

**Rayat Shikshan Sanstha's**  
**YASHAVANTRAO CHAVAN INSTITUTE OF**  
**SCIENCE, SATARA**  
**(AN AUTONOMOUS COLLEGE)**

**Reaccredited by NAAC with 'A+' Grade**

**Bachelor of Science**

**Part - II**

**Computer Science (Optional)**

Syllabus

to be implemented w. e. f. June, 2022

## Structure of the course:

### 2) Semester III

Sr. No.	Subject title	Theory					Practical	
		Course No. and Course code	Title of Course	No. of lectures per week	Credits		No. of lectures per week	Credits
1.	Computer Science	Course V BCST301	Data Communication s and Computer Networks	3	2	Compu ter Science practic al III BCSP3 03	8	4
		Course VI BCST302	Algorithms and Data Structures using C	3	2			

### 2) Semester IV

Sr. No	Subject title	Theory					Practical	
		Course No.andC ourse Code	Title of Course	No. of lectures per week	Credits		No. of lecture s per week	Credits
1.	Computer Science	Course VII BCST401	Operating Systems	3	2	Computer Science practical III BCSP403	8	4
		Course VIII BCST402	Object Oriented Concepts using JAVA	3	2			

**B.Sc. II: Evaluation structure**  
Semester III.

	ESE	Internal Exam		Practical			Submission	Total
		ISE-I	ISE-II		Exam	Journal	Seminar + Student Performance	
Course V	30	5	5	Practical-III(A)	25	5	5	150
Course VI	30	5	5	Practical IV(A)	25	5	5	

**Semester IV**

	ESE	Internal Exam		Practical			Submission	Total
		ISE-I	ISE-II		Exam	Journal	Industrial visit/Educational Tour + Student Performance	
Course V	30	5	5	Practical-III(A)	25	5	5	150
Course VI	30	5	5	Practical IV(A)	25	5	5	

## Structure and titles of the course of B.Sc. II course

### Semester III

Code	Name of Course	Units
BCST301	<b>Data Communications and Computer Networks</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Data Communication <b>Unit II:</b> Computer Network types <b>Unit III :</b> OSI Reference Model <b>Unit IV :</b> Windows Server 2008 and Managing Active Directory
BCST302	<b>Algorithms and Data Structures using C</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Basic of Data Structures and algorithms <b>Unit II:</b> Stack <b>Unit III:</b> Queue <b>Unit IV:</b> Linked List

### Semester IV

BCST401	<b>Operating Systems</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Fundamental Concepts <b>Unit II:</b> Operating System Organization <b>Unit III :</b> Process Management and Memory Management <b>Unit IV :</b> Shell introduction and Shell Scripting
BCST402	<b>Object Oriented Concepts using JAVA</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Introduction To Java ,Objects and Classes <b>Unit II:</b> Inheritance,Polymorphism and Packages <b>Unit III :</b> Multithreading and Exception Handling <b>Unit IV :</b> AWT and Event Handling

**Semester – III**

**Course – V: BCST301: Data Communications and Computer Networks**

**Course Objectives:** Student will be able to

1. Understand different types of networks, various topologies and application of networks.
2. Remember types of addresses, data communication.
3. Study the concept of networking models, protocols, functionality of each layer.
4. Imbibe basic networking hardware configuration and tools.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BCST301 Data Communications and Computer Networks</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Data Communication</b>	<b>(11)</b>
	A) Introduction, Objectives, Data Communication and Networking for Today’s Enterprise, Communication Model and Band limited signal, Maximum data rate & channel. B) Data Transmission modes: Serial & Parallel, Simplex, and Half Duplex, full Duplex. Synchronous & Asynchronous transmission. C) Transmission Impairments: Attenuation Distortion, Delay, Dispersion, Noise.	
<b>UNIT - II</b>	<b>Computer Network types</b>	<b>(12)</b>
	A) Introduction, Computer Networks- Goals and applications – Business Application, Home Application, Mobile User, Social Issues. B) Network Hardware - Broadcast and point-to-point, topologies – star, bus, mesh, ring etc. C) Network Types-LAN, MAN, WAN, Wireless Networks.	
<b>UNIT - III</b>	<b>OSI Reference Model</b>	<b>(10)</b>
	A) Protocols & Standards, Network Software - Protocol Hierarchies -layers, protocols, peers, interfaces Network architecture, ISO-OSI layer, protocol stack B) Design issues of the layers –addressing, error control, flow control, multiplexing, routing. Connection-oriented and connectionless service C) Service Primitives – listen, connect, receive, send, disconnect and Berkley Socket.	
<b>UNIT - IV</b>	<b>Windows Server 2008 and Managing Active Directory</b>	<b>(12)</b>
	A) Managing Windows Server 2008: Working with administrative tool using control panel, Graphical administrative tool & command line utility B) Working with computer management: Computer	

	<p>management system tools, storage tools, services and application tools.</p> <p>C) Active Directory Physical Architecture: Top level view, Local security Authority, Directory service architecture, Data storage architecture.</p> <p>D) Logical Architecture: Object, Domain, Trees &amp; forests Trust, functional level Managing Users &amp; Computers, Managing Domain user account, Types of user, User account policies, Password setting, User account capabilities, Properties &amp; Rights, Create computer account.</p>	
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**Course outcomes:** Student should be able to

1. Understand the fundamentals computer network organization-Networking techniques.
2. Apply the knowledge, concepts and terms related to Data Communication through a Network.
3. Analyze the basic concept of OSI layer.
4. Identify Active Directory logical components and infrastructure, create and manage file System access security.

**References-**

1. Computer Networks By Tennenbaum and wetherall, Pearson Education India,5 edition ,2013.
2. Data Communications and Computer Networks by Gupta P.C, Prentice Hall India Learning Private Limited; 2nd edition (1 January 2013)
3. Windows Server 2008 by William R. Stanek (Prentice- Hall Publications),Microsoft Press, 2014.
4. Data Communications and Networking by BehrouzForouzan, McGraw Hill Education; Huga Media, Fifth edition, 2017.
5. DATA COMMUNICATIONS AND COMPUTER NETWORKS by BRIJENDRA SINGH, PHI Learning Pvt. Ltd., 2014
6. Principles of Microbiology – Ronald M. Atlas Second edition Mc Graw Hill Education ( Unit I ,Unit II ,Unit III, Unit IV)

## Course VI: BCST302: Algorithms and Data Structures using C

**Course Objectives:** Student will be able to

1. Understand the basic concepts such as Linear and Non Linear Data structures.
2. Apply the notations used to analyze the Performance of algorithms.
3. Imbibe the behavior of data structures such as stacks queues and their representations.
4. Study an appropriate data structure for a specified application and to understand and analyze various algorithms.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BCST302 Algorithms and Data Structures using C</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Basic of Data Structures and algorithms C</b>	<b>(11)</b>
	A)Data Structures Basics: Structure and Problem Solving B)Algorithm Specification-Introduction, Performance analysis- time complexity and space complexity C)Asymptotic Notation-Big O, Omega and Theta notations, Complexity Analysis Examples, D) Introduction to Linear and Non Linear data structures, Applications of linear data structure (Searching & Sorting).	
<b>UNIT - II</b>	<b>Stack</b>	<b>(12)</b>
	A)Introduction, Representation-static & dynamic, Operations B)Application - infix to postfix & prefix, postfix evaluation, Concept of Multiplestacks	
<b>UNIT - III</b>	<b>Queue</b>	<b>(10)</b>
	A)Introduction, Representation -static &dynamic,Operations B)Circular queue, De-Queue, priority queues, Concept of Multiple Queues	
<b>UNIT - IV</b>	<b>Linked List</b>	<b>(12)</b>
	A) Introduction, Representation of linked lists in Memory, Memory allocation and Garbage collection B) Types of linked list, Operations on singly linked list, Traversing a linked list, Searching a linked list, insertion into linked list, Deletion from a linked list.	

**Course outcomes-**Students should be able to

1. Understand the fundamentals of c and ability to choose appropriate data structures to represent data items in real world problems.
2. Analyze the different types of stack notations.
3. Design programs using a variety of data structures such as stacks, queues.
4. Demonstrate various kinds of linked list.

## References

1. Data Structure Through C by Yashavant P Kanetkar, BPB Publications; 2nd edition, 2003.
2. Data Structures Through C in Depth by Deepali Srivastava and S K Srivastava, by BPB Publications, 2nd edition, 2011
3. An Introduction to Data Structures and Algorithms (Progress in Theoretical Computer Science)”
4. By J A Storer and John C Cherniavsky, Springer Science & Business Media, illustrated edition, 2001.
5. Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles” by Narasimha Karumanchi, Career Monk Publications, Second Edition, 2011.



**BCSP303: Lab Course I (Data Communications and Computer Networks  
And Algorithms and Data Structures using C)**

**Course Objectives:** Student will be able to

1. Understand the concept of networking models, protocols, functionality of each layer.
2. Learn basic networking hardware and tools.
3. Study the notations used to analyze the Performance of algorithms.
4. Identify the behavior of data structures such as stacks queues and their representations.

<b>Credits (Total Credit 04)</b>	<b>SEMESTER-III BCSP303: Lab Course I (Data Communications and Computer Networks And Algorithms and Data Structures using C)</b>	<b>No. of hours per unit/credits</b>
	<b>Part A: Data Communications and Computer Networks</b>	
	<p><b>Exercise No. 1. Network Devices</b> 1. Study of Network Devices in Detail.</p> <p><b>Exercise No. 2. Connection of Local Area Network</b> 1. Connect the computers in Local Area Network on the host computer. 2. Connect the computers in Local Area Network on the client computer.</p> <p><b>Exercise No. 3. Windows Server Installation and Active Directory</b> 1. Create node and connect it to server including crimping. 2. Installation of active directory.</p> <p><b>Exercise No.4. Active and User Account</b> 1. Study of properties of user account 2. Time restriction for user login.</p> <p><b>Exercise No.5. Creation of account and security</b> 1. Password security policy experiment. 2. Create computer account</p>	
	<b>Part B: Algorithms and Data Structures using C</b>	
	<p><b>Exercise No.1 Programs on Data Structures and algorithms.</b> 3. Write Pseudo code algorithm to find summation of given n numbers. 4. Problems on Big O, Omega and Theta notations.</p> <p><b>Exercise No.2 Programs on Stack</b> 1. STACK Implementation using Array with PUSH, POP, and TRAVERSE Operations.</p>	

	<ol style="list-style-type: none"> <li>2. STACK Implementation using C Structure with more than One Item.</li> <li>3. STACK Implementation using C with PUSH, POP, TRAVERSE Operations.</li> </ol> <p><b>Exercise No.3 Programs on Queue</b></p> <ol style="list-style-type: none"> <li>1. Perform Queues operations using Circular Array implementation. Use Templates.</li> <li>2. Create and perform different operations on Double-ended Queues using Linked List implementation.</li> </ol> <p><b>Exercise No.4 Programs on Linked List</b></p> <ol style="list-style-type: none"> <li>1. STACK Implementation with Linked List using C Program.</li> <li>2. Linked List Implementation using C Program.</li> </ol>	
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**Course outcomes-**Students should be able to

1. Prepare and perform an installation of Windows Server 2008 and identify the various types of file Systems and their components.
2. Identify Active Directory logical components and infrastructure, create and manage file System access security
3. Understand the fundamentals of c and ability to choose appropriate data structures to represent data items in real world problems.
4. Analyze the time and space complexities of algorithms.

**Practical References-**

1. Computer Networks By Tennenbaum and wetherall, Pearson Education India; 5 edition (2013)
2. Windows Server 2008 By William R. Stanek(Prentice- Hall Publications),Microsoft Press,2014.
3. Data Communications and Networking By BehrouzForouzan, McGraw Hill Education; Huga Media, Fifth edition, (2017)
4. Data Structure Through C by Yashavant P Kanetkar, BPB Publications; 2nd edition, 2003.
5. Data Structures Through C in Depth by Deepali Srivastava and S K Srivastava, by BPB Publications,2nd edition ,2011
6. An Introduction to Data Structures and Algorithms (Progress in Theoretical Computer Science)” by J A Storer and John C Cherniavsky, Springer Science & Business Media,illustrated edition,2001.
7. Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles” by Narasimha Karumanchi, CareerMonk Publications, Second Edition, 2011.

## SEMESTER- IV

### Course VII: BCST401: Operating Systems

**Course Objectives:** Student will be able to

1. Understand the basic organization of operating system.
2. Imbibe brief about OS organization.
3. Study memory management techniques.
4. Learn Shell operating system.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BCST401 Operating Systems</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Fundamental Concepts</b>	<b>(11)</b>
	A) System Software, Resource Abstraction, OS strategies. B) Types of operating systems –Windows, Linux/Ubuntu, Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems.	
<b>UNIT - II</b>	<b>Operating System Organization</b>	<b>(10)</b>
	A) Factors in operating system design, basic OS functions, implementation consideration B) Process modes, methods of requesting system services – system calls and system programs.	
<b>UNIT - III</b>	<b>Process Management and Memory Management</b>	<b>(12)</b>
	A) System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model B) Scheduling: Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies. C) Mapping address space to memory space, memory allocation strategies, fixed partition, variable partition, paging, virtual memory.	
<b>UNIT - IV</b>	<b>Shell introduction and Shell Scripting</b>	<b>(12)</b>
	A) What is shell and various type of shell, Various editors present in linux B) Different modes of operation in vi editor ,What is shell script, Writing and executing the shell script ,Shell variable (user defined and system variables) C)System calls, Using system calls,Pipes and Filters ,Decision making in Shell Scripts (If else, switch), Loops in shell ,Functions ,Utility programs (cut, paste, join, tr , uniq utilities) ,Pattern matching utility (grep).	

**Course outcomes:** Student should able to

1. Understand the fundamentals of operating systems and its types.
2. Imbibe the basic Operating System Organization.
3. Identify the process & memory management in Operating System.
4. Design programs using a Shell Scripting.

### **References**

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, John Wiley Publications, 8th Edition, 2008.
2. A.S. Tanenbaum, Modern Operating Systems, Pearson Education, 3rd Edition, 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, Pearson Education, 3rd Edition, 2003.
4. W. Stallings, Operating Systems, Internals & Design Principles, Prentice Hall of India, 5th Edition, 2008.
5. M. Milinkovic, Operating Systems- Concepts and design, Tata McGraw Hill , New Delhi, 2nd Edition, 2009.
6. System Programming and Operating System – D. M. Dhamdhare, Tata McGraw Hill, 2nd Revised Edition, 2002.
7. Unix shell programming- Yashwant Kanetkar, BPB Publications, 1st edition, 2003.
8. UNIX Unbounded: A Beginning Approach by Amir Afzal, Pearson Education, 3rd Edition ,2011

## Course VIII: BCST402: Object Oriented Concepts using JAVA

**Course Objectives:** Student will be able to

1. Improve the analytical skills of object oriented programming and formal introduction to Java programming language
2. Understand Object Oriented Programming language
3. Study abnormal termination of a program using exception handling
4. Imbibe User Interface using Swing and AWT

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BCST402 Object Oriented Concepts using JAVA</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction To Java, Objects and Classes</b>	<b>(10)</b>
	A) Introduction to object oriented programming, Basic concepts of OOP (Object, class, inheritance, polymorphism etc) Advantages of OOP over Procedure oriented programming B) History and features of Java Programming, Java Environment, Java tokens, constants, variables, data types, type casting, Operators and Expressions C) Implementing Java Program, Branching and looping statements, Class, objects, methods, Constructors and destructor	
<b>UNIT - II</b>	<b>Inheritance, Polymorphism and Packages</b>	<b>(10)</b>
	A) Defining sub class, subclass constructor, Inheritance- Multiple and hierarchical B) Defining packages, system packages, Creating & accessing packages, Adding a class to package C) Polymorphism- function overloading and over riding, its difference	
<b>UNIT - III</b>	<b>Multithreading and Exception Handling</b>	<b>(12)</b>
	A) Concept of thread, Life cycle of thread, Creating threads, extending a thread class- declaring the class, run() method, Stopping and blocking threads, Using thread method, Thread priority B) Introduction to exception, Syntax of exception handling code, Multiple catch statement, Using finally statement, Throwing exception, user defined exception.	
<b>UNIT - IV</b>	<b>AWT and Event Handling</b>	<b>(13)</b>
	A) Introduction to Abstract Window Toolkit (AWT) B) Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames C) Layout Managers: Flow Layout, Border Layout, Grid Layout	

**Course outcomes:** Student should be able to

1. Demonstrate professionally acceptable coding and performance standard.
2. Understand the basic principles of the object-oriented programming
3. Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.
4. Identify the principles of the applets and its GUI programming

### **References**

1. Complete reference Java by Herbert Schildt, McGraw Hill, 5th edition, 2002.
2. Java 2 programming black books, Steven Horlzner, Paraglyph, Incorporated, 2nd edition, 2001
3. Programming with Java, A primer, Forthedition, By E.Balagurusamy, McGraw Hill, 4th Edition 2010.
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Sun Microsystems Press, Prentice Hall; 8th edition ,2007.
5. Java Programming- Rajendra Salokhe, Aruta Publication, First Edition, 2008.

## BCSP403: Lab Course II (Operating Systems and Object Oriented Concepts using JAVA)

**Course objectives:** Student will be able to

1. Understand Shell operating system and memory management techniques.
2. Identify the need to create the special purpose operating system
3. Learn case studies to demonstrate practical applications of different concepts.
4. Imbibe scope to students where they can solve small, real life problems.

Credits (Total Credit 04)	SEMESTER-IV BCSP403:Lab Course II(Operating Systems and Object Oriented Concepts using JAVA)	No. of hours per unit/credits
	<b>Part A: Operating Systems</b>	
	<ol style="list-style-type: none"> <li>1. Write a program to check status of keyboard using interrupt handler</li> <li>2. Write a program to implement copy command of DOS.</li> <li>3. Write a program to display date and time of system</li> <li>4. Write a program to implement pwd command of linux.</li> <li>5. Write a program to implement wc command of linux.</li> <li>6. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.</li> <li>7. Usage of following commands: cal, cat(append), cat(concatenate), mv, cp, man, date.</li> <li>8. Usage of following commands: chmod, grep, tput (clear, highlight), bc.</li> <li>9. Write a shell script to check if the number entered at the command line is prime or not.</li> <li>10. Write a shell script to modify “cal” command to display calendars of the specified months.</li> <li>11. Write a shell script to modify “cal” command to display calendars of the specified range of months.</li> <li>12. Write a shell script to accept a login name. If not a valid login name display message – “Entered login name is invalid”.</li> <li>13. Write a shell script to display date in the mm/dd/yy format.</li> <li>14. Write a shell script to display on the screen sorted output of “who” command along with the total number of users.</li> <li>15. Write a shell script to display the multiplication table any number.</li> </ol>	

	<b>Part B: Object Oriented Concepts using JAVA</b>	
	<p><b>Exercise No.1 Programs on JAVA Basics</b>(Sample Programs)</p> <p>1 Program to define a structure of a basic JAVA program  2 Program to define the data types, variable, operators, arrays and control structures.</p> <p><b>Exercise No.2 Programs on Constructor and Overloading</b>(Sample Programs)</p> <p>1.Program to define class and constructors. Demonstrate constructors.  2.Program to define class, methods and objects. Demonstrate method overloading</p> <p><b>Exercise No.3 Programs on Inheritance</b>(Sample Programs)</p> <p>1.Program to define inheritance and show method overriding.  2.Program to demonstrate Packages.</p> <p><b>Exercise No.4 Programs on Exception Handling And Multithreading</b> (Sample Programs)</p> <p>1. Program to demonstrate Exception Handling.  2.Program to demonstrate Multithreading.</p> <p><b>Exercise No.5 Programs on Event Handling</b> (Sample Programs)</p> <p>1.Program to demonstrate Applet structure and event handling.  2.Program to demonstrate Layout managers</p>	

**Course outcomes-**Students should be able to

1. Derive the process & memory management in Operating System and the basic Operating System organization.
2. Design programs using a Shell Scripting.
3. Analyze professionally acceptable coding and performance standard.
4. Demonstrate graphical user interfaces, multithreaded programming, and event-driven programming.

**Practical References-**

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, John Wiley Publications , 8th Edition,2008.
2. A.S. Tanenbaum, Modern Operating Systems, Pearson Education ,3rd Edition, 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, Pearson Education,3rd Edition, 2003.
4. W. Stallings, Operating Systems, Internals & Design Principles, Prentice Hall of India,5th Edition, 2008.



5. M. Milinkovic, Operating Systems- Concepts and design, Tata McGraw Hill , New Delhi, 2nd Edition, 2009.
6. System Programming and Operating System – D. M. Dhamdhere, Tata McGraw Hill, 2nd Revised Edition, 2002.
7. Unix shell programming- Yashwant Kanetkar, BPB Publications, 1st edition, 2003.
8. UNIX Unbounded: A Beginning Approach by Amir Afzal, Pearson Education, 3rd Edition ,2011.
9. Complete reference Java by Herbert Schildt, McGraw Hill,5th edition,2002.
10. Java 2 programming black books, Steven Horlzner, Paraglyph, Incorporated,2nd edition, 2001
11. Programming with Java , A primer ,Forthedition,ByE.Balagurusamy, McGraw Hill,4th Edition 2010.
12. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Sun Microsystems Press, Prentice Hall; 8th edition ,2007.
13. Java Programming- Rajendra Salokhe ,Aruta Publication, First Edition,2008.