERN:** Semester
5. **MEDIUM OF INSTRUCTION:** English
6. **PRACTICAL BATCHES :** 12 Student/Batch
7. **STRUCTURE OF COURSE:**

As per NEP-2020 (2.0)

Sem (Level)	Courses		VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credit s	Degree/ Cum. Cr. MEME
	Course I	Course II					
	Major Mandatory	Major Elective					
Sem V (5.5)	Major IX (2) Major X (2) Major XI (2) Major P V (2)	Major XII (Elect.) (2) Major P VI (Elect.) (2)	VSC 3 (2) (P) Major specific)	AEC 3 (2) (English)	OJT (4) CEP (2)	22	UG Degree: 132
Sem VI (5.5)	Major XIII (2) Major XIV (2) Major XV (2) Major P VII (2)	Major XVI (Elect.) (2) Major P VIII (Elect.) (2)	VSC 4 (2) (P) Major specific) SEC 3 (2) (P)	AEC 3 (2) (English)	FP (2) CC (2)	22	
Credits	16	08	06	04	10	44	

* Major Elective - 1 Papers out of two for each semester

8. COURSE TITLE

1) Fifth Semester

➤ Semester V Level 5.5

Semester V				
Sr. No.	Components	Course Code	Course	Credits
1	Major IX	BCSET 351	Core Java	02
2	Major X	BCSET 352	C# Programming	02
3	Major XI	BCSET 353	Software Engineering	02
4	Major XII (Electives)	BCSET 354	PHP Programming I	02
		BCSET 355	Basic of Shell Scripting	
5	Major Practical	BCSEP 356	Practical XI	02
6	Major Elective Practical	BCSEP 357	Practical XII	02
7	VSC	BCSEPVSC 3	Git Version Control	02
8	AEC	BCSETAEC 3	English	02
9	OJT	BCSEPOJT 1	On Job Training	04
10	CEP	BCSEPCEP 1	Community Engagement Program	02
Total				22

2) Sixth Semester

➤ Semester VI Level 5.5

Semester VI				
Sr. No	Components	Course Code	Course	Credits
1	Major XIII	BCSET 361	Advanced Java	02
2	Major XIV	BCSET 362	ASP.Net	02
3	Major XV	BCSET 363	Software Testing	02
4	Major XVI (Electives)	BCSET 364	PHP Programming II	02
		BCSET 365	Theoretical Computer Science	
5	Major Practical	BCSEP 366	Practical XIII	02
6	Major Elective Practical	BCSEP 367	Practical XIV	02
7	VSC	BCSEPVSC 4	Fundamentals of MongoDB	02
8	SEC	BCSEPSEC 3	Figma	02
9	AEC	BCSEPAEC 4	English	02
10	CC	BCSETCC 1	Co-curricular Course	02
11	FP	BCSET FP 1	Field Project	02
Total				22
EXIT OPTION: Award of UG Degree in Major with 132 credits OR Continue with Major & Minor.				

VSC: Vocational Skill Course; **AEC:** Ability Enhancement Course, **OJT:** On Job Training, **FP:** Field Project, **CEP:** Community Engagement Program, **T:** Theory, **P:** Practical

9. EVALUATION STRUCTURE:

Semester V (5.5)

Vertical	Course Category	Course Code	Internal Evaluation (Best of Two CCE)			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BCSET 351	10	10	10	30	50	02
	T	BCSET 352	10	10	10	30	50	02
	T	BCSET 353	10	10	10	30	50	02
	P	BCSEP 356	20			30	50	02
DSE (1 Theory Papers Out of 2)	T	BCSET 354	10	10	10	30	50	02
	T	BCSET 355	10	10	10	30	50	02
	P	BCSEP 357	20			30	50	02
AEC	T	AEC 3	10	10	10	30	50	02
VSC	P	BCSEPVSC 3	20			30	50	02
CEP	P	BCSEPCEP 1	20			30	50	02
OJT	P	BCSEPOJT 1	40			60	100	04
Total							550	22

Semester VI

Vertical	Course Category	Course Code	Internal Evaluation (Best of Two CCE)			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BCSET 361	10	10	10	30	50	02
	T	BCSET 362	10	10	10	30	50	02
	T	BCSET 363	10	10	10	30	50	02
	P	BCSEP 366	20			30	50	02
DSE (1Theory Papers Out of 2)	T	BCSET 364	10	10	10	30	50	02
	T	BCSET 365	10	10	10	30	50	02
	P	BCSEP 367	20			30	50	02
AEC	T	AEC 4	10	10	10	30	50	02
VSC	P	BCSEPVSC 4	20			30	50	02
SEC	P	BCSEPSEC 3	20			30	50	02
CC	T	BCSEPCC 1	10	10	10	30	50	02
FP	P	BCSEPFP 1	20			30	50	02
Total							550	22

Abbreviations: DSC: Discipline Specific Course; DSE: Discipline Specific Elective; CCE: Continuous Comprehensive Examination; AEC: Ability Enhancement Course; VSC: Vocational Skill Course; SEC: Skill Enhancement Course; OJT: On Job Training; FP: Field Project; CEP: Community Engagement Program; CC: Co-curricular Course; T: Theory; P: Practical, ESE: End Semester Exam

INTERNAL EVALUATION STRUCTURE

- Internal evaluation of theory papers shall carry a weightage of 40%.
- **Activity:** For the internal evaluation of theory papers following activities will be adopted for CCE I & CCE II: class test/ open book test/ online course/ Industrial review/ Industrial visit/ e learning video creation/ assignment/seminar/ case study/ fieldwork/ project.
- CCE III shall consist of multiple-choice questions.
- Each CCE will carry 10 marks for 2-credit theory papers and 20 marks for 4-credit theory papers, and the best two scores will be considered for final score.
- Internal evaluation of practical papers shall carry a weightage of 40%.
- For practical examinations, internal evaluation will be based on student performance, attendance, journal records, and viva voce.

10. OTHER FEATURES:

A) LIBRARY:

Reference books, Textbooks and journals are available in Institute and Departmental Library. (Separate reference lists are attached along with the respective course syllabus)

B) EQUIPMENT:

1. Computers: 80 Desktop Computers
2. Installed Software: Java, XAMPP, Visual Studio, R Software, MongoDB, Dev C++, Keil, Proteus, Eclipse, Git, MATLAB
3. Smart Classroom Equipment: 4 Smart Digital Screen
4. Projector: 2
5. LED Screen: 2
6. Development Boards / Embedded Systems: Raspberry Pi, Arduino UNO, Arduino Nano
7. Operating Systems Available Windows, Linux (Ubuntu)

11. Syllabus:



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Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – V

Type: Major(DSC) IX

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Core Java (BCSET 351)

Course Objectives: Student should be able to ...

1. learn basic concepts of Java language
2. study the concepts of classes and objects.
3. know the concepts of inheritance, packages, and interfaces.
4. discuss exception handling and multithreading

Course Outcomes: Student will be able to ...

1. implement Object oriented concepts using Java
2. develop Object oriented software application
3. implement multithreading applications
4. use exceptions while executing programs

Module	Title and Contents	Hrs.
Module-1:	Basics of Java	08
	1.1 History and features of Java 1.2 Java Virtual Machine (JVM), JDK tool 1.3 Compilation and execution of java program, Java keywords, Data types. 1.4 Java variables- declaration and assigning values to variables 1.5 Scanner Class, Scope of variables. 1.6 Type casting- Implicit and Explicit casting 1.7 Operators of java, Control structures of java 1.8 Branching statements- If, if..else, if ...else if and switch statement. 1.9 Iterative statements- for loop, do... while, while loop, for each loop, jumping statements-break and continue statement	
Module-2:	Object oriented concepts in Java	07
	2.1 Introduction: Classes, Objects and methods 2.2 Field declaration, method declaration, Accessing class members 2.3 Access modifiers in java, Static variables and methods 2.4 Method overloading 2.5 Constructor- types of constructors, constructor overloading 2.6 Use of this keyword 2.7 Array, types of array 2.8 Collection- List interface, Array List class, Linked List class, Vector class and Stack class	
Module-3:	Inheritance, packages and interfaces	08
	3.1 Inheritance- definition, syntax. 3.2 Types of inheritance, Method overriding 3.3 Difference between method overloading and overriding 3.3 Abstract class and method 3.4 Use of final keyword 3.5 Interface, abstract class 3.6 Packages and its types	

Module-4:	Exception Handling and Multithreading	07
	4.1 Concept of exception, Types of exceptions 4.2 Exception handling: try and catch block, Multiple catch block 4.3 finally block, throws keyword 4.4 User defined exception: throw keyword. 4.5 Concept of Thread, Life cycle of thread start (), run(), sleep(), wait(), stop() 4.6 Multithreading, creating thread by extending Thread class and implementing Runnable interface	
Reference Books: -		
1. H. Schildt, Java: The Complete Reference, McGraw Hill,13th ed., 2025 2. C.S. Horstmann,Core Java, Volume I – Fundamentals, Pearson Education, 13th ed., 2025 3. K.Sierra & B.Bates,Head First Java,O'Reilly Media,3rd ed., 2022 4. E. Balagurusamy, Programming with Java: A Primer,McGraw Hill Education,6th ed., 2019		
Evaluation Pattern:40:60		
Total Marks: 50		
Continuous Comprehensive Evaluation (20 Marks): • CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	End Semester Examination (50 Marks): • Question -1: Solve the following questions. (Five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)	



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Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – V

Type: Major(DSC) X

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: C# Programming (BCSET 352)

Course Objectives: Student should be able to ...

1. study the concept of parameter passing mechanism
2. learn concept of command line argument, typecasting
3. understand control structure, looping statement
4. know array, statics, non-static, dll, exe concepts

Course Outcomes: Student will be able to ...

1. use of command line argument, typecasting in C#
2. implement the use of control structure, looping statement
3. apply the concept of array, statics, non -static, DLL, EXE concepts
4. develop the concept of Inheritance, Interface

Module	Title and Contents	Hrs.
Module-1:	Dot Net Framework	08
	1.1 Overview, component Architecture of .Net framework 1.2 Features of .NET 1.3 Evolution of .net framework 1.4 Meta data and assembly, CLR 1.5 Managed and unmanaged code 1.6 MSIL, JIT Compiler, CTS, CLS 1.7 Compilation and execution process 1.8 NET base classes, namespace	
Module-2:	C# Basics	07
	2.1 Introducing C#, Inside a C# Program 2.2 Compiling and Running the Program, Variables, datatypes 2.2 The Main() Method, Multiple Main() Methods 2.4 Defining & using functions & its scope 2.5 Passing Arguments to Main() 2.6 Parameter passing technique, Console I/O 2.7 Classes and Structs, Class Members, Data Members 2.8 Function Members, read-only Fields, The Object Class 2.9 System Object Methods, The ToString() Method	
Module-3:	Class, Object, Inheritance, Types of Inheritance	08
	3.1 Implementation Inheritance 3.2 Abstract Classes and Functions Sealed Classes and Functions 3.3 Constructors, Interfaces 3.4 Defining and Implementing Interfaces 3.5 Polymorphism 3.6 Method overloading, Operator overloading	
Module-4:	Exception Handling and Threading	07

	4.1 Try, catch for Handling runtime errors. 4.2 Generate exceptions using throw keyword. 4.3 Execute code using finally block 4.4 Nested try, block inside another try block. 4.5 Custom exception 4.6 Threading, Run multiple tasks at same time. 4.7 Applications with Multiple Threads	
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Reference Books: -

1. J. Albahari, B. Albahari, C# 11 in a Nutshell, O'Reilly Media, 1st ed., 2022.
2. A. Troelsen, P. Japikse, Pro C# 10 with .NET 6, Apress, 11th ed., 2022.
3. J. Sharp, Microsoft Visual C# Step by Step, Microsoft Press, 10th ed., 2021.
4. J. Perkins, C# Programming for Beginners, Amazon Digital Services, 1st ed., 2019.
5. C. Nagel, Professional C# and .NET Core 2.0, Wrox, 1st ed., 2018.

Evaluation Pattern: 40:60

Total Marks: 50

Continuous Comprehensive Evaluation (20 Marks): • CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	End Semester Examination (50 Marks): • Question -1: Solve the following questions. (Five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)
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Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester - V

Type: Major(DSC) XI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Software Engineering (BCSET 353)

Course Objectives: Student should be able to ...

1. introduce the principles of software engineering and the software development Life cycle (SDLC).
2. understand software processes, requirements engineering, and design methodologies.
3. provide foundational knowledge of coding, testing, and software maintenance.
4. know unified modelling language

Course Outcomes: Student will be able to ...

1. use Software Engineering Fundamentals.
2. apply Software Development Processes.
3. analyse document and user requirements for software systems.
4. implement unified modelling language

Module	Title and Contents	Hrs.
Module-1:	Introduction to Software Engineering	08
	1.1 Definition and Importance of Software Engineering 1.2 Characteristics of Software 1.3 Software Engineering Ethics and Professionalism 1.4 Software Development Lifecycle (SDLC) Phases: Planning, Analysis, Design, Implementation, Testing, Deployment, Maintenance	
Module-2:	Software Process Models	07
	2.1 Waterfall Model 2.2 Incremental and Iterative Models 2.3 Agile Development 2.4 Spiral and V-Model 2.5 Prototype Model 2.6 RAD Model	
Module-3:	Requirements Engineering & Software Design	08
	3.1 Functional and Non-Functional Requirements 3.2 Requirements Gathering and Analysis 3.3 Use Case Modelling 3.4 Writing Software Requirements Specification (SRS) 3.5 Principles of Software Design (Modularity, Cohesion, Coupling) 3.6 Architectural Design Patterns (e.g., MVC, Layered Architecture)	
Module-4:	UML	07
	4.1 Introduction, Need of UML, 4.2 Use Case Driven Object Oriented Analysis, 4.3 Data Flow Diagrams (DFD) and Entity-Relationship Diagrams (ERD), 4.4 User Interface (UI) and User Experience (UX) Design Basics, 4.5 Use Case Diagram 4.6 Activity Diagram 4.7 Sequence Diagram 4.8 Collaboration Diagram 4.9 Class Diagram 4.10 State Chart Diagram	

Reference Books: -

1. R.S. Pressman, B.R. Maxim, Software Engineering: A Practitioner's Approach, McGraw-Hill Education, 9th ed.,2020.
2. I. Sommerville, Software Engineering, Pearson Education,10th ed., 2015.
3. L.Bass, P.Clements, R. Kazman, Software Architecture in Practice, Addison-Wesley Professional,3rd ed., 2012.
4. R.C. Martin, Clean Code: A Handbook of Agile Software Craftsmanship, Prentice Hall,1st ed.,2008.
5. P.Jalote, Software Engineering: A Precise Approach, Wiley India Pvt. Ltd.,1st ed.,2010.

Evaluation Pattern:40:60**Total Marks: 50****Continuous Comprehensive Evaluation (20 Marks):**

- CCE - I: 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(The Best of two will be considered for the final mark entry)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions.
(Five questions of 2 Marks)
- Question -2: Attempt any two questions.
(Three questions of 10 marks)
- Question -3: Attempt any four questions.
(Six questions of 5 marks)

(50 Marks converted to 30 marks)



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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester - V

Type: Major(DSC) Elective I XII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: PHP Programming I (BCSET 354)

Course Objectives: Student should be able to ...

1. study Basic PHP Programs
2. learn basic concepts of PHP programming Language
3. know Programming logic in PHP.
4. understand skills for writing programs of control structure and looping structure using 'PHP'.

Course Outcomes: Student will be able to ...

1. identify basic PHP syntax, Create basic PHP scripts
2. apply variables, string, and constant to a PHP script
3. use Control and looping structures in PHP.
4. develop Array and Functions in PHP.

Module	Title and Contents	Hrs.
Module-1:	Basics of PHP	08
	1.1 Introduction to PHP and Applications of PHP Language 1.2 Benefits of using PHP Language and Basic PHP Syntax 1.3 Writing and Executing First PHP Program 1.4 Embedding PHP in HTML and HTML in PHP 1.5 Introduction to Different PHP Data Types 1.6 Declaration and Use of Variables in PHP 1.7 Defining and Using PHP Constants 1.8 Type Casting and Data Type Conversion in PHP 1.9 Different Types of Operators in PHP 1.10 PHP Strings and String Handling	
Module-2:	Control Structure & Arrays	07
	2.1 Introduction to Indexed Arrays, Associative Arrays and Multidimensional Arrays 2.2 Sorting of Arrays using Different PHP Sorting Functions 2.3 Introduction to Control Structures and Looping Statements 2.4 Working of If Statement and If Else If Statement 2.5 Use of If Else Statement in Decision Making 2.6 Implementation of Nested If Statement 2.7 Use of Switch Statement for Multiple Conditions 2.8 Use of For Loop for Repetitive Execution 2.9 Working of While Loop in PHP 2.10 Use of Do While Loop with Condition Checking	
Module-3:	PHP OOPS & Functions	08
	3.1 Declaring class and objects 3.2 constructor and destructor 3.3 Inheritance & Polymorphism 3.4 Abstract method and class 3.5 Interface 3.6 Function Definition, Syntax 3.7 Conditional Functions	

	3.8 Functions with parameters 3.9 Function with Relive in Values 3.10 Assigning Default values to function parameters 3.11 Functions with static variables, Passing Array to A Function and returning list 3.13 Nested Functions, Recursive function, Anonymous Functions 3.14 Dynamic Function Calls 3.15 Call Back function Passing array to function	
Module-4:	PHP Forms	07
	4.1 Working with Forms and User Input: HTML forms and form elements 4.2 Retrieving user input with \$_GET and \$_POST 4.3 Form validation and sanitization 4.4 Handling file uploads Designing Form through CSS Elements	
Reference Books: -		
1. T.Butler, K.Yank, PHP & MySQL: Novice to Ninja, SitePoint,6th ed.,2021. 2. M. Zandstra, PHP Objects, Patterns, and Practice, Apress, 6th ed.,2021. 3. R.Nixon, Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, O'Reilly Media, 6th ed.,2021. 4. K.Tatroe, P. MacIntyre, R.. Lerdorf, Programming PHP, O'Reilly Media,4th ed.,2020. 5. J.Lockhart, Modern PHP: New Features and Good Practices, O'Reilly Media, 1st ed., 2015.		
Evaluation Pattern:40:60		
Total Marks: 50		
Continuous Comprehensive Evaluation (20 Marks): • CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	End Semester Examination (50 Marks): • Question -1: Solve the following questions. (Five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)	



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Programme: B.Sc.

Semester – V

Type: Major(DSC) Elective 2 XII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Basic of Shell Scripting (BCSET 355)

Course Objectives: Student should be able to ...

1. understand the fundamentals of shell scripting and its role in automating tasks in Linux environments.
2. study use variables, data types, and operators to store and manipulate data in scripts.
3. learn shell scripts and identify errors for effective troubleshooting.
4. navigate the command-line interface and execute basic shell commands

Course Outcomes: Student will be able to ...

1. debug and troubleshoot shell scripts to resolve errors and optimize performance.
2. develop automate system administration tasks like backups, monitoring, and file handling.
3. use and manage input/output redirection and manipulate files using shell commands.
4. execute shell scripts to automate tasks in Linux/Unix environments.

Module	Title and Contents	Hrs.
Module-1:	Shell Scripting Basic's	08
	1.1 Shell concept 1.2 Types of Shells (Bash, Korn, C Shell, etc.) 1.3 Features and Role of Shell Scripting in Automation 1.4 Basic Linux/Unix Commands (ls, pwd, cd, mkdir, rm, etc.) 1.5 File and Directory Operations 1.6 Concept of Permissions (chmod, chown, chgrp) 1.7 Getting Started with Shell Scripting	
Module-2:	Shell Scripting Fundamentals	08
	2.1 Variables and Data Types 2.2 Defining Variables and Scope, Reading User Input (read) 2.3 Positional Parameters and Special Variables (\$1, \$2, \$?, \$#, etc.). 2.4 Operators in Shell Scripting, Arithmetic Operators (+, -, *, /, %) 2.5 Relational and Logical Operators (==, !=, -lt, -gt, -le, -ge, &&,) 2.6 String Operators and File Test Operators 2.7 Control Structures: If else, else if ladder, nested if, Looping statements, Switch	
Module-3:	Functions in Shell Scripting	07
	3.1 Defining and Calling Functions 3.2 Function Arguments and Return Values 3.3 Recursive Functions 3.4 Handling Files and Directories	
Module-4:	Applications and Tools Integration	07
	4.1 Shell Scripting commands: awk, sed and grep 4.2 Shell Scripting commands: unique, sort, head, tail. 4.3 Automating Tasks with Shell Scripts.	

Reference Books: -

1. R.Ball, Linux Shell Scripting Essentials, United Kingdom, Packt Publishing, 1st ed., 2020.
2. W.E. Shotts, The Linux Command Line: A Complete Introduction, United States, No Starch Press, 2nd ed., 2019.
3. J.Cannon, Linux Command Line and Shell Scripting Bible, United States, Wiley, 3rd ed., 2016.
4. C.Newham, B.Rosenblatt, Learning the Bash Shell, United States, O'Reilly Media, 3rd ed., 2005.
5. A.Robbins, N. F. Beebe, Classic Shell Scripting, United States, O'Reilly Media, 1st ed., 2005.

Evaluation Pattern: 40:60**Total Marks: 50****Continuous Comprehensive Evaluation (20 Marks):**

- CCE - I: 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(The Best of two will be considered for the final mark entry)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions.
(Five questions of 2 Marks)
- Question -2: Attempt any two questions.
(Three questions of 10 marks)
- Question -3: Attempt any four questions.
(Six questions of 5 marks)
- (50 Marks converted to 30 marks)



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Faculty of Science & Technology

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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – V

Type: Major (DSCP) V

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical XI (BCSEP 356)

Course objectives: Student should be able to ...

1. study Basic Java Programs
2. learn Class, object and methods in Java
3. understand the fundamentals of the C# programming language and the .NET framework.
4. know array, statics, non-static, DLL, EXE concepts

Course Outcomes: Student will be able to ...

1. implement Class, object and methods in Java
2. apply object-oriented principles such as encapsulation, inheritance, and polymorphism in C#.
3. develop modular and reusable code using classes, interfaces, and delegates.
4. use exceptions while executing programs

Sr.no	List of Practical	Hrs.
1.	Program to demonstrate variable declaration, initialization, and type casting	60
2.	Program using Scanner class to take user input and perform operations	
3.	Program using arithmetic and logical operators	
4.	Program using if-else to check if a number is positive, negative, or zero	
5.	Program using switch-case	
6.	Program using do-while loop to print a multiplication table	
7.	Program to define a class with fields and methods (student data example)	
8.	Program using try-catch and finally block	
9.	Program on Variables and Data Types	
10.	Create a small console-based calculator using functions for each operation	
11.	Program on Class and Object	
12.	Program on Inheritance	
13.	Write a C# program where you implement Multiple Inheritance using Interfaces	
14.	Exception Handling in C# (Try-Catch, Throw, Finally, Nested Try-Catch, Custom Exception)	
15.	Multithreading in C# (Threads and Thread Priority)	

Reference Books:

1. C.S. Horstmann, Core Java Volume I—Fundamentals, Pearson, 11th ed., 2022.
2. J. Sharp, Microsoft Visual C# Step by Step, Microsoft Press, 10th ed., 2021.
3. H.Schildt, Java: The Complete Reference, McGraw-Hill Education, 11th ed., 18.
4. J.Price, C# for Beginners, Independently Published, 1st ed., 2017.
5. W.Watson, Beginning C# Programming, CreateSpace Independent Publishing Platform, 1st ed., 2015.

Practical Evaluation Pattern: 40:60

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE= 30 Marks



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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – V

Type: Major (DSCP) Elective VI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical XII (BCSEP 357) E-I

Course Objectives: Student should be able to ...

1. introduce the principles of software engineering and the software development Life cycle (SDLC).
2. understand software processes, requirements engineering, and design methodologies
3. know problem-solving skills using functions, object-oriented programming concepts, and reusable code in PHP.
4. learn to design dynamic web applications using forms, user input handling, validation, and file upload techniques.

Course Outcomes: Student will be able to ...

1. apply Software Engineering Fundamentals.
2. analyse user requirements for software systems and gather document
3. discuss modular and object-oriented PHP applications using classes, objects, inheritance, polymorphism, and functions.
4. develop interactive web applications using HTML forms, GET/POST methods, validation, sanitization, and file upload handling.

Sr.no	List of Practical	Hrs.
1.	Implementing Agile Methodology in a Large-Scale Enterprise: A Case Study of Transition Challenges and Successes.	60
2.	Iterative Development in Action: Building a Scalable E-Commerce Platform.	
3.	Requirements Engineering for Smart City Applications: A Case Study in Traffic Management Systems.	
4.	Handling Changing Requirements in Agile Projects: A Real-World Case Study.	
5.	Designing a Scalable and Reliable Software Architecture for Cloud-Based Applications.	
6.	Risk Management in Software Development: A Case Study from the Gaming Industry.	
7.	Applying Waterfall Model in Mission-Critical Systems: Lessons from an Aerospace Software Project	
8.	Program to display "Hello World".	
9.	Program to demonstrate variables, data types, and constants.	
10.	Program to perform arithmetic, logical, and string operations.	
11.	Program to create, display, and sort indexed, associative, and multidimensional arrays.	
12.	Program using if-else, nested if, and switch statements.	
13.	Program using for, while, do-while, and foreach loops.	
14.	Program to demonstrate class, object, constructor, destructor, inheritance, and polymorphism.	
15.	Program to create a form and retrieve data using GET and POST methods.	

Reference Books: -

1. R.S. Pressman, B.R. Maxim, Software Engineering: A Practitioner's Approach, McGraw-Hill Education, 9th ed., 2020.
2. K. Tatroe, P. MacIntyre, R. Lerdorf, Programming PHP, O'Reilly Media, 4th ed., 2020.
3. J. Lockhart, Modern PHP: New Features and Good Practices, O'Reilly Media, 1st ed., 2015.
4. I. Sommerville, Software Engineering, Pearson Education, 10th ed., 2015.
5. L. Bass, P. Clements, R. Kazman, Software Architecture in Practice, Addison-Wesley Professional, 3rd ed., 2012.

Practical Evaluation Pattern: 40:60

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal : 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE= 30 Marks



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester - V

Type: Major (DSCP) Elective VI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical XII (BCSEP 357) E-II

Course Objectives: Student should be able to ...

1. introduce the principles of software engineering and the software development Life cycle (SDLC).
2. develop an understanding of software processes, requirements engineering and design methodologies.
3. build problem-solving skills using functions, file handling, and process automation through shell scripts.
4. enable learners to use shell utilities such as awk, sed, grep, sort, and other tools for text processing and system administration tasks.

Course Outcomes: Student will be able to ...

1. understand Software Engineering Fundamentals.
2. apply Software Development Processes.
3. implement modular shell programs using functions, recursion, and file or directory handling techniques.
4. apply shell scripting with Unix utilities such as awk, sed, grep, sort, uniq, head, and tail to automate real-world system tasks.

Sr.no	List of Practical	Hrs.
1.	Implementing Agile Methodology in a Large-Scale Enterprise: A Case Study of Transition Challenges and Successes.	60
2.	Iterative Development in Action: Building a Scalable E-Commerce Platform.	
3.	Requirements Engineering for Smart City Applications: A Case Study in Traffic Management Systems.	
4.	Handling Changing Requirements in Agile Projects: A Real-World Case Study.	
5.	Designing a Scalable and Reliable Software Architecture for Cloud-Based Applications.	
6.	Risk Management in Software Development: A Case Study from the Gaming Industry.	
7.	Applying Waterfall Model in Mission-Critical Systems: Lessons from an Aerospace Software Project	
8.	Develop a script using positional parameters to display command-line arguments and special variables (\$1, \$2, \$#, \$?).	
9.	Shell script to demonstrate arithmetic, relational, and logical operators.	
10.	Script to check string comparison and file test operators (-f, -d, -r, -w, -x).	
11.	Develop a shell script using if statement to check whether a number is positive or negative.	
12.	Shell script using if-else, else-if ladder, and nested if for student grade classification.	
13.	Shell script using case (switch) statement to build a menu-driven calculator.	
14.	Shell script to demonstrate for loop for printing numbers and tables.	
15.	Shell script using while loop and until loop for factorial and sum of digits.	

Reference Books: -

1. R. Ball, Linux Shell Scripting Essentials, Packt Publishing, 1st ed., 2020.
2. W.E. Shotts, The Linux Command Line: A Complete Introduction, No Starch Press, 2nd ed., 2019.
3. C. Newham, B. Rosenblatt, Learning the Bash Shell, O'Reilly Media, 3rd ed., 2005.
4. A. Robbins, N. F. Beebe, Classic Shell Scripting, O'Reilly Media, 1st ed., 2005.
5. J. Cannon, Linux Command Line and Shell Scripting Bible, Wiley, 3rd ed., 2016

Practical Evaluation Pattern: 40:60**Total Marks: 50****Internal Evaluation (20 Marks):**

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE = 30 Marks



Karmaveer Bhaurao Patil University, Satara

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Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – V

Type: VSC III

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Git Version Control (BCSEPVSC 3)

Course Objectives: Student should be able to ...

1. understand the fundamental concepts of version control and the role of Git in software development.
2. gain proficiency in resolving merge conflicts during team development.
3. acquire knowledge of tagging and release management using Git.
4. develop problem-solving skills by working on real-world version control scenarios

Course Outcomes: Student will be able to ...

1. create and manage project releases using Git tags and versioning techniques.
2. collaborate efficiently on projects by using remote repositories.
3. manage and navigate branching workflows for feature development.
4. resolve merge conflicts independently and maintain code integrity.

Sr.no	List of Practical	Hrs.
1.	Initialize a New Git Repository	60
2.	Add and Commit Files	
3.	Check the Status of Your Repository	
4.	View Commit History	
5.	Create a New Branch	
6.	Make Changes and Switch Branches	
7.	Merge Changes from One Branch to Another	
8.	Undo Local Changes	
9.	Delete Files from the Git Repository	
10.	Clone an Existing Repository	
11.	Connect a Local Repository to a Remote	
12.	Push Local Changes to a Remote Repository	
13.	Pull Remote Changes to Your Local Repository	
14.	Fetch Remote Changes Without Merging	
15.	Create and Tag a Release	

Reference Books: -

1. E. Jane, and A. Skoulikari. Head First Git. Sebastopol, CA: O'Reilly Media, 2022.
2. T. Berglund, and J. Marsman. Git for Teams: A User-Centered Approach to
3. Creating Efficient Workflows in Git. Sebastopol, CA: O'Reilly Media, 2019.
4. Premkumar, Narayan. Mastering Git. Birmingham, UK: Packt Publishing, 2017.
5. Chacon, Scott, and B. Straub. Pro Git. Apress, 2nd ed., 2014

Practical Evaluation Pattern: 40:60

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE=30 Marks



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Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – V

Type: OJT

Marks: 100

Credits: 4

From: A. Y. 2026-27

Name of the Course and Code: On Job Training (BCSEPOJT 1)

Course Objectives: Students should be able to...

1. gain practical exposure to software development, programming, networking, and computer-based work environments.
2. develop technical skills in programming, database management, web development, and data analysis.
3. enhance problem-solving abilities by applying computer science concepts to real-world situations.
4. build professional skills such as communication, teamwork, work ethics, and technical documentation.

Course Outcomes: Upon completion of the OJT, Students will be able to...

1. apply fundamental computer science concepts in practical industrial and IT environments.
2. develop and operate software applications using appropriate programming tools and techniques.
3. analyse and solve real-world problems using programming and computational methods.
4. demonstrate professional behaviour, teamwork, and effective communication in the workplace.

Evaluation Pattern: 40:60

Total Marks: 100

Internal Evaluation: (40 Marks)

Internal Work = 40 Marks

End Semester Examination: (60 Marks)

ESE = 60 Marks

On-Job Training (OJT) in Computer Science (Entire) provides students with practical exposure to the real-world application of computing concepts in industries, software companies, IT organizations, and research institutions. Students gain hands-on experience in programming, software development, database management, networking, cybersecurity, web development, data analysis, and computer-based problem solving. It helps students connect theoretical concepts learned in the classroom with their practical implementation in real-world projects. OJT develops technical skills, logical thinking, problem-solving abilities, teamwork, professional ethics, communication skills, and confidence, preparing students for higher education and future employment in the field of Computer.



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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Computer Science (Entire))**

Programme: B.Sc.

Semester: V

Type: CEP

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course & Code: Community Engagement Programme (BCSEPCEP I)

Course Objectives: Students should be able to...

1. promote understanding of rural culture and values.
2. learn about rural development and agriculture.
3. identify rural social and economic challenges.
4. apply classroom knowledge to real-life situations.

Course Outcomes: Students will be able to...

1. understand rural life and social realities.
2. develop empathy and community engagement.
3. appreciate local knowledge and contributions.
4. contribute to rural socioeconomic development.

Module	Title and Content	Hrs.
	Community Engagement Programme (CEP) The Community Engagement Programme (CEP) is an integral part of the undergraduate curriculum under NEP 2020. It aims to connect students with society by involving them in activities that promote civic responsibility, scientific temper, and sustainable development. This program encourages experiential learning by exposing students to community challenges and enabling them to contribute positively using their academic knowledge and innovative ideas. Rules and Regulations 1) Attendance: Minimum 75% required in all modules. 2) Discipline: Respectful and ethical behavior in the community is mandatory. 3) Documentation: Field diary and report must be handwritten or typed by the student only. 4) Safety: Students must follow safety guidelines and institutional norms during field visits. 5) Consent: No photos or videos of community members without prior permission. 6) The fieldwork conference is part of the timetable and is mandatory. Faculty should hold a fieldwork conference FOREIGHTNIGHTLY for all students. Guidelines for Implementation: 1) The Community Engagement Project should be different from the regular programmes of NSS/NCC/Green Club /F.P., etc. 2) Department shall designate a faculty coordinator for	60

	programme. 3) The programme should be implemented during the semester as per the academic calendar. 4) Collaborations with NGOs, local bodies, and government departments are encouraged for meaningful engagement. 5) Students should work in groups (5–10 members) for field visits and activities. 6) A field diary should be maintained by each student and verified by the faculty. 7) Final assessment should be done jointly by the internal coordinator and an external evaluator based on set criteria. 8) Department should maintain documentary evidence such as photos, attendance, and reports for audit.	
Evaluation Pattern: 40:60		
Total Marks:50		
Internal Evaluation: (20 Marks) Internal Work = 20 Marks	End Semester Examination: (30 Marks) ESE = 30 Marks	

SEMESTER-VI



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Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – VI

Type: Major (DSC) XIII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Advanced Java (BCSET 361)

Course Objectives: Student should be able to ...

1. study the concepts of Swing and javafx.
2. understand Java Database Connectivity.
3. learn Servlet concepts.
4. know and Design Java Server Pages.

Course Outcomes: Student will be able to ...

1. implement skill about AWT.
2. design and implement JDBC.
3. develop servlet concepts.
4. apply JSP.

Module	Title and Contents	Hrs.
Module-1:	Swing and JavaFX	08
	1.1 Swing, Concept 1.2 Component of swing: JFrame, JComponent, JLabel, JTextfield, JCheckbox, JPanel, JRadiobuttons, JTabbed Pane, JButton, JMenu, JTable. 1.3 Introduction to JavaFX: JavaFX, JavaFX Core Components. 1.4 Layout Containers: StackPane, BorderPane, GridPane, FlowPane 1.5 Common Controls: Label, Button, TextField, TextArea, ComboBox 1.6 Event Handling: setOnAction()	
Module-2:	Java Database Connectivity (JDBC)	07
	2.1 Introduction, Types of Drivers 2.2 JDBC program: Connection, PreparedStatement. 2.3 Result Set, Executing commands and SQL queries. 2.4 Discuss with Example.	
Module-3:	Servlet	08
	3.1 Introduction of servlet: servlet working 3.2 Installation, Life cycle of servlet. 3.3 Uses of servlet 3.4 Servlet API: packages- jakarta.servlet , jakarta.servlet.http. 3.5 Session, servlet jdbc	
Module-4:	Java Server Page (JSP)	07
	4.1 Concept, Life cycle methods in JSP 4.2 JSP and Servlet difference 4.3 Components of JSP: Directives. 4.4 Tags, Scripting Elements, Implicit objects of JSP. 4.5 Connecting to database 4.6 Simple application's using JSP	

Reference Books: -

1. S. Jothi, Advanced Java Programming, SciTech , 1st ed., 2021
2. R. White, Java Web Services, CreateSpace, 1st ed., 2020
3. C. Ullman, Beginning JSP, JSF, and Tomcat, Apress , 1st ed., 2017
4. R. Sharan , JSP and Servlets: A Comprehensive Study , PHI Learning , 2nd ed., 2011
5. M. P. Kumar , Web Technology , Tata McGraw-Hill , 1st ed., 2007

Evaluation Pattern: 40:60**Total Marks: 50****Continuous Comprehensive Evaluation (20 Marks):**

- CCE - I: 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(The Best of two will be considered for the final mark entry)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions.
(Five questions of 2 Marks)
 - Question -2: Attempt any two questions.
(Three questions of 10 marks)
 - Question -3: Attempt any four questions.
(Six questions of 5 marks)
- (50 Marks converted to 30 marks)



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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – VI

Type: Major(DSC) XIV

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: ASP. Net (BCSET 362)

Course Objectives: Student should be able to ...

1. study the basic concepts of Exception handling
2. understand concepts of ASP.Net.
3. learn server controls and Database connectivity.
4. know ASP.Net state management.

Course Outcomes: Student will be able to ...

1. implement skill of basics exception handling
2. apply asp.net concepts.
3. design and develop database connectivity using server controls.
4. develop state management

Module	Title and Contents	Hrs.
Module-1:	Windows base Application	08
	1.1 Creating a Windows Form Application 1.2 Standard Controls and Components 1.4 Properties and Events of the controls, Forms 1.4 Form Class, Multiple Document Interface (MDI). 1.5 Custom Controls (user Controls)	
Module-2:	Introduction to ASP.Net	07
	2.1 Web browser, web server 2.2 HTTP request response structure,HTML form elements 2.4 GET/POST method 2.5 Client side and server-side programming. 2.6 Web form lifecycle 2.7 Page events. 2.8 Visual studio IDE.	
Module-3:	Server Controls and Database connectivity	08
	3.1 Textbox, Listcontrols, LinkButton, Imagemap, Image 3.2 ImageButton, FileUpload Calender, Literal control, RadioButton, Checkbox Validation Controls 3.3 Navigation controls- Menu, TreeView, SiteMapPath, Master Page 3.4 Sitemap, Sitemap Datasource 3.5 Database: Connections, command 3.6 Data adapters, and datasets, name spaces 3.7 Connection to database using MS-Access 3.8 SQL Server	
Module-4:	ASP.Net State Management	07
	4.1 Cross page postback property of button 4.2 Response.Redirect, Server.transfer 4.3 Response.Write, Client Side: Hiddenfield control 4.4 View State, Cookies 4.5 Server Side: Session 4.6 Application, Global.asax.	

Reference Books: -

1. J.Shah, Hands-On C# with .NET Core, Packt Publishing, 1st ed., 2023.
2. A.Troelsen, P. Japikse, Pro C# 10 with .NET 6, Apress, 11th ed., 2022.
3. A.Freeman, Essential C# 10.0, Apress, 1st ed., 2022.
4. G. Andrew D. Nathan, Advanced C# Programming, Independently Published, 1st ed., 2021.
5. M.Cox, Mastering C# Concurrency, Packt Publishing, 1st ed., 2020.

Evaluation Pattern: 40:60**Total Marks: 50****Continuous Comprehensive Evaluation (20 Marks):**

- CCE - I: 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(The Best of two will be considered for the final mark entry)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions.
(Five questions of 2 Marks)
 - Question -2: Attempt any two questions.
(Three questions of 10 marks)
 - Question -3: Attempt any four questions.
(Six questions of 5 marks)
- (50 Marks converted to 30 marks)



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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – VI

Type: Major(DSC) XV

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Software Testing (BCSET 363)

Course Objectives: Student should be able to ...

1. discuss various software testing issues.
2. learn how to plan, and design test cases.
3. manage software problems and defects.
4. know and generate a testing report

Course Outcomes: Student will be able to ...

1. apply software testing knowledge and engineering methods.
2. design test cases.
3. implement test cases.
4. develop defect report

Module	Title and Contents	Hrs.
Module-1:	Introduction to Testing	08
	1.1 Introduction to Software testing 1.2 Testing Objectives 1.3 Testing principles and Testing fundamentals 1.4 Types of Testing 1.5 White Box Testing and Types 1.6 Black Box Testing and Types	
Module-2:	Software Testing Strategies	07
	2.1 Software Testing Process 2.2 Unit Testing 2.3 Integration Testing- Top-down, Bottom up 2.4 System Testing 2.5 Acceptance Testing (alpha, Beta testing) 2.6 Big Bang Approach 2.7 Performance Testing 2.8 Regression Testing 2.9 Load Testing	
Module-3:	Software Testing Life Cycle	08
	3.1 Overview of the stages of STLC 3.2 Test strategy, Test planning and Test design 3.3 Test execution, Test reporting and Test Case Design, 3.4 Entry criteria, Exit Criteria, Test Cases for Entry and Exit Criteria	
Module-4:	Defect Life Cycle	07
	4.1 Bug/Defect Life Cycle 4.2 Difference between Bug and Defect, Failure, Error, 4.3 Defect Tracking and Reporting 4.4 Types of Bugs, Identifying the Bugs, Reporting the Bugs 4.5 Introduction to automated testing- Install and configure selenium testing tool	

Reference Books: -

1. G. J. Myers, C.Sandler, T.Badgett, The Art of Software Testing, John Wiley & Sons, 3rd ed.,2011.
2. I.Burnstein, Practical Software Testing: A Process-Oriented Approach, Springer,1st ed., 2003.
3. M.Fewster, D.Graham, Software Test Automation: Effective Use of Test Execution Tools, Addison-Wesley Professional, 1st ed.,1999.
4. C.Kaner, J.Falk, H.Nguyen, Testing Computer Software, John Wiley & Sons,2nd ed., 1999.
5. B.Beizer, Black-Box Testing: Techniques for Functional Testing of Software and Systems, John Wiley & Sons,1st ed., 1995.

Evaluation Pattern:40:60**Total Marks: 50****Continuous Comprehensive Evaluation (20 Marks):**

- CCE - I: 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(The Best of two will be considered for the final mark entry)

End Semester Examination (50 Marks):

- Question -1: Solve the following questions.
(Five questions of 2 Marks)
- Question -2: Attempt any two questions.
(Three questions of 10 marks)
- Question -3: Attempt any four questions.
(Six questions of 5 marks)

(50 Marks converted to 30 marks)



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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester - VI

Type: Major(DSC) Elective 1XVI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: PHP Programming II (BCSET 364)

Course Objectives: Student should be able to ...

1. study the concepts of Object-oriented Programming in PHP.
2. understand Exception handling in PHP.
3. design, and develop applications in PHP using mysql.
4. learn Web development in PHP

Course Outcomes: Student will be able to ...

1. develop PHP program using oops concept.
2. implement PHP program using Exception Handling.
3. use skill of connecting database using PHP.
4. design and develop Project.

Module	Title and Contents	Hrs.
Module-1:	Exception Handling 1.1 Introduction to Errors and Exceptions 1.2 Exception Handling Constructs in PHP 1.3 try, catch, finally blocks 1.4 The throw statement 1.5 Built-in Exception Classes 1.6 Exception class 1.7 creating Custom Exception Classes 1.8 Extending the Exception class 1.9 Advanced Exception Handling 1.10 Multiple catch blocks 1.11 Nested try-catch	08
Module-2:	Web Development in PHP 2.1 Static and dynamic web pages, 2.2 Communication between HTML and PHP 2.3 HTML Special chars() function 2.4 Form validation 2.5 Handling Multi- Valued form fields 2.6 Uploading a file in PHP.	07
Module-3:	MYSQL 3.1 Introduction to Databases 3.2 Installation 3.3 Connection with MySQL 3.4 Creating database 3.5 Creating tables 3.6 Inserting values in table 3.7 Displaying, changing, searching, deleting records from the table	08

Module-4:	PHP Session & application 4.1 Session Management and Cookies 4.2 Understanding sessions and cookies 4.3 Creating and destroying sessions 4.4 Storing session data 4.5 Managing user authentication and authorization 4.6 Website application 4.7 Login application Registration application, etc.	07
Reference Books: -		
1. T.Butler, K.Yank, PHP & MySQL: Novice to Ninja, SitePoint, 6th ed., 2021. 2. M.Zandstra, PHP Objects, Patterns, and Practice, Apress, 6th ed., 2021. 3. R.Nixon, Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, O'Reilly Media, 6th ed.,2021. 4. K.Tatroe, P.MacIntyre, R.Lerdorf, Programming PHP, O'Reilly Media, 4th ed., 2020. 5. J.Lockhart, Modern PHP: New Features and Good Practices, O'Reilly Media,1st ed., 2015.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Continuous Comprehensive Evaluation (20 Marks): • CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)	End Semester Examination (50 Marks): • Question -1: Solve the following questions. (Five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)	



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Programme: B.Sc.

Semester - VI

Type: Major(DSC) Elective 2 XVI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Theoretical Computer Science (BCSET 365)

Course Objectives: Student should be able to ...

1. understand and apply the concepts of formal languages and automata theory.
2. analyse the computational power of different models of computation.
3. study various grammar types and their applications.
4. understand the fundamentals of computability and complexity theory.

Course Outcomes: Student will be able to ...

1. use the fundamental concepts of automata theory and formal languages.
2. design and analyse finite automata, regular expressions, and grammars.
3. develop context-free grammars and design pushdown automata for various languages
4. apply automata theory concepts to solve problems in compiler design, parsing, and language processing.

Module	Title and Contents	Hrs.
Module-1:	Finite Automaton	08
	1.1 Introduction: Symbol, Alphabet, String, Prefix & Suffix of Strings, 1.2 Formal Language, Operations on Languages. 1.3 Deterministic finite Automaton – Definition, DFA as language recognizer, DFA as pattern recognizer. 1.4 Nondeterministic finite automaton – Definition and Examples. 1.5 NFA To DFA (Myhill Nerode Method) 1.6 NFA with ϵ - transitions Definition and Examples. 1.7 NFA with ϵ -Transitions to DFA & Examples 1.8 Finite automaton with output – Mealy and Moore machine, Definition and Examples. 1.9 Minimization of DFA, Algorithm & Problem using Table Method.	
Module-2:	Regular Expressions and Languages	07
	2.1 Regular Expressions (RE): Definition & Example 2.2 Regular Expressions Identities. 2.3 Regular Language-Definition and Examples. 2.4 Conversion of RE to FA-Examples. 2.5 Pumping lemma for regular languages and applications. 2.6 Closure Properties of regular Languages	
Module-3:	Context-Free Grammars and Languages	08
	3.1 Grammar - Definition and Examples. 3.2 Derivation-Reduction - Definition and Examples. Chomsky Hierarchy. 3.3 CFG: Definition & Examples. LMD, RMD, Parse Tree 3.4 Ambiguous Grammar: Concept & Examples. 3.5 Simplification of CFG: Removing Useless Symbols, Unit Production, ϵ - production and Nullable Symbol. 3.6 Normal Forms: Greibach Normal Form (GNF) and Chomsky Normal Form (CNF)	

	3.7 Regular Grammar: Definition. 3.8 Left linear and Right Linear Grammar-Definition and Example. 3.9 Equivalence of FA & Regular Grammar	
Module-4:	Push Down Automata	07
	4.1 Definition of PDA and examples.	
	4.2 Construction of PDA using empty stack and final State	
	4.3 method: Examples using stack method.	
	4.4 Definition DPDA & NPDA, their correlation and Examples of NPDA	
	4.5 CFG (in GNF) to PDA: Method and examples	
Reference Books: -		
1. M.Sipser, Introduction to the Theory of Computation, Cengage Learning,3rd ed.,2012. 2. J.C. Martin, Introduction to Languages and the Theory of Computation, McGraw-Hill Education, 4th ed., 2010. 3. S.Arora, B.Barak, Computational Complexity: A Modern Approach, Cambridge University Press,1st ed., 2009. 4. J. E. Hopcroft, R.Motwani, J.D. Ullman, Introduction to Automata Theory, Languages, and Computation, Addison-Wesley,3rd ed.,2006. 5. H.R. Lewis, C.H. Papadimitriou, Elements of the Theory of Computation, Prentice Hall,2nd ed.,1997.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Continuous Comprehensive Evaluation (20 Marks): • CCE - I: 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (The Best of two will be considered for the final mark entry)		End Semester Examination (50 Marks): • Question -1: Solve the following questions. (Five questions of 2 Marks) • Question -2: Attempt any two questions. (Three questions of 10 marks) • Question -3: Attempt any four questions. (Six questions of 5 marks) (50 Marks converted to 30 marks)



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(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science & Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc. III

Semester - VI

Type: Major (DSCP) VII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical XIII (BCSEP 366)

Course Objectives: Student should be able to ...

1. study the concepts of Swing.
2. learn the concept of Server control
3. know the basic concepts of Exception handling
4. explore concepts of ASP.Net.

Course Outcomes: Student will be able to ...

1. implement the concept of Server control
2. design and implement JDBC.
3. develop ASP.Net concepts.
4. apply database connectivity.

Sr.no	List of Practical	Hrs.
1.	Create a Swing application using basic components: JLabel, JTextField, JButton,	60
2.	JCheckBox, and JRadioButton with input validation.	
3.	Create Swing applications for displaying a message, login form validation, JTable	
4.	for student data, and menu using JMenuBar.	
5.	Design a JavaFX form using GridPane with TextField, PasswordField, and	
6.	TextArea.	
7.	Create JavaFX interfaces using BorderPane, FlowPane, and StackPane with	
8.	multiple UI elements and view switching.	
9.	Programs to connect to MySQL, insert student data using PreparedStatement, and	
10.	display records using ResultSet.	
11.	Create servlets to print a message, accept form data, and manage login/logout	
12.	sessions using HttpSession.	
13.	Connect servlet with JDBC to fetch and display database data on a webpage.	
14.	Create a Windows Form Application that accepts two numbers and displays the	
15.	sum.	
	Create a login form using standard controls (TextBox, Label, Button)Basic HTML	
	Form with Input Controls	
	ASP.NET Web Form using GET and POST Methods	
	Web Page Lifecycle, Request/Response Flow, Client-side and Server-side	
	Scripting	
	Validation Controls, Navigation Controls, and Master Page	
	Create a .NET application and demonstrate the installation and use of a NuGet	
	package.	
	Database Connectivity with MS Access / SQL Server using GridView	
	State Management, Cross Page Postback, and University Master Page	

Reference Books: -

1. J.Shah, Hands-On C# with .NET Core, Packt Publishing, 1st ed., 2023.
2. A.Troelsen, Philip Japikse, Pro C# 10 with .NET 6, Apress, 11th ed., 2022.
3. A.Freeman, Essential C# 10.0, Apress, 1st ed., 2022.
4. G.Ghosh, Java Web Applications, BPB Publications, 1st ed., 2021.
5. B.Kurniawan, Developing Java Web Services, Apress, 1st ed., 2013.

Practical Evaluation Pattern:40:60

Total Marks: 50	
Internal Evaluation (20 Marks): • Journal: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): ESE=30 Marks



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Board of Studies in Computational Sciences (Computer Science (Entire))

Programme: B.Sc.

Semester – VI

Type: Major (DSCP) Elective VIII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical XIV (BCSEP 367)

Course Objectives: Student should be able to ...

1. discuss various software testing issues.
2. learn how to plan, and design test cases
3. design, and develop applications in php using mysql.
4. know Web development in PHP

Course Outcomes: Student will be able to ...

1. design test cases.
2. develop test cases.
3. use skill of connecting database using php.
4. implement Project.

Sr.no	List of Practical	Hrs.
1.	Login Page Testing	60
2.	Calculator Functionality	
3.	Shopping Cart Validation	
4.	Simple Performance Test	
5.	Registration Form Testing	
6.	Bug Reporting for a Simple App	
7.	Automated Login Test	
8.	Top-Down Integration Test	
9.	Function in PHP that throws an exception if a number is less than zero.	
10.	Write a script that uses try and catch to handle division by zero.	
11.	Write a PHP script to start a session and store a username in a session variable	
12.	PHP script to check if a session variable is set and print a message like "User is logged in" or "User is not logged in".	
13.	Program to create static and dynamic web page using PHP.	
14.	PHP script to destroy the session and log the user out.	
15.	Program on Data Connectivity.	

Reference Books: -

1. R.Nixon, Learning PHP, MySQL & JavaScript: With jQuery, O'Reilly Media, 6th ed., 2021.
2. K.Tatroe, P.MacIntyre, R.Lerdorf, Programming PHP, O'Reilly Media, 4th ed., 2020.
3. J.Lockhart, Modern PHP: New Features and Good Practices, O'Reilly Media, 1st ed., 2015.
4. I.Burnstein, Practical Software Testing: A Process-Oriented Approach, Springer, 1st ed., 2003.
5. C.Kaner, J.Falk, H.Nguyen, Testing Computer Software, John Wiley & Sons, 2nd ed., 1999.

Practical Evaluation Pattern: 40:60

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE = 30 Marks



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Programme: B.Sc.

Semester – VI

Type: Major (DSCP) Elective VIII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical XIV (BCSEP 367)

Course Objectives: Student should be able to ...

1. understand and apply the concepts of formal languages and automata theory.
2. analyse the computational power of different models of computation.
3. study various grammar types and their applications.
4. know the fundamentals of computability and complexity theory.

Course Outcomes: Student will be able to ...

1. apply software testing knowledge and engineering methods.
2. create plan test cases.
3. develop context-free grammars and design pushdown automata for various languages
4. apply automata theory concepts to solve problems in compiler design, parsing, and language processing.

Sr.no	List of Practical	Hrs.
1.	Login Page Testing	60
2.	Registration Form Testing	
3.	Shopping Cart Validation	
4.	Simple Performance Test	
5.	Bug Reporting for a Simple App	
6.	Calculator Functionality	
7.	Automated Login Test	
8.	Top-Down Integration Test	
9.	Design a Deterministic Finite Automaton (DFA) that accepts strings over the alphabet $\{0, 1\}$ where the number of 1s is even.	
10.	Construct a Non-deterministic Finite Automaton (NFA) that accepts strings over the alphabet $\{a, b\}$ that contain at least one 'a'.	
11.	Convert the NFA from the previous question into an equivalent DFA using the subset construction method.	
12.	Design a Mealy machine that outputs '1' when the input string contains an even number of 'a's and '0' otherwise.	
13.	Write a regular expression for the language consisting of strings over $\{a, b\}$ that end with 'ab'.	
14.	Convert the regular expression from the previous question into an NFA.	
15.	Use the pumping lemma to prove that the language $\{a^n b^n \mid n \geq 0\}$ is not regular.	

Reference Books: -

1. D.Schmalstieg, T.Hollerer, Augmented Reality: Principles and Practice, Addison-Wesley Professional, 1st ed., 2016.
2. A.Nee, Springer Handbook of Augmented Reality, Springer, 1st ed., 2022.
3. I.Burnstein, Practical Software Testing: A Process-Oriented Approach, Springer, 1st ed., 2003.
4. C.Kaner, J.Falk, H.Nguyen, Testing Computer Software, John Wiley & Sons, 2nd ed., 1999.
5. R.Mall, Software Testing and Quality Assurance: Theory and Practice, Pearson Education India, 1st ed., 2009.

Practical Evaluation Pattern: 40:60	
Total Marks: 50	
Internal Evaluation (20 Marks): • Journal: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): ESE = 30 Marks



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Programme: B.Sc.

Semester – VI

Type: VSC IV

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Fundamentals of MongoDB (BCSEPVSC 4)

Course Objectives: Student should be able to ...

1. learn to create, read, update, and delete data in mongodb using shell commands and mongodb drivers.
2. know the creation of efficient schema designs for relational and non-relational data.
3. understand powerful query operators, filtering, sorting, and projection techniques to retrieve and manipulate data.
4. explore and manage indexes to optimize query performance and improve system efficiency.

Course Outcomes: Student will be able to ...

1. efficiently use mongodb shell, Compass, and mongodb Atlas for database management and querying.
2. develop efficient and scalable data models for applications, using embedded documents or references as needed.
3. execute create, read, update, and delete operations on mongodb databases, and understand when to use each type of operation.
4. write complex queries using MongoDB's query operators, aggregation framework, and indexes to retrieve and manipulate data.

Sr.no	List of Practical	Hrs.
1.	Install MongoDB locally or use MongoDB Atlas for cloud-based databases.	60
2.	Start the MongoDB shell and explore basic commands (show dbs, use <dbname>, etc.).	
3.	Install and set up MongoDB Compass for graphical database management.	
4.	Create a database and collections using MongoDB shell (use, createCollection).	
5.	Create collections and insert documents into them.	
6.	Use insertOne() and insertMany() to add data to MongoDB.	
7.	Use find() and findOne() to retrieve documents.	
8.	Modify documents using updateOne() and updateMany().	
9.	Use deleteOne() and deleteMany() to remove documents.	
10.	Apply filters with operators like \$gt, \$lt, \$eq, and \$in.	
11.	Use projections to include/exclude fields in query results.	
12.	Implement sort(), limit(), and skip() in queries for pagination.	
13.	Use regular expressions for string pattern matching in queries.	
14.	Query embedded documents and arrays using dot notation.	
15.	Combine \$and, \$or, \$not operators in queries	

Reference Books: -

1. K.Chodorow, MongoDB: The Definitive Guide, O'Reilly Media, 4th ed., 2021.
2. S. S.Raj, MongoDB for Developers: A Guide to Build Scalable and Efficient Applications, Apress, 1st ed., 2021.
3. S. Banks, Mastering MongoDB 4.x: A Practical Guide to Database Design, Data Modeling, and Query Optimization, Packt Publishing, 1st ed., 2020.

4. M.Meijer, Practical MongoDB Aggregations, Independent Publishing,1st ed., 2020.
5. P.Harrison, MongoDB Applied Design Patterns, O'Reilly Media,1st ed., 2019.

Practical Evaluation Pattern: 60:40

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE = 30 Marks



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Programme: B.Sc.

Semester - VI

Type: SEC III

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Figma (BCSEPSEC 3)

Course Objectives: Student should be able to ...

1. identify Understand the interface, tools, and functionalities of Figma.
2. learn to design wireframes, prototypes, and high-fidelity interfaces for web and mobile applications.
3. know the creation and management of reusable components and design systems
4. gain hands-on experience with advanced features like Auto Layout, prototyping, and interactive components.

Course Outcomes: Student will be able to ...

1. navigate and utilize Figma's tools and features efficiently.
2. create professional wireframes and prototypes for diverse applications.
3. develop reusable components, styles, and scalable design systems.
4. implement responsive design principles for interfaces across different devices and screen sizes.

Sr.no	List of Practical	Hrs.
1.	Familiarize yourself with Figma's interface, menus, and tools.	60
2.	Design a wireframe for a single webpage.	
3.	Experiment with Figma's text tools, applying different fonts, weights, and alignments.	
4.	Create and use a button component in multiple frames.	
5.	Design a form using Figma's Auto Layout feature.	
6.	Link two frames to create a simple click-through prototype.	
7.	Learn to mask images into shapes and apply effects.	
8.	Design a simple icon (e.g., a search or home icon).	
9.	Design a responsive layout for desktop and mobile.	
10.	Create a button component with different states (e.g., default, hover, disabled).	
11.	Add interactions like hover effects or slide animations to a prototype.	
12.	Build complex UI element (e.g., a card) using nested components.	
13.	Work on a file with a teammate to explore real-time collaboration.	
14.	Design a layout using a custom grid system.	
15.	Create a style guide with typography, color, and components.	

Reference Books:-

1. T.Green, K.Brandon, UX Design with Figma: User-Centered Interface Design and Prototyping with Figma, Apress, 1st ed., 2024.
2. A.Sharma, Ultimate Figma for UI/UX Design, Self-published, 1st ed.,2024.
3. F.Staiano, Designing and Prototyping Interfaces with Figma, Packt Publishing, 1st ed.,2022.

4. J.Yablonski, Laws of UX: Using Psychology to Design Better Products & Services, O'Reilly Media, 1st ed.,2020.
5. A.Kholmatova, Design Systems: A Practical Guide to Creating Design Languages for Digital Products, Smashing Magazine, 1st ed.,2017.

Practical Evaluation Pattern: 60:40

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

ESE = 30 Marks



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Programme: B.Sc.

Semester - VI

Type: FP

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Field Project (BCSETFP 1)

Course Objectives: Students should be able to...

1. apply theoretical knowledge to real-world situations
2. develop research, observation and analytical skills
3. encourage interdisciplinary and experiential learning
4. enhance problem-solving and communication skills

Course Outcomes: Students will be able to...

1. apply subject knowledge, technical skills, tools, and appropriate methodologies to identify and address a real-world problem during the field project.
2. analyze the identified field problem, collected information/data, existing practices, and project requirements to determine suitable solutions.
3. develop and implement a suitable project solution/product/model based on the identified field problem and documented requirements.
4. prepare and present a systematic field project report and effectively communicate the methodology, findings, results, challenges, and outcomes to relevant stakeholders.

A field project for students is a practical learning activity where students study real-world physics application outside the classroom. The project can be done individually or in group under faculty guidance, with report writing and presentation included. It helps students connect theory with observation, improve research skills and understanding the use of physics in daily life.

Practical Evaluation Pattern: 40:60

Total Marks: 50

Internal Evaluation: (20 Marks)

Internal Work = 20 Marks

End Semester Examination: (30 Marks)

ESE = 30 Marks

Bachelor of Science (B. Sc.) Part - III: Computer Science

Semester VI

C.C. (Co-Curricular) (Credit 2)

Evaluation Pattern: 40:60

Total Marks: 50

Internal Evaluation: (20 Marks)

Internal Work = 20 Marks

End Semester Examination: (30 Marks)

ESE = 30 Marks