



Karmaveer Bhaurao Patil University, Satara

**Syllabus for
B. Sc. III Computer Science**

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

With effect from Academic Year 2026-2027

Syllabus for Bachelor of Science Computer Science Part III

PREAMBLE:

This syllabus is framed to give sound knowledge with an understanding of Computer Science to undergraduate students in the third year of B.Sc. degree course. It has been designed to meet the specific needs of B.Sc. Computer Science students in accordance with the NEP 2020 guidelines.

It is an integrated degree in the Faculty of Science, plays a crucial role in modern education. The rapid growth of technology makes it essential to revise the existing Computer Science syllabus. This revision is a sincere effort to move toward a knowledge-driven and technology-oriented era.

It aims to equip students with both theoretical understanding and practical skills. Students from the science faculty must become competent in adapting to technological changes. The updated syllabus focuses on developing confidence in handling computers and related tools. It enables students to write and understand programs in various programming languages. Practical exposure to computer systems and peripherals is also emphasized. The curriculum ensures a strong foundation in programming skills and problem-solving abilities. By the end of the year, students will gain confidence and competence in the field of Computer Science.

1. TITLE: Computer Science

2. YEAR OF IMPLEMENTATION: From 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)

Sem (Level)	Courses		VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credits
	Course I	Course II				
	DCS Mandatory	DSE Elective				
Sem V (5.5)	DSC IX (2) DSC X (2) DSC XI (2) DSC P V (2)	DSE XII (Elect.) (2) DSE P I(Elect.) (2)	VSC III (2) (P) (Major specific)	AEC III (2) (English)	OJT (4) CEP (2)	22
Sem VI (5.5)	DSC XIII (2) DSC XIV (2) DSC XV (2) DSC P VI (2)	DSE XVI (Elect.) (2) DSE P (Elect.) (2)	VSC IV (2) (P) (Major specific) SEC III (2) (P) (Major specific)	AEC III (2) (English)	FP (2) CC (2)	22

8. COURSE TITLE

1) Semester V

Semester V				
Sr. No	Components	Course Code	Course	Credits
1	DSC IX	BCST 351	Algorithmic Techniques	02
2	DSC X	BCST 352	Software Engineering	02
3	DSC XI	BCST 353	Web Technology	02
4	DSEXII	BCST 354	Python Programming	02
	DSEXII	BCST 355	Computer Graphics	
5	DSC Practical V	BCSP 356	Practical based on theory paper BCST 351 & BCST 352	02
6	DSE Practical VI	BCSP 357	Practical based on theory paper BCST 353 & BCST 354	02
			Practical based on theory paper BCST 353 & BCST 355	
7	VSC	BCSPVSC III	Agile Project Management	02
8	AEC	BCSTAEC III	English	02
9	OJT	BCSPOJT I	On Job Training	04
10	CEP	BCSPCEP-1	Community Engagement Programme	02
Total				22

2) Semester VI

Semester VI				
Sr. No	Components	Course Code	Course	Credits
1	DSC XIII	BCST 361	C # Programming	02
2	DSC XIV	BCST 362	React JS	02
3	DSC XV	BCST 363	Artificial Intelligence	02
4	DSE XVI	BCST 364	Data Analysis using Python	02
	DSE XVI	BCST 365	Multimedia Systems	
5	DSC Practical VII	BCSP 366	Practical based on theory paper BCST 361 & BCST 362	02
6	DSE Practical VIII	BCSP 367	Practical based on theory paper BCST 363 & BCST 364	02
			Practical based on theory paper BCST 363 & BCST 365	
7	VSC	BCSPVSC IV	Open CV for AI Solution	02
8	SEC	BCSP SEC III	R Programming	
9	AEC	BCSTAEC IV	English	02
10	FP	BCSPFP I	Field Project in Computer Science	04
11	CC	BCSTCC I	Co-curricular Course in Computer Science	02
Total				22

9. EVALUATION STRUCTURE:

Semester V (5.5)

Vertical	Course Category	Course Code	Internal Evaluation			ESE	Total Mark s	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BCST 351	10	10	10	30	50	02
	T	BCST 352	10	10	10	30	50	02
	T	BCST 353	10	10	10	30	50	02
	P	BCSP 356	20			30	50	02
DSE (1 Theory Papers Out of 2)	T	BCST 354	10	10	10	30	50	02
	T	BCST 355	10	10	10	30	50	02
	P	BCSP 357	20			30	50	02
AEC	T	AEC III	10	10	10	30	50	02
VSC	P	BCSPVSC III	20			30	50	02
CEP	P	BCSPCEP I	20			30	50	02
OJT	P	BCSPOJT I	40			60	100	04
Total							550	22

Semester VI (5.5)

Vertical	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BCST 361	10	10	10	30	50	02
	T	BCST 362	10	10	10	30	50	02
	T	BCST 363	10	10	10	30	50	02
	P	BCSP 366	20			30	50	02
DSE (1 Theory Papers Out of 2)	T	BCST 364	10	10	10	30	50	02
	T	BCST 365	10	10	10	30	50	02
	P	BCSP 367	20			30	50	02
AEC	T	AEC IV	10	10	10	30	50	02
VSC	P	BCSPVSC IV	20			30	50	02
SEC	P	BCSPSEC III	20			30	50	02
CC	T	BCSTCC I	10	10	10	30	50	02
FP	P	BCSPFP I	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

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

B) EQUIPMENT:

1. Computer =120 Computers
2. Software: - Dev C++, Turbo C7, Oracle, JDK, Ubuntu, StarUML, Adobe Photoshop, Visual Studio, Jupyter Notebook, Scala, Tableau, Hadoop.
3. LCD projector=2
4. Smart board= 5



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc. III

Semester - V

Type: DSC IX

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Algorithmic Techniques (BCST 351)

Course Objectives: Students should be able to...

- 1) understand the fundamental concepts of algorithms, algorithm specification, performance analysis, time and space complexity, and asymptotic notations.
- 2) study divide-and-conquer, decrease-and-conquer, transform-and-conquer, and brute-force techniques to solve computational problems.
- 3) learn algorithms using recurrence relations, asymptotic notations, and best, worst, average, and amortized case analysis.
- 4) design efficient algorithms using greedy techniques for optimization, spanning tree, shortest path, and other computational problems.

Course Outcomes: Students will be able to...

- 1) explain the fundamental concepts of algorithms, their characteristics, specifications, correctness, performance measures, and asymptotic notations.
- 2) apply divide-and-conquer, decrease-and-conquer, transform-and-conquer, and brute-force techniques to solve problems such as searching, sorting, and string matching.
- 3) analyze the time and space complexity of algorithms using recurrence relations, growth of functions, and best, worst, average, and amortized case analysis.
- 4) evaluate greedy algorithms for activity selection, fractional knapsack, job sequencing, Huffman coding, minimum spanning tree, and shortest path problems.

Module	Title and Contents	Hrs.
Module -1:	Introduction & Analysis of Algorithms 1.1 Fundamentals: definition, characteristics, steps in designing an algorithm, types of problems (sorting, searching, graph, optimization). 1.2 Algorithm specification: pseudo code conventions, flowcharts (basic idea), input-output specification. 1.3 Performance analysis: time complexity, space complexity, input size and its role, cases in analysis: best case, worst case, average case, amortized analysis (basic idea). 1.4 Asymptotic notations: Big-O (O) – Upper bound, Big-Ω (Omega) – Lower bound, Big-Θ (Theta) – Tight bound, Little-o and Little-ω (intro level), Growth of Functions, Recurrence Relation, Algorithm Correctness.	08
Module -2:	Divide and Conquer 2.1 Concept: divide problem into subproblems, solve recursively, combine solutions, general structure: divide → conquer → combine. 2.2 Applications: binary search, merge sort, quick sort, sorting details: merge sort and quick sort. 2.3 Advanced applications: Strassen's matrix multiplication, closest pair of points (basic idea). 2.4 Recurrence analysis, advantages & limitations.	07

Module -3:	Decrease, Conquer and Brute Force 3.1 Decrease and conquer strategy: decrease-by-1, decrease-by-constant factor, decrease-by-variable size. 3.2 Transform and conquer, brute force approach: definition and characteristics, exhaustive search. 3.3 Examples: linear search, bubble sort, selection sort, string matching (naive method), complexity analysis: comparison with efficient methods, trade-offs. 3.4 Advantages and disadvantages.	08
Module -4:	Greedy Algorithms & Shortest Path Algorithms 4.1 Greedy method – concept. 4.2 Properties of greedy algorithms: greedy choice property and optimal substructure. 4.3 General greedy strategy. 4.4 Standard greedy problems: activity selection problem, fractional knapsack problem, job sequencing with deadlines, huffman coding, minimum spanning tree (greedy) (prim's algorithm and kruskal's algorithm), single source shortest path (dijkstra's algorithm and bellman-ford algorithm), all-pairs shortest path (added).	07
Reference Books: - 1) S. S. Skiena, 'The Algorithm Design Manual', Springer, Cham, Switzerland, 3rd Edition, 2020. 2) M. T. Goodrich, R. Tamassia and M. H. Goldwasser, 'Data Structures and Algorithms in Python', John Wiley & Sons, Hoboken, New Jersey, 2013. 3) T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, 'Introduction to Algorithms', MIT Press, Cambridge, Massachusetts, 3rd Edition, 2009. 4) E. Horowitz, S. Sahni and S. Rajasekaran, 'Fundamentals of Computer Algorithms', Universities Press, Hyderabad, 2nd Edition, 2008. 5) S. Dasgupta, C. Papadimitriou and U. Vazirani, 'Algorithms', McGraw-Hill Education, New York, 2008.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) (Best of two CCE) • CCE - I: 10 Marks • CCE - II: 10 Marks • CCE - III: 10 Marks	End Semester Examination (50 Marks): (50 Marks converted to 30 marks) • Question -1: 10 M (2x5=10M) • Question - 2: 20 M (2x10=20M) • Question -3: 20 M (4x5=20M)	



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – V

Type: DSC X

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Software Engineering (BCST 352)

Course Objectives: Students should be able to...

- 1) understand the core concepts, characteristics, challenges, and costs of software engineering.
- 2) know the Software Development Life Cycle (SDLC), its phases, activities, and different software development approaches.
- 3) learn software testing strategies and project management principles to ensure software quality and successful project execution.
- 4) design appropriate software development and testing strategies based on project requirements and quality objectives.

Course Outcomes: Students will be able to...

- 1) apply the fundamental concepts, characteristics, and phases of the Software Development Life Cycle (SDLC).
- 2) select and apply suitable software process models based on project requirements and constraints.
- 3) construct a formal Software Requirements Specification (SRS) document based on given software requirements.
- 4) collaborate and apply software engineering principles effectively while working in teams to develop software projects.

Module	Title and Contents	Hrs.
Module -1:	Introduction to Software Engineering 1.1 Definition of software, types of software, characteristics of software. 1.2 Definition of software engineering, need for software engineering, software engineering process. 1.3 Software crisis & challenges, software engineering costs, system engineering vs software engineering. 1.4 Mc Call's Quality Model, overview of SDLC (Software Development Life Cycle).	08
Module -2:	Software Development Process Models 2.1 Software process & process models, waterfall model, incremental model. 2.2 Evolutionary models: prototyping model spiral model, rad (rapid application development). 2.3 Agile methodology, extreme programming (XP), component-based software engineering (CBSE). 2.4 Case tools: overview of case, classification of case tools.	07
Module -3:	Software Requirement Analysis & Specification 3.1 System requirements vs software requirements, requirement analysis. 3.2 Types of requirements: functional requirements, non-functional requirements, domain requirements, user requirements, and requirement elicitation techniques: interviews, scenarios, use cases, and viewpoints. 3.3 Feasibility study, modeling techniques: data flow diagrams (DFD), entity relationship diagram (ERD), data dictionary. 3.4 Requirement validation, software requirement specification (SRS): structure	08

	of SRS, contents of SRS.	
Module -4:	Software Testing & Quality Assurance 4.1 Software Testing fundamentals, Verification vs Validation, Testing techniques: black-box testing, white-box testing. 4.2 Levels of testing: unit testing, integration testing, system testing, and interface testing. 4.3 Alpha testing & beta testing, regression testing, test case design, debugging concepts. 4.4 Quality assurance (SQA) - quality management activities, Software Quality Standards: Iso 9000, Capability Maturity Model (CMM).	07
Reference Books: - 1) M. Felderer and G. H. Travassos, 'Handbook on Teaching Empirical Software Engineering', Springer, Cham, Switzerland, 1st Edition, 2024. 2) G. Orosz, 'The Software Engineer's Guidebook', Pragmatic Bookshelf, Raleigh, North Carolina, 1st Edition, 2023. 3) I. Sommerville, 'Engineering Software Products: An Introduction to Modern Software Engineering', Pearson, Harlow, United Kingdom, 1st Edition, 2020. 4) R. Mall, 'Fundamentals of Software Engineering', PHI Learning, New Delhi, India, 5th Edition, 2018. 5) R. S. Pressman and B. R. Maxim, 'Software Engineering: A Practitioner's Approach', McGraw-Hill, New York, United States, 7th Edition, 2010.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) (Best of two CCE) • CCE - I: 10 Marks • CCE - II: 10 Marks • CCE - III: 10 Marks	End Semester Examination (50 Marks): (50 Marks converted to 30 marks) • Question -1: 10 M (2x5=10M) • Question - 2: 20 M (2x10=20M) • Question -3: 20 M (4x5=20M)	



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Computer Science)

Programme: B.Sc.

Semester – V

Type : DSC XI

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Web Technology (BCST 353)

Course Objectives: Students should be able to...

- 1) understand the concepts and components of client-server architecture and their role in web application development.
- 2) learn Java technologies to develop basic web applications using appropriate frameworks, components, and programming techniques.
- 3) develop web applications through project-based learning by integrating programming, database, and web development skills.
- 4) Identify different web-related technologies, tools, protocols, and standards used in modern web application development.

Course Outcomes: Students will be able to...

- 1) explain the fundamentals of web protocols and client-server communication.
- 2) apply appropriate web-related technologies and tools for web application development.
- 3) analyze data handling mechanisms in web systems.
- 4) evaluate web security vulnerabilities and appropriate measures for securing web applications.

Module	Title and Contents	Hrs.
Module -1:	Web Essentials 1.1 Introduction to web technology, basic web architecture, role of the client and server, Static vs. Dynamic web pages. 1.2 History of scripting technologies: HTML as a foundation, early use of inline scripting, limitations of static HTML. 1.3 Introduction to WWW: Protocols and programs, HTTP Status Codes, HTTP Request message, HTTP response message, secure connections. 1.4 Web development strategies, web site planning and design issues, application and development tools.	08
Module -2:	Web Development Process 2.1 HTML: structure of html document, HTML elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms. 2.2 CSS: Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors. 2.3 XML: Introduction to XML, XML key component, Transforming XML into XSLT. 2.4 Introduction to JSON, AJAX: AJAX Architecture, Actions.	08
Module -3:	Introduction to Client-Side Programming 3.1 Introduction to JavaScript, Basic Syntax. 3.2 Variables and data types, statements, operators, literals, functions. 3.3 JavaScript Objects–properties, references, methods, constructors, Arrays, other built-in objects, Debugging JavaScript. 3.4 Introduction to Host Objects, Document Object Model (DOM), Document tree, DOM event handling, jQuery, YUI Library.	07

Module -4:	Server Side Technologies 4.1 Introduction to Server Side technology, Servlet: Introduction to 4.2 Servlet, need and advantages, Servlet. 4.3 Lifecycle, creating and testing of sample Servlet, session management. 4.4 JSP: Introduction to JSP, advantages of JSP over Servlet, elements of JSP page: directives, comments, scripting elements, actions and templates. 4.5 JDBC Connectivity with JSP. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.	07
Reference Books: - 1) A. Bretz and C. J. Ihrig, 'Full Stack JavaScript Development with MEAN', Packt Publishing, Birmingham, United Kingdom, 1st Edition, 2017. 2) J. Duckett, 'JavaScript and JQuery: Interactive Front-End Web Development', Wiley, Indianapolis, Indiana, 1st Edition, 2014. 3) R. W. Sebesta, 'Programming the World Wide Web', Pearson Education, Boston, Massachusetts, 4th Edition, 2007. 4) H. M. Deitel, P. J. Deitel and A. Deitel, 'Internet & World Wide Web: How to Program', Pearson Education, Boston, Massachusetts, 3rd Edition, 2006. 5) M. Hall and L. Brown, 'Core Web Programming', Pearson Education, Upper Saddle River, New Jersey, 2nd Edition, 2001.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) (Best of two CCE) • CCE - I: 10 Marks • CCE - II: 10 Marks • CCE - III: 10 Marks		End Semester Examination (50 Marks): (50 Marks converted to 30 marks) • Question -1: 10 M (2x5=10M) • Question - 2: 20 M (2x10=20M) • Question -3: 20 M (4x5=20M)



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – V

Type : DSEXII

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Python Programming (BCST 354)

Course Objectives: Students should be able to...

- 1) explain the fundamental concepts and programming constructs of Python.
- 2) understand Object-Oriented Programming concepts in Python applications.
- 3) design Graphical User Interfaces using Python libraries.
- 4) develop problem-solving and programming skills using Python.

Course Outcomes: Students will be able to...

- 1) summarize the features, advantages, and applications of Python as a scripting language.
- 2) demonstrate Python programming constructs in developing applications.
- 3) illustrate the fundamental principles and features of Python programming.
- 4) construct database-oriented and GUI-based applications using Python.

Module	Title and Contents	Hrs.
Module -1:	Fundamentals of Python Programming 1.1 History, features, writing and executing python scripts, structure of a python program. 1.2 Interpreters, variables, names and assignment, types input and output statements. 1.3 Data types- int, float etc., literals, strings, lists, tuples, sets, dictionaries. 1.4 Indentation, atoms, identifiers and keywords, python operators.	08
Module -2:	Creating Python Programs and Structures 2.1 Control statements (looping- while loop, for loop, loop control, conditional statement- if...else, difference between break, continue and pass). 2.2 Date & time, modules, functions: - defining and calling functions, arguments, return values, *args, **kwargs, lambda functions, recursion. 2.3 Modules & packages: - importing modules (import, from, as), standard libraries (math, random, datetime), creating user defined modules 2.4 Exception handling: - try, except, finally, else, built-in exceptions, custom exceptions, file handling: opening/closing files, reading/writing text and CSV files, file methods and modes	08
Module -3:	Object Oriented Programming 3.1 Concept of classes and objects, creating classes and objects, attributes and methods self-keyword, constructors (__init__() method), types of constructors, destructors (__del__() method). 3.2 Inheritance and its types, method overriding and super(), polymorphism (overloading and overriding concepts). 3.3 Encapsulation and data hiding, access specifiers (public, protected, private), abstraction and abstract classes. 3.4 Introduction to regular expressions, pattern matching, special characters and metacharacters, functions of re module (match, search, findall, sub).	07
Module -4:	Creating the GUI Form, Database Interaction and Libraries 4.1 Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox,	07

	Menubutton, Menu. 4.2 Message, Radiobutton, Layout Management, SQL Database connection using python. 4.3 Creating and searching tables Reading and storing config information on database. 4.4 Numpy, Pandas, Matplotlib, Scipy Only Introduction.	
Reference Books: - 1) M. C. Brown, 'Python: The Complete Reference', McGraw Hill Education, New Delhi, India, 2018. 2) C. Severance, 'Python for Informatics: Exploring Information', CreateSpace Independent Publishing, Ann Arbor, Michigan, 1st Edition, 2013. 3) J. V. Guttag, 'Introduction to Computation and Programming Using Python', Prentice Hall of India, New Delhi, India, 1st Edition, 2013. 4) T. A. Budd, 'Exploring Python', Tata McGraw-Hill, New Delhi, India, 1st Edition, 2011. 5) M. Lutz, 'Learning Python', O'Reilly Media, Sebastopol, California, 4th Edition, 2009.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) (Best of two CCE) • CCE - I: 10 Marks • CCE - II: 10 Marks • CCE - III: 10 Marks	End Semester Examination (50 Marks): (50 Marks converted to 30 marks) • Question -1: 10 M (2x5=10M) • Question - 2: 20 M (2x10=20M) • Question -3: 20 M (4x5=20M)	



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester – V

Type: DSE XII

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Computer Graphics (BCST 355)

Course Objectives: Students should be able to...

- 1) understand the basics of various input and output computer graphics.
- 2) make the student present the content graphically.
- 3) gain knowledge about graphics hardware and software.
- 4) learn various 2D and 3D objects transformation techniques.

Course Outcomes: Students will be able to...

- 1) identify the fundamental concepts, components, and applications of computer graphics.
- 2) differentiate between various graphics hardware, software, and display technologies.
- 3) utilize 2D and 3D geometric transformations for manipulating graphical objects.
- 4) formulate graphical solutions for real-world problems using suitable graphics algorithms and techniques.

Module	Title and Contents	Hrs.
Module -1:	Basic of Computer Graphics 1.1 Overview of computer graphics, computer graphics application and software. 1.2 Description of some graphics devices, input devices for operator interaction, active and passive graphics devices, display technologies. 1.3 Storage tube graphics displays, calligraphic refresh graphics displays, raster refresh (Raster-Scan) graphics displays. 1.4 Cathode ray tube basics, color CRT raster scan basics, video basics. The video controller, random-scan display processor, LCD displays.	08
Module -2:	Graphics Primitive 2.1 Graphics programming, initializing the graphics. 2.2 Graphical functions, simple programs point plotting techniques. 2.3 Qualities of good line drawing algorithms. 2.4 The digital differential analyzer (DDA), Bresenham's algorithm, generation of circles.	07
Module -3:	Two-Dimensional and Three-Dimensional Transformations 3.1 Introduction of transformations, types, transformations and matrices. transformation conventions. 3.2 homogeneous coordinates and matrix representation of 2D and 3D transformations. 3.3 Translations, rotation, reflection, scaling, shearing. 3.4 Combined transformation, transformation of points.	07
Module -4:	Clipping Techniques and OpenGL 4.1 Clipping, need for clipping. 4.2 Types of clipping, point clipping, line clipping, text clipping, mid-point subdivision line clipping algorithm. 4.3 Drawing polygon, introduction to OpenGL, Features in OpenGL, OpenGL	08

	operations. abstractions in OpenGL – GL, GLU & GLUT, 3D viewing pipeline, viewing. 4.4 Matrix specifications, a few examples and demos of OpenGL programs.	
Reference Books:-		
1) E. Angel and D. Shreiner, ‘Interactive Computer Graphics: A Top-Down Approach with WebGL’, Pearson, Boston, Massachusetts, 8th Edition, 2021. 2) P. Shirley, M. Ashikhmin, S. Marschner and S. Ahn, ‘Fundamentals of Computer Graphics’, CRC Press, Boca Raton, Florida, 5th Edition, 2021. 3) D. D. Hearn, M. P. Baker and W. Carithers, ‘Computer Graphics with OpenGL’, Pearson, Boston, Massachusetts, 4th Edition, 2015. 4) J. F. Hughes, A. van Dam, M. McGuire, D. F. Sklar, J. D. Foley, S. K. Feiner and K. Akeley, ‘Computer Graphics: Principles and Practice’, Addison-Wesley, Boston, Massachusetts, 3rd Edition, 2014. 5) A. N. Sinha and A. D. Udai, ‘Computer Graphics’, New Age International, New Delhi, India, 2nd Edition, 2014.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) (Best of two CCE) • CCE - I: 10 Marks • CCE - II: 10 Marks • CCE - III: 10 Marks		End Semester Examination (50 Marks): (50 Marks converted to 30 marks) • Question -1: 10 M (2x5=10M) • Question - 2: 20 M (2x10=20M) • Question -3: 20 M (4x5=20M)



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester – V

Type: DSC P V

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical based on theory paper BCST 351 & BCST 352 (BCSP 356)

Course Objectives: Students should be able to...

- 1) explain different algorithm design techniques and their uses.
- 2) calculate the time and space complexity of algorithms.
- 3) describe the main stages of software development processes.
- 4) show different system modeling techniques used in software development.

Course Outcomes: Students will be able to...

- 1) implement algorithms using appropriate design techniques and differentiate their performance.
- 2) formulate solutions to computational problems using suitable algorithmic techniques.
- 3) construct SRS documents and UML diagrams for given software systems.
- 4) utilize software testing and estimation techniques for evaluating software projects.

Sr. No.	Content	Hrs.
1.	Programs on algorithm analysis.	60
2.	Programs on recursion & recurrence.	
3.	Programs on searching algorithms.	
4.	Programs on sorting algorithms.	
5.	Programs on traversal.	
6.	Programs on greedy algorithms.	
7.	Programs on graph algorithms.	
8.	Programs on shortest path & string matching.	
9.	Prepare a software requirements specification (SRS) document for a given system.	
10.	Identify domain classes from a given problem statement.	
11.	To draw model uml diagrams including class diagram, sequence diagram, use case diagram, and to capture use case scenarios for a given system.	
12.	Develop an entity-relationship (E-R) model and draw data flow diagrams (DFD) for a given application.	
13.	Model state chart diagram and activity diagram for a system.	
14.	Estimate project metrics for a software project.	
15.	Design test suites for a given application.	

Reference Books: -

- 1) T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, 'Introduction to Algorithms', MIT Press, Cambridge, Massachusetts, 4th Edition, 2022.
- 2) I. Sommerville, 'Software Engineering', Pearson, Boston, Massachusetts, 10th Edition, 2016.

- 3) R. S. Pressman and B. R. Maxim, 'Software Engineering: A Practitioner's Approach', McGraw-Hill, New York, United States, 8th Edition, 2015.
- 4) A. Levitin, 'Introduction to the Design and Analysis of Algorithms', Pearson, Boston, Massachusetts, 3rd Edition, 2012.
- 5) P. Jalote, 'An Integrated Approach to Software Engineering', Springer, New York, United States, 3rd Edition, 2005.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation (20 Marks):

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – V

Type: DSE P VI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and code: Practical based on theory paper BCST 353 & BCST 354 (BCSP 357)

Course Objectives: Students should be able to...

- 1) learn the basics of the Internet and web architecture.
- 2) use HTML, CSS, and JavaScript for front-end web development.
- 3) describe the basic concepts and syntax of Python.
- 4) solve problems using Python programming techniques.

Course Outcomes: Students will be able to...

- 1) construct static and dynamic web pages using HTML, CSS, and JavaScript.
- 2) demonstrate client-side validation and interactive features using JavaScript.
- 3) develop modular Python programs using functions and standard libraries.
- 4) organize and manipulate Python data structures such as lists, tuples, dictionaries, and sets.

Sr. No.	Content	Hrs.
1.	Create a college website using HTML tags.	60
2.	Design and implement a simple calculator using Java Script for operations like addition, multiplication, subtraction, division, square of number etc.	
3.	Add a simple script using Click event.	
4.	Create Employee details using schemas.	
5.	Draw an image in flash and work with different layers.	
6.	Creating a banner – Typography and Animation with different layers with adding sounds.	
7.	Create an Image Gallery with Lightbox effects using JavaScript.	
8.	Create Dynamic web application using JSP & MySQL. e.g.: - Students Registration System and Perform database operations (CRUD Operations using JSP + JDBC).	
9.	Write a Python program to demonstrate the use of variables, data types, and type casting, to accept user input and display the result using different operators, implement a Python script to check if a number is even or odd using if-else, create a program to display the Fibonacci series using loops.	
10.	Demonstrate list, tuple, set, and dictionary operations. Write a Python function to calculate factorial using recursion.	
11.	Create a module with multiple functions and import it in another script. Write a program to handle division by zero using exception handling. Write a program to handle division by zero using exception handling.	
12.	Develop a program to read and write data to a text file. Write a Python script to read data from a CSV file and print it. Create a class 'Student' with attributes and methods	

	to display student details.	
13.	Demonstrate inheritance by creating a base class and a derived class. Configuring the MySQL connection, designing the python GUI database	
14.	Write a generator function to yield even numbers up to a limit.	
15.	Write a program using regular expressions to validate email addresses.	
Reference Books: - 1) M. C. Brown, 'Python: The Complete Reference', McGraw Hill Education, New Delhi, India, 2018. 2) A. Bretz and C. J. Ihrig, 'Full Stack JavaScript Development with MEAN', Packt Publishing, Birmingham, United Kingdom, 1st Edition, 2017. 3) J. Duckett, 'JavaScript and JQuery: Interactive Front-End Web Development', Wiley, Indianapolis, Indiana, 1st Edition, 2014. 4) C. Severance, 'Python for Informatics: Exploring Information', CreateSpace Independent Publishing, Ann Arbor, Michigan, 1st Edition, 2013. 5) R. W. Sebesta, 'Programming the World Wide Web', Pearson Education, Boston, Massachusetts, 4th Edition, 2007.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) - Q.1 Student Performance = 5M - Q.2 Oral = 5M - Q.3 Journal = 10 M		End Semester Examination: (30 M) Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B. Sc.

Semester – V

Type: DSE P VI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practical based on theory paper BCST 353 & BCST 355 (BCSP 357)

Course Objectives: Students should be able to...

- 1) identify the fundamental concepts of the Internet and web architecture.
- 2) demonstrate the use of HTML, CSS, and JavaScript for front-end web development.
- 3) describe the basic concepts and syntax of the Python programming language.
- 4) practice problem-solving techniques using Python programming.

Course Outcomes: Students will be able to...

- 1) construct static and dynamic web pages using HTML, CSS, and JavaScript.
- 2) demonstrate client-side validation and interactive features using JavaScript.
- 3) develop modular programs using Python functions and standard libraries.
- 4) manipulate Python data structures such as lists, tuples, dictionaries, and sets.

Sr. No.	Content	Hrs.
1.	Create a college website using HTML tags.	60
2.	Design and implement a simple calculator using Java Script for operations like addition, multiplication, subtraction, division, square of number etc.	
3.	Add a simple script using Click event.	
4.	Create Employee details using schemas.	
5.	Draw an image in flash and work with different layers.	
6.	Creating a banner – Typography and Animation with different layers with adding sounds.	
7.	Create an Image Gallery with Lightbox Effects using JavaScript.	
8.	Create Dynamic web application using JSP & MySQL. E.g:- Students Registration System and Perform database operations (CRUD Operations using JSP + JDBC).	
9.	Introduction to various graphics commands.	
10.	Develop the DDA line drawing algorithm.	
11.	Draw basic graphics construction.	
12.	Program to define functions in graphics.	
13.	Translation, rotation, and scaling using composite transformation.	
14.	Implement standard perspective projection in 3- dimensions, implement point clipping, to implement OpenGL programming.	
15.	Draw a rectangle, triangle, and ellipse using graphics primitives.	

Reference Books: -

- 1) S. Marschner and P. Shirley, 'Fundamentals of Computer Graphics', CRC Press, Boca Raton,

Florida, 5th Edition, 2021.

- 2) A. Bretz and C. J. Ihrig, 'Full Stack JavaScript Development with MEAN', Packt Publishing, Birmingham, United Kingdom, 1st Edition, 2017.
- 3) A. B. Downey, 'Think Python: How to Think Like a Computer Scientist', Green Tea Press, Needham, Massachusetts, 2nd Edition, 2015.
- 4) J. Duckett, 'JavaScript and JQuery: Interactive Front-End Web Development', Wiley, Indianapolis, Indiana, 1st Edition, 2014.
- 5) R. W. Sebesta, 'Programming the World Wide Web', Pearson Education, Boston, Massachusetts, 4th Edition, 2007.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation: (20 M)

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc

Semester – V

Type: Vocational Skill Course III

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Practicals Based on Agile Project Management System (BCSPVSC III)

Course Objectives: Students should be able to...

- 1) know the basic principles, values, and practices of Agile software development.
- 2) describe the Scrum and Kanban frameworks and their use in software projects.
- 3) learn Agile practices to manage team sprints and large-scale software projects.
- 4) use industry-standard tools such as Jira and Git for Agile project management and software development.

Course Outcomes: Students will be able to...

- 1) interpret Cumulative Flow Diagrams and cycle-time measurements to monitor project progress.
- 2) configure repositories, branches, and digital Kanban boards using appropriate tools.
- 3) maintain repositories and track the complete history of project changes using Git.
- 4) combine different development branches into a main repository using Git merging techniques.

Sr. No	Content	Hrs.
1.	Introduction to scrum & sprint planning. Set up a scrum team structure for a sample project.	60
2.	Define product backlog items, estimate story points using planning poker, and create a sprint goal for a 2-week sprint.	
3.	User story mapping & backlog refinement: build a user story map for a web app (e.g., an online bookstore).	
4.	Sprint review & demo: prepare and deliver a sprint review for a completed mock sprint. Present the working increment to stakeholders, collect feedback, and update the product backlog accordingly.	
5.	Building your first kanban board: design a kanban board for a software support team. Define columns (backlog → in progress → review → done) and populate with work items.	
6.	WIP limits & bottleneck analysis: run a kanban simulation. Experiment with different WIP limits and observe the effect on flow, cycle time, and throughput.	
7.	Basic Linux and git commands — ls, mkdir, cd, nano, init, commit & branch, install git, configure user settings, initialize a repository.	
8.	Make commits with meaningful messages, and push the files to GitHub.	
9.	Create/switch between branches and perform merge and pull/push operations.	
10.	Practice the basic git workflow on a small html project.	
11.	Case study: college website using Jira framework.	
12.	Case study: risks in planning hospital management website.	

13.	Case Study: Mobile App for Food Delivery (Agile Iteration).	
14.	Case Study: Online Learning Platform (Kanban).	
15.	Case Study: Software Bug Fixing Project.	
Reference Books: -		
1) T. J. Kloppenborg, ‘Contemporary Project Management: Plan-Driven and Agile Approaches’, Cengage Learning, Boston, Massachusetts, 5th Edition, 2024.		
2) D. K. Rigby, S. Elk and S. Berez, ‘Doing Agile Right: Transformation Without Chaos’, Harvard Business Review Press, Boston, Massachusetts, 1st Edition, 2020.		
3) J. P. Lander, ‘R for Everyone: Advanced Analytics and Graphics’, Pearson Education, Noida, India, 2nd Edition, 2018.		
4) Project Management Institute, ‘Agile Practice Guide’, Project Management Institute, Newtown Square, Pennsylvania, 1st Edition, 2017.		
5) R. Hoda, J. Noble and S. Marshall, ‘Agile Project Management’, Victoria University of Wellington and Monash University Research, Wellington, New Zealand, 2010.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) - Q.1 Student Performance = 5M - Q.2 Oral = 5M - Q.3 Journal = 10 M		End Semester Examination: (30 M) Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – V

Type: OJT I

Marks: 100

Credits: 4

From: A. Y. 2026-27

Name of the Course & Code: On Job Training (BCSP OJT I)

Course Objectives: Students should be able to...

- 1) practical exposure: Bridge skill gaps by providing hands-on work experience in real-world environments.
- 2) industry alignment: Foster cooperation with local industries, MSMEs, and craft centers to match market demands.
- 3) experiential learning: Shift focus from rote memorization to active, experience based learning and problem-solving.
- 4) career readiness: Equip students with 21st-century skills, professional ethics, and an understanding of workplace dynamics.

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

- 1) demonstrate proficiency in domain-specific technical tasks and job roles mapped with National Occupational Standards (NOS).
- 2) exhibit improved communication, teamwork, leadership, and adaptability in professional settings.
- 3) apply analytical abilities to resolve practical operational challenges on-site.
- 4) display higher self-reliance and readiness for entrepreneurship or immediate workforce entry.

Title and Content

On-the-Job Training provides students with practical exposure to real-world applications of Computer Science in software companies, IT industries, technology organizations, research laboratories and other professional environments. Students gain hands-on experience in programming, software development, database management, web and application development, data analysis, testing, debugging, and modern computing technologies. It helps students connect theoretical concepts learned in the classroom with their practical implementation in real-world projects. OJT develops technical and programming skills, problem-solving abilities, teamwork, communication skills, professional ethics, adaptability and confidence, thereby preparing students for higher education, internships, employment and careers in the IT and software industry.

Evaluation Pattern: 40:60

Total Marks: 100

Internal Continuous Evaluation: (40 M)

- Q.1 Internal Work = 40M

End Semester Examination: (60 M)

- Q. 1 = 60 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – V

Type: CEPI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course & Code: Community Engagement Programme (BCSP CEP-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.

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 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.

60

- | | |
|---|--|
| 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 Continuous Evaluation: (20 M)	End Semester Examination: (30 M)
---	---

- | | |
|---|---|
| <ul style="list-style-type: none"> • Q.1 Internal Work = 20M | <ul style="list-style-type: none"> • Q. 1 = 30 M |
|---|---|



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – VI

Type: DSC XIII

Marks: 50

Credits: 2

From: A. Y. 2026-2027

Name of the Course and Code: C# Programming (BCST 361)

Course Objectives: Students should be able to...

- 1) learn algorithms using C#.NET, VB.NET, and ASP.NET programming technologies.
- 2) describe the .NET Framework and its major components used in application development.
- 3) know Object-Oriented Programming concepts and their implementation in C#.
- 4) understand Windows-based applications using standard controls and components.

Course Outcomes: Students will be able to...

- 1) demonstrate advanced C# concepts such as multithreading, exception handling, and reflection.
- 2) utilize C# features such as properties, indexers, delegates, events, and namespaces in application development.
- 3) construct ASP.NET web applications using different types of controls and data-binding techniques.
- 4) establish database connectivity in ASP.NET applications using ADO.NET and perform file and database operations.

Module	Title and Contents	Hrs.
Module -1:	Introduction to .Net 1.1 An overview of C#, history and features of C#, .NET framework architecture, ide. 1.2 Components of .NET: CLR, CLS, microsoft intermediate language, the common type system (CTS). 1.3 Data types, value and reference types, C# - flow control: branching and looping. 1.4 Type casting, multithreading, delegates.	08
Module -2:	Object Oriented Concepts and Windows Form Applications Using C# 2.1 Object oriented concepts: classes and objects, command line arguments, polymorphism, inheritance and its types- single, multiple, multilevel, hierarchical. 2.2 Parameter passing mechanism – ‘val’ and ‘ref’, abstract classes, sealed classes, partial classes and exception handling. 2.3 introduction to windows form applications using C#: developing GUI application using WINFORMS - basic controls, form controls: label, button, textbox, checkbox, radio button, timer, calendar, list box, image and overview of remaining all common. 2.4 controls its properties and events.	07
Module -3:	Files Streams and Data Handling 3.1 Working with drives, directories, and files, the drive info class, the directory and directory info, classes. 3.2 File and file info, working with paths, file and directory properties. 3.3 Attributes, and access, control, lists, reading and writing files. 3.4 Streams, readers and writers, compressing streams.	08

Module -4:	ASP.NET & ADO.NET for web & Database Management 4.1 Building a web application, examples using standard controls, using HTML controls validating form input controls using validation controls. 4.2 Understanding applications and state, applying styles, themes, and skins, creating a layout using master pages. 4.3 Binding to databases using controls, creating a site navigation hierarchy, navigation controls, membership and role management. 4.4 Login controls, securing applications caching for performance, working with XML, using crystal reports in web forms. 4.5 Database introduction data management with ADO.net, ADO.net architecture.	07
Reference Books:- 1) D. Rodrigues, ‘Learn C#: Master Scalable Development with Modern Programming: From Fundamentals to Practical Applications’, 2025. 2) L. Byrne, ‘C# for New Programmers, 2025 Edition: A Practical Guide with Projects’, 2025. 3) N. Dobovizki, ‘C# Concurrency’, Manning Publications, Shelter Island, New York, 2025. 4) M. J. Price, ‘C# 13 and .NET 9 – Modern Cross-Platform Development Fundamentals’, Packt Publishing, Birmingham, United Kingdom, 9th Edition, 2024. 5) J. Skeet, ‘C# in Depth’, Manning Publications, Shelter Island, New York, 4th Edition, 2019.		
Evaluation Pattern: 40:60		
Total Marks: 50		
Internal Continuous Evaluation: (20 M) (Best of two CCE) • CCE - I: 10 Marks • CCE - II: 10 Marks • CCE - III: 10 Marks	End Semester Examination (50 Marks): (50 Marks converted to 30 marks) • Question -1: 10 M (2x5=10M) • Question - 2: 20 M (2x10=20M) • Question -3: 20 M (4x5=20M)	



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – VI

Type : DSC XIV

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: React JS (BCST 362)

Course Objectives: Students should be able to...

- 1) know modern front-end development concepts and practices.
- 2) learn the principles of component-based architecture.
- 3) create interactive user interfaces using modern front-end technologies.
- 4) use routing techniques for developing Single Page Applications (SPAs).

Course Outcomes: Students will be able to...

- 1) explain the basic concepts, features, and structure of React.
- 2) create reusable and modular UI components using React.
- 3) handle events and user interactions in React applications.
- 4) connect React applications with APIs and manage asynchronous operations.

Module	Title and Contents	Hrs
Module -1:	React Introduction 1.1 Introduction to ReactJS, features of ReactJS, advantages and importance of ReactJS, library vs. framework, history of ReactJs, characteristics of ReactJs what is single page application vs. multi page application, understanding component-based architecture, concept of virtual dom. 1.2 Setting up ReactJS environment installation of Node.js and npm creating react application using create-react-app, running the react application. 1.3 Structure of ReactJS application src, public, App.js, index.js, basics of JSX (JavaScript XML), modifying ReactJS application, editing components. 1.4 Creating and using new components, understanding hot reloading.	08
Module -2:	JSX & Components 2.1 React JSX intro, React JSX Expressions. 2.2 React class, react props, using props in react- destructuring, react props children. 2.3 ReactJS components, types of components- create your first component how to call components. 2.4 React state, using state in component, creating the state, updating the state.	07
Module -3:	Events, Lists & Forms 3.1 React events, react conditionals, react lists, react forms, react forms submit. 3.2 React text area, react select, react multiple inputs. 3.3 Controlled vs. Uncontrolled components, form validation basics, and handling errors. 3.4 React checkbox, react radio.	08
Module -4:	React Hooks 4.1 Introduction to hooks & rules. 4.2 Types of React Hooks- 1. State Hooks. 2. Context Hooks 3. Effect Hooks. 4.3 Advanced Hooks (usecontext, useReducer, useRef). 4.4 Performance & customization (usecallback, useMemo, Custom Hooks), redux toolkit, API handling.	07

Reference Books: -

- 1) A. Banks and E. Porcello, 'Learning React: Modern Patterns for Developing React Apps', O'Reilly Media, Sebastopol, California, 2nd Edition, 2020.
- 2) R. Wieruch, 'The Road to React: The React.js 2025 Edition', Independently Published, 2025.
- 3) F. Zammetti, 'Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker', Apress, Berkeley, California, 1st Edition, 2020.
- 4) M. Haverbeke, 'Eloquent JavaScript: A Modern Introduction to Programming', No Starch Press, San Francisco, California, 4th Edition, 2024.
- 5) N. C. Zakas, 'Professional JavaScript for Web Developers', Wrox, Indianapolis, Indiana, 4th Edition, 2020.

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

(Best of two CCE)

- CCE - I: 10 Marks
- CCE - II: 10 Marks
- CCE - III: 10 Marks

End Semester Examination (50 Marks):

(50 Marks converted to 30 marks)

- Question -1: 10 M (2x5=10M)
- Question -2: 20 M (2x10=20M)
- Question -3: 20 M (4x5=20M)



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – VI

Type: DSC XV

Marks: 50

Credits: 2

Name of the Course and Code: Artificial Intelligence (BCST 363)

Course Objectives: Students should be able to...

- 1) learn the major achievements of Artificial Intelligence and the theories behind intelligent systems.
- 2) understand rational intelligent agents and different types of agents used for problem solving.
- 3) study the major stages in the development of Artificial Intelligence.
- 4) represent real-life problems using state-space models and apply search and game-playing techniques.

Course Outcomes: Students will be able to...

- 1) demonstrate knowledge of the fundamental concepts of Artificial Intelligence and intelligent agents.
- 2) formulate real-world problems using state-space and graph representations and select suitable search or game-playing techniques.
- 3) construct intelligent algorithms for constraint satisfaction and game-playing applications.
- 4) represent real-world problems using logic-based techniques and perform inference and planning.

Module	Title and Contents	Hrs
Module -1:	Introduction to AI 1.1 Introduction to AI, A brief history of AI and how it's used in daily life (e.g voice assistants, smart devices). 1.2 Understanding the idea of intelligence in machines. 1.3 Introduction to machine “intelligent”. 1.4 The Turing Test: Can machines think like humans. Introduction to smart systems (Agents).	08
Module -2:	Problem Solving with AI 2.1 Understanding problems AI can help solve. 2.2 Simple ways to represent and solve problems (like puzzles and games). 2.3 Search Techniques: Breadth-First Search (BFS), Depth-First Search (DFS). 2.4 Introduction to smarter searching using ideas and guesses (Heuristics). Introduction to Game Playing – How AI plays games like Tic-Tac-Toe.	07
Module -3:	Knowledge Representation 3.1 Introduction to First Order Predicate Logic. 3.2 Resolution Principle, Unification, Semantic Nets. 3.3 Conceptual Dependencies, Frames, and Scripts, Production Rules. 3.4 Conceptual Graphs.	08
Module -4:	Programming in Logic (PROLOG) 4.1 Introduction to Prolog: Syntax and Numeric Function. 4.2 Basic list Manipulation, Functions in Prolog, Predicates. 4.3 Conditional Input Output, Local Variables. 4.4 Iteration and Recursion, Property Lists and Arrays.	07

Reference Books: -

- 1) N. Maslej, 'Artificial Intelligence Index Report', Stanford Institute for Human-Centered AI, Stanford, California, 2023.
- 2) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2022.
- 3) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2021.
- 4) I. Goodfellow, Y. Bengio and A. Courville, 'Deep Learning', MIT Press, Cambridge, Massachusetts, 1st Edition, 2021.
- 5) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2020.

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

(Best of two CCE)

- CCE - I: 10 Marks
- CCE - II: 10 Marks
- CCE - III: 10 Marks

End Semester Examination (50 Marks):

(50 Marks converted to 30 marks)

- Question -1: 10 M (2x5=10M)
- Question -2: 20 M (2x10=20M)
- Question -3: 20 M (4x5=20M)



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester – VI

Type: DSEXVI

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: Data Analysis using Python (BCST 364)

Course Objectives: Students should be able to...

- 1) understand data manipulation and visualization techniques.
- 2) learn statistical and analytical methods using Python libraries.
- 3) study skills for real-world data analysis and decision making.
- 4) describe the ability to apply data analysis techniques using Python for solving real-world problems.

Course Outcomes: Students will be able to...

- 1) analyze datasets using NumPy and Pandas.
- 2) visualize data using Matplotlib and Seaborn.
- 3) perform basic statistical and exploratory data analysis.
- 4) interpret analytical results and draw meaningful conclusions for decision-making.

Module	Title and Contents	Hrs
Module -1:	Data Manipulation using NumPy and Pandas 1.1 Arrays (1D, 2D, multi-dimensional), Array operations (indexing, slicing, reshaping), Mathematical and Statistical operations on arrays. 1.2 Creation of Series and DataFrames, Importing datasets from CSV, Excel, and other sources, Data inspection (head(), tail(), info(), describe()). 1.3 Handling missing values (dropna(), fillna()), Data cleaning and Formatting 1.4 Filtering and sorting data, Grouping and aggregation (groupby()).	08
Module -2:	Data Visualization Techniques 2.1 Line plots, bar charts, histograms, pie charts, Labeling axes, titles. 2.2 Legends, customizing plots (colors, styles) using Matplotlib. 2.3 Advanced statistical plots (heatmaps, boxplots, pairplots). 2.4 Distribution plots and categorical plots using Seaborn.	07
Module -3:	Statistical Analysis and Applications 3.1 Measures of central tendency (mean, median, mode), Measures of dispersion (variance, standard deviation). 3.2 Correlation analysis, Basics of regression. 3.3 Exploratory Data Analysis (EDA). 3.4 Real-world case studies using datasets.	08
Module -4:	Machine Learning Basics for Data Analysis 4.1 Introduction to Machine Learning and its types (Supervised, Unsupervised, Reinforcement Learning). 4.2 Difference between traditional programming and machine learning, Dataset handling using built-in datasets. 4.3 Linear Regression (prediction and trend analysis), Classification algorithms (Logistic Regression, Decision Trees), Clustering (K-Means algorithm). 4.4 Training and testing datasets, Accuracy, confusion matrix, Overfitting and underfitting concepts.	07

Reference Books:-

- 1) M. Lutz, 'Learning Python: Powerful Object-Oriented Programming', O'Reilly Media, Sebastopol, California, 6th Edition, 2025.
- 2) A. Géron, 'Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow', O'Reilly Media, Sebastopol, California, 3rd Edition, 2022.
- 3) J. VanderPlas, 'Python Data Science Handbook: Essential Tools for Working with Data', O'Reilly Media, Sebastopol, California, 1st Edition, 2016.
- 4) W. McKinney, 'Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython', O'Reilly Media, Sebastopol, California, 1st Edition, 2012.
- 5) A. B. Downey, 'Think Stats: Probability and Statistics for Programmers', O'Reilly Media, Sebastopol, California, 1st Edition, 2011.

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

(Best of two CCE)

- CCE - I: 10 Marks
- CCE - II: 10 Marks
- CCE - III: 10 Marks

End Semester Examination (50 Marks):

(50 Marks converted to 30 marks)

- Question -1: 10 M (2x5=10M)
- Question -2: 20 M (2x10=20M)
- Question -3: 20 M (4x5=20M)



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Computer Science)

Programme: B.Sc. III

Semester – VI

Type : DSEXVI

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Multimedia Systems (BCST 365)

Course Objectives: Students should be able to...

- 1) describe the basic concepts of multimedia and its components such as text, audio, video and animation.
- 2) identify different multimedia hardware, software, and tools used for multimedia development.
- 3) explain basic image, audio, and video processing techniques.
- 4) use multimedia editing tools to create and modify multimedia content.

Course Outcomes: Students will be able to...

- 1) identify suitable multimedia hardware, software, and tools for different applications.
- 2) apply basic image, audio, and video processing techniques to multimedia content.
- 3) operate multimedia editing tools to create and modify multimedia content.
- 4) design simple multimedia applications or projects using appropriate multimedia components and tools.

Module	Multimedia Computing	Hrs.
Module -1:	Introduction to Multimedia 1.1 Definition and components of multimedia. 1.2 Multimedia systems architecture. 1.3 Applications of multimedia (education, entertainment, web, etc.). 1.4 Multimedia authoring tools.	08
Module -2:	Text and Image Processing 2.1 Types of Text (Formatted, Unformatted). 2.2 Unicode Standards and Text Compression (Huffman, Run Length Encoding). 2.3 Digital Image Representation (Bitmap, Vector). 2.4 Image File Formats: JPEG, PNG, GIF Basic Image Processing: Color models, Filtering, Histogram.	07
Module -3:	Audio Processing 3.1 Basics of Sound and Digital Audio. 3.2 Audio File Formats: WAV, MP3, AAC. 3.3 Audio Sampling and Quantization. 3.4 Audio Compression (Lossless & Lossy), Speech Synthesis and Recognition.	08
Module -4:	Multimedia Databases and Retrieval 4.1 Multimedia Data Storage and Retrieval. 4.2 Content-Based Image Retrieval (CBIR). 4.3 Indexing and Querying Multimedia Content. 4.4 Metadata and Annotation.	07

Reference Books:-

- 1) R. Parekh, 'Principles of Multimedia', Tata McGraw-Hill Education, New Delhi, India, 2021.
- 2) M. K. Mandal, 'Multimedia Signals and Systems', Springer, New Delhi, India, 2012.
- 3) T. Vaughan, 'Multimedia: Making It Work', McGraw-Hill, New York, United States, 8th Edition, 2011.
- 4) R. Steinmetz and K. Nahrstedt, 'Multimedia Systems', Springer, Berlin, Germany, 2004.
- 5) B. Furht, 'Multimedia Systems and Techniques', Kluwer Academic Publishers, Boston, Massachusetts, 2003..

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

(Best of two CCE)

- CCE - I: 10 Marks
- CCE - II: 10 Marks
- CCE - III: 10 Marks

End Semester Examination (50 Marks):

(50 Marks converted to 30 marks)

- Question -1: 10 M (2x5=10M)
- Question -2: 20 M (2x10=20M)
- Question -3: 20 M (4x5=20M)



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester – VI

Type : DSC P VII

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical based on theory paper BCST 361 & BCST 362 (BCSP 366)

Course Objectives: Students should be able to,

- 1) understand the .NET framework and its architecture.
- 2) learn the fundamentals of C# syntax, data types, and control structures.
- 3) retrieve and display data from external APIs using asynchronous programming techniques.
- 4) develop skills to debug React applications and ensure proper functionality.

Course Outcomes: Students will be able to,

- 1) outline the features of C# and the major components of the .NET Framework.
- 2) construct and execute basic C# programs using appropriate syntax, data types, and control structures.
- 3) create interactive and reusable user-interface components using React.
- 4) implement event handling and form management in React applications.

Sr. No.	Content	Hrs
1.	Write a menu driven of Face value, Armstrong, Palindrome.	60
2.	Write a program for thread.	
3.	Write a program for static class and partial class.	
4.	Write a program to implement inheritance and interface.	
5.	Write a program to display messages in a calendar control.	
6.	Build a form with Textbox, Dropdown List, and Button to collect user data.	
7.	Write a program to demonstrate treeview control and datalist.	
8.	Write a program to use of Validation controls.	
9.	Installation of Node.js and Setting up React Environment.	
10.	Creating React Application using create-react-app.	
11.	Modifying Default React App Component.	
12.	Creating and Using Simple Functional Component.	
13.	Passing and Using Props in Component.	
14.	Handling Events in React Applications.	
15.	Using useEffect Hook for Component Lifecycle.	

Reference Books: -

- 1) M. J. Price, 'C# 13 and .NET 9 – Modern Cross-Platform Development Fundamentals', Packt Publishing, Birmingham, United Kingdom, 9th Edition, 2024.
- 2) J. Skeet, 'C# in Depth', Manning Publications, Shelter Island, New York, 4th Edition, 2019.
- 3) A. Troelsen and P. Japikse, 'Pro C# 10 with .NET 6: Foundational C# Programming', Apress, Berkeley, California, 11th Edition, 2022.
- 4) A. Freeman, 'Pro ASP.NET Core 6: Develop Cloud-Ready Web Applications Using MVC, Blazor, and Razor Pages', Apress, Berkeley, California, 9th Edition, 2022.
- 5) A. Banks and E. Porcello, 'Learning React: Modern Patterns for Developing React Apps', O'Reilly Media, Sebastopol, California, 2nd Edition, 2020.

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

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester – VI

Type : DSE P VIII

Marks: 50

Credits : 2

From: A. Y. 2026-27

**Name of the Course and Code: Practical based on theory paper BCST
363 & BCST 364 (BCSP 367)**

Course Objectives: Students should be able to...

- 1) explore problem-solving methods using state-space search, heuristics, and constraint satisfaction.
- 2) understand the basics of machine learning, including supervised and unsupervised learning.
- 3) apply statistical methods for analysing datasets.
- 4) build basic machine learning models for predictive analysis.

Course Outcomes: Students will be able to...

- 1) perform data cleaning, transformation, and manipulation efficiently.
- 2) visualize data using various plotting techniques.
- 3) describe the core principles of AI and identify its key areas and real-world applications.
- 4) apply uninformed and informed search strategies to solve AI problems.

Sr. No.	Content (Any 15)	Hrs.
1.	Introduction of Artificial Intelligence and its application.	60
2.	Write a Program to Implement Depth First Search and Breadth First Search Using Python.	
3.	Write a Program to Implement Tower of Hanoi using Python.	
4.	Write a Program to Implement Tic-Tac-Toe game and Search problem of 3 x 3 puzzle.	
5.	Write a Program to implement 8-Puzzle problem using Python.	
6.	Write a Program to Implement Water-Jug problem using Python.	
7.	Write a Program to Implement Travelling Salesman Problem using Python.	
8.	Write a program to implement heuristic search procedure.	
9.	Write a prolog program to perform arithmetic and mathematical operations in PROLOG.	
10.	Importing datasets from different formats (CSV, Excel, and JSON) and basic exploration.	
11.	Data merging and joining using Pandas (merge, concat).	
12.	Group-wise data analysis using groupby () and aggregation functions.	
13.	Working with date and time data in Pandas.	
14.	Detecting and removing duplicate records in datasets. Creating pivot tables and cross-tabulations.	

15.	Correlation matrix and heatmap visualization.	
16.	Feature scaling techniques (normalization and standardization).	
17.	Implementing simple linear regression using Python.	

Reference Books: -

- 1) M. Lutz, 'Learning Python: Powerful Object-Oriented Programming', O'Reilly Media, Sebastopol, California, 6th Edition, 2025.
- 2) N. Maslej, 'Artificial Intelligence Index Report', Stanford Institute for Human-Centered AI, Stanford, California, 2023.
- 3) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2022.
- 4) A. Géron, 'Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow', O'Reilly Media, Sebastopol, California, 3rd Edition, 2022.
- 5) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2022.
- 6) J. VanderPlas, 'Python Data Science Handbook: Essential Tools for Working with Data', O'Reilly Media, Sebastopol, California, 1st Edition, 2016.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation: (20 M)

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester – VI

Type : DSE P VIII

Marks: 50

Credits : 2

From: A. Y. 2026-27

**Name of the Course and Code: Practical based on theory paper BCST
363 & BCST 365
(BCSP 367)**

Course Objectives: Students should be able to...

- 1) explore problem-solving methods using state-space search, heuristics, and constraint satisfaction.
- 2) understand the basics of machine learning, including supervised and unsupervised learning.
- 3) apply statistical methods for analysing datasets.
- 4) build basic machine learning models for predictive analysis.

Course Outcomes: Students will be able to...

- 1) perform data cleaning, transformation, and manipulation efficiently.
- 2) visualize data using various plotting techniques.
- 3) describe the core principles of AI and identify its key areas and real-world applications.
- 4) apply uninformed and informed search strategies to solve AI problems.

Sr. No.	Content	Hrs.
1.	Introduction of Artificial Intelligence and its application.	60
2.	Write a Program to Implement Depth First Search and Breadth First Search Using Python.	
3.	Write a Program to Implement Tower of Hanoi using Python.	
4.	Write a Program to Implement Tic-Tac-Toe game and Search problem of 3 x 3 puzzle.	
5.	Write a Program to implement 8-Puzzle problem using Python.	
6.	Write a Program to Implement Water-Jug problem using Python.	
7.	Write a Program to Implement Travelling Salesman Problem using Python.	
8.	Write a program to implement heuristic search procedure.	
9.	Write a prolog program to perform arithmetic and mathematical operations in PROLOG.	
10.	Creating a Simple Multimedia Presentation Using Authoring Tools (e.g., PowerPoint, Adobe Animate).	
11.	Demonstration of Multimedia Applications in Education, Entertainment and Web.	
12.	Image Filtering and Enhancement Using OpenCV.	
13.	Analyzing Audio Waveforms and Digital Sound Properties.	
14.	Demonstration of Sampling and Quantization Effects on Audio Quality Storing.	

15.	Retrieving Multimedia Content from a Database.	
16.	Content-Based Image Retrieval Using Feature Matching (Color, Texture).	
17.	Create simple 2D animation.	

Reference Books:-

- 1) M. Lutz, 'Learning Python: Powerful Object-Oriented Programming', O'Reilly Media, Sebastopol, California, 6th Edition, 2025.
- 2) N. Maslej, 'Artificial Intelligence Index Report', Stanford Institute for Human-Centered AI, Stanford, California, 2023.
- 3) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2022.
- 4) A. Géron, 'Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow', O'Reilly Media, Sebastopol, California, 3rd Edition, 2022.
- 5) S. Russell and P. Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, Hoboken, New Jersey, 4th Edition, 2022.
- 6) J. VanderPlas, 'Python Data Science Handbook: Essential Tools for Working with Data', O'Reilly Media, Sebastopol, California, 1st Edition, 2016.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation: (20 M)

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester – VI

Type : Vocational Skill Course IV

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Based on Open CV for AI solutions
(BCSPVSC IV)

Course Objectives: Students should be able to...

- 1) understand the Fundamentals of Computer Vision and AI.
- 2) learn to use OpenCV effectively for tasks such as image manipulation, object detection, feature tracking, and face recognition.
- 3) implement AI-based Solutions for Real-World Applications.
- 4) learn how to optimize OpenCV applications for speed and efficiency, focusing on real-time performance and deployment in resource-constrained environments.

Course Outcomes: Students will be able to...

- 1) describe the core principles of computer vision and image processing using OpenCV.
- 2) utilize OpenCV libraries for real-time image and video processing in AI-based applications.
- 3) demonstrate feature detection, object tracking, and face recognition using classical and AI-based computer vision techniques.
- 4) construct practical AI applications such as gesture recognition, smart surveillance, and automated POS systems using OpenCV.

Sr. No.	Content	Hrs.
1.	Understanding the fundamentals of computer vision, Introduction and installation of the OpenCV library.	60
2.	Reading an image in OpenCV using Python.	
3.	Load an image and use OpenCV's imwrite() function.	
4.	Saving an Image using OpenCV.	
5.	Program to define Detect and draw edges.	
6.	Program to implement Arithmetic Operations on Images using OpenCV.	
7.	Program to implement Bitwise Operations on Binary Images.	
8.	Program to implement image in painting.	
9.	Program to implement Eye, smile detection with pretrained XML models.	
10.	Program to implement Grayscale Conversion.	
11.	Program to Resizing an Image.	
12.	Program to implement Rotating an Image.	

13.	Program to define Detect geometric shapes (circle, triangle, square).	
14.	Program to define Detect and decode QR codes or barcodes.	
15.	Program to define Image blending using addWeighted() and Flip an image horizontally or vertically.	

Reference Books:-

- 1) A. Vaishya, 'Mastering OpenCV with Python: Use NumPy, Scikit, TensorFlow, and Matplotlib to Learn Advanced Algorithms for Machine Learning through a Set of Practical Projects', Orange Education Pvt. Ltd., New Delhi, India, 1st Edition, 2023.
- 2) R. Szeliski, 'Computer Vision: Algorithms and Applications', Springer, Cham, Switzerland, 2nd Edition, 2022.
- 3) A. Géron, 'Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems', O'Reilly Media, Sebastopol, California, 2nd Edition, 2019.
- 4) S. Gollapudi, 'Learn Computer Vision Using OpenCV', Packt Publishing, Birmingham, United Kingdom, 1st Edition, 2015.
- 5) J. E. Solem, 'Programming Computer Vision with Python: Tools and Algorithms for Analyzing Images', O'Reilly Media, Sebastopol, California, 1st Edition, 2012.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation: (20 M)

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

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

Programme: B.Sc.

Semester - VI

Type : Skill Enhancement Course III

Marks: 50

Credits : 2

From: A. Y. 2026-27

**Name of the Course and Code: Practical Based on R Programming
(BCSP SEC III)**

Course Objectives: Students should be able to...

- 1) understand the basics of r language.
- 2) handle different data types, structures (vectors, matrices, data frames, lists), and indexing.
- 3) perform data manipulation and analysis.
- 4) apply statistical methods.

Course Outcomes: Students will be able to...

- 1) show the installation of r programming environment.
- 2) utilize and r data types for developing programs.
- 3) process data using R for reading, cleaning, and visualization.
- 4) analyze data using statistical methods available in R.

Sr. No.	Content	Hrs
1.	Learn all the basics of R-Programming (Data types, Variables, Operators).	60
2.	Using R execute the Vector, Array and list.	
3.	Using R execute the Matrix computation.	
4.	Implement data frames in R. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.	
5.	Implement decision making statements with different examples.	
6.	Implement R-Loops with different examples.	
7.	Write a program to read a csv file and analyse the data in the file in R.	
8.	Data visualization using R.	
9.	To find Measure of central tendency-I using R.	
10.	To find Measure of central tendency-II using R.	
11.	To find Measure of dispersion using R -I.	
12.	To find skewness and kurtosis using R.	
13.	To find Correlation using R.	
14.	To find Regression using R.	
15.	To find probabilities and testing of hypothesis using R.	

Reference Books: -

- 1) S. Narang, 'R Programming for Business Analytics', Amazon.in, New Delhi, India, 2024.
- 2) Hadley Wickham and Garrett Golemund, 'R for Data Science', O'Reilly Media, Sebastopol, California, 2nd Edition, 2023.

- 3) Richard McElreath, 'Statistical Rethinking: A Bayesian Course with Examples in R and Stan', CRC Press, Boca Raton, Florida, 2nd Edition, 2020.
- 4) Chris Chapman and Elea McDonnell Feit, 'R for Marketing Research and Analytics', Springer, New York, United States, 2nd Edition, 2019.
- 5) S. R. ManiSekhar and T. V. SureshKumar, 'Programming with R', Cengage India, New Delhi, India, 1st Edition, 2017.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation: (20 M)

- Q.1 Student Performance = 5M
- Q.2 Oral = 5M
- Q.3 Journal = 10 M

End Semester Examination: (30 M)

- Q.1 = 30 M



Karmaveer Bhaurao Patil University, Satara

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

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Computer Science)

Programme: B.Sc.

Semester - VI

Type: FP I

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course & Code: Field Project (BCSP FP-I)

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. Its helps students connect theory with observation, improve research skills and understanding the use of physics in daily life.

Evaluation Pattern: 40:60

Total Marks: 50

Internal Continuous Evaluation: (20 M)

- Q.1 Internal Work = 20M

End Semester Examination: (30 M)

- Q. 1 = 30 M

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 Continuous Evaluation: (20 M)

- Q.1 Internal Work = 20M

End Semester Examination: (30 M)

- Q. 1 = 30 M