



**M.C.E. Society's**

**ABEDA INAMDAR SENIOR COLLEGE OF ARTS, SCIENCE AND  
COMMERCE (AUTONOMOUS), PUNE**

**AZAM CAMPUS, CAMP, PUNE – 411001**

## **Syllabus of S.Y. B.C.A. (Science)**

**Applicable for the Autonomous College affiliated to**

**Savitribai Phule Pune University**

**BCA Science (Honours) Four Year Degree Programme**

**(Choice Based Credit System)**

**(NEP 2023 Pattern)**

**With effect from June 2024**

SEMESTER III					
Course Type	Course Code	Course Name	Credits		Total
			Theory	Practical	
Major/Core Theory	23SBCA31MM	Python Programming	2		
Major/Core Theory	23SBCA32MM	Web Technology using PHP	2		
Major/Core Theory	23SBCA33MM	Software Engineering	2		
Major/Core Practical	23SBCA34MM	Lab I : Python Programming		2	
Minor Theory	23SBCA31MNA	Computer Network	2		
	Or 23SBCA31MNB	Computer Organization			
Minor/Practical	23SBCA32MNA	Lab II: Computer Network		2	
	Or 23SBCA32MNB	Lab II – Computer Organization			
GE/OE	23CBCO3OEE	From Basket of OE	2		
Vocational Skill Course	23SBCA31VS	Lab III - Web Technology using PHP		2	
AECC	23ABHN31AE	Hindi	2		
Co-Curricular Courses	23ABHNCC	From Basket of CC	2		
Field Project	23SBCA4FP	Project		2	
			14	8	22

SEMESTER IV					
Course Type	Course Code	Course Name	Credits		Total
			Theory	Practical	
Major/Core Theory	23SBCA41MM	Data Structure using Python	2		
Major/Core Theory	23SBCA42MM	Object Oriented Programming using Java	2		
Major/Core Theory	23SBCA43MM	Cloud Computing	2		
Major/Core Practical	23SBCA44MM	Lab I : Data Structure using Python		2	
Minor Theory	23SBCA41MNA	Introduction to Cyber Security	2		
	Or 23SBCA41MNB	8051 Microcontroller Programming			
Minor Practical	23SBCA42MNA	Lab II – Introduction to Cyber Security		2	
	Or 23SBCA42MNB	Lab II – 8051 Micro-controller Programming			
GE/OE	23CBCO4OEF	From Basket of OE	2		
SEC	23SBCA41SE	Lab III: Object Oriented Programming using Java		2	
AECC	23ABHN31AE	Hindi	2		
Co-Curricular Courses	23ABENCC	From Basket of CC	2		
CEP	23SBCA4CEP	CEP	2		
			14	8	22



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**S.Y.B.C.A (Science) SEM III (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Python Programming</b>	
<b>Course Code: 23SBCA31MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	Able to learn and understand the basics of Python programming.
<b>2.</b>	Able to understand Python programming functions, conditional statements and loops.
<b>3.</b>	Able to learn class object concept in python programming

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Solve basics programs of python programming.
<b>2.</b>	To implement object oriented program.
<b>3.</b>	To create user defined functions.
<b>4.</b>	To create modules in python.
<b>5.</b>	To create user defined packages.

<b>Unit No</b>	<b>Title with Contents</b>	<b>No.of Lectures</b>
<b>Unit I</b>	<b>Introduction to Python</b>	<b>08</b>
	<b>1. Introduction to Python</b> <b>2. Feature of Python</b> <b>3. Variable and data types</b> <b>4. Operators in python</b> <b>5. Conditional statements-If, If-Else, nested if-else</b> <b>6. Loops</b> <ul style="list-style-type: none"> <li>i. For loop</li> <li>ii. While</li> <li>iii. Nested loops</li> </ul> <b>7. Control Statements-</b> <ul style="list-style-type: none"> <li>i. Break,</li> <li>ii. Continue</li> <li>iii. Pass.</li> </ul> <b>8. String Manipulation-Accessing String, Basic Operations, and String Slices.</b>	1 1 1 1 1 1  1  1  1
<b>Unit II</b>	<b>Data Structure and Functions in python</b>	<b>08</b>
	<b>1. Lists in python</b> <ul style="list-style-type: none"> <li>i. Lists-Introduction,</li> <li>ii. accessing list,</li> <li>iii. working with lists,</li> <li>iv. Function &amp; methods.</li> </ul> <b>2. Tuple-Introduction</b> <ul style="list-style-type: none"> <li>i. Accessing tuples</li> <li>ii. Operations working function &amp; methods,</li> </ul> <b>3. Dictionaries-Introduction</b> <ul style="list-style-type: none"> <li>i. Accessing values in dictionaries</li> <li>ii. Working with dictionaries</li> </ul> <b>4. Functions</b> <ul style="list-style-type: none"> <li>i. Defining a function</li> <li>ii. Calling a function</li> <li>iii. Function arguments</li> <li>iv. Anonymous function</li> <li>v. global &amp; local variables</li> </ul>	2  2 2 2 2
<b>Unit III</b>	<b>Modules and Packages</b>	<b>07</b>
	<b>1. Modules and Packages</b> <ul style="list-style-type: none"> <li>i. Built in Modules</li> <li>ii. Importing modules in python program</li> <li>iii. Working with Random Modules.</li> <li>iv. Example - time, date time, calendar</li> <li>v. User Defined functions.</li> <li>vi. Structure of Python Modules</li> </ul> <b>2. Packages</b> <ul style="list-style-type: none"> <li>i. Predefined Packages</li> <li>ii. User defined Package</li> </ul>	1 1 1 1 1 1 2





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**S.Y.B.C.A (Science) SEM III (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Web Technology Using PHP</b>	
<b>Course Code: 23SBCA32MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To introduce server-side programming concepts and terminology.
<b>2.</b>	To analyze the basic structure of a PHP web application and be able to install and maintain the web server, compile, and run a simple web application
<b>3.</b>	To provide the necessary knowledge to design and develop Static, web applications using PHP

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Understand the PHP downloading, installation and configuring PHP process
<b>2.</b>	Familiar with Function String loop control statement & arrays.
<b>3.</b>	To analyze the basic structure of a PHP web application and be able to install and maintain the web server, compile, and run a simple web application.
<b>4.</b>	Creation of web pages that includes verification and validation of web pages using different web technologies.

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Introduction to PHP</b>	<b>6</b>
	<b>1. Introduction</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>i. HTTP Basics</li> <li>ii. Web Server</li> <li>iii. Web Browser</li> </ul>	<b>2</b>
	<b>2. Introduction PHP</b>	
	<ul style="list-style-type: none"> <li>i. Installing PHP</li> <li>ii. Setting up a Development Environment</li> </ul>	
	<b>3. Language Basics</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>i. Operators</li> <li>ii. Flow-Control Statements</li> <li>iii. Including Code Embedding PHP in Webpages</li> </ul>	
<b>Unit II</b>	<b>Web Techniques</b>	<b>8</b>
	<b>1. HTTP Basics</b>	<b>1</b>
	<b>2. Variables</b>	<b>1</b>
	<b>3. Server Information</b>	<b>1</b>
	<b>4. Processing Forms</b>	<b>2</b>
	<b>5. File uploading</b>	<b>1</b>
	<b>6. Setting Response Headers</b>	<b>1</b>
	<b>7. Maintaining State</b>	<b>1</b>
<b>Unit III</b>	<b>Functions and Strings</b>	<b>8</b>
	<b>1. Functions in PHP</b>	<b>4</b>
	<ul style="list-style-type: none"> <li>i. Calling a Function</li> <li>ii. Defining a Function</li> <li>iii. Variable Scope</li> <li>iv. Function Parameters</li> <li>v. Return Values</li> <li>vi. Variable Functions</li> <li>vii. Anonymous Functions</li> </ul>	
	<b>2. Strings in PHP</b>	<b>4</b>
	<ul style="list-style-type: none"> <li>i. Quoting String</li> <li>ii. Constants</li> <li>iii. Printing Strings</li> <li>iv. Accessing Individual Characters</li> <li>v. Cleaning Strings</li> <li>vi. Encoding and Escaping</li> <li>vii. Comparing Strings</li> </ul>	
<b>Unit IV</b>	<b>Arrays in PHP</b>	<b>8</b>
	<b>1. Indexed Versus Associative Arrays</b>	<b>1</b>
	<b>2. Identifying Elements of an Array</b>	<b>1</b>
	<b>3. Storing Data in Arrays</b>	<b>1</b>
	<b>4. Multidimensional Arrays</b>	<b>1</b>
	<b>5. Extracting Multiple Values</b>	<b>1</b>
	<b>6. Converting Between Arrays and Variables</b>	<b>1</b>
	<b>7. Traversing Arrays</b>	<b>1</b>
	<b>8. Sorting</b>	<b>1</b>

Suggested Reading	
1.	“Programming PHP”, RasmusLerdorf and Kevin Tatroe, O'Reilly publication, ISBN-13978-1565926103
2.	“Beginning PHP5, Apache, and MySQL Web Development (Programmer to Programmer)”, byElizabethNaramore,JasonGerner,YannLeScouarnec,JeremyStolz,MichaelK.Glass,Wrox;2nd edition (27 January 2005), SB - 3978-0764579660.
3.	“Beginning PHP 5. FOR BEGG ERS” By: Ivan Byross, Sharanam Shah Publisher: The Team (SPD) ISBN 10:81-8404-075-X
4.	“Beginning PHP 5” by : Dave W. Mercer, Allent Kent, Steven D. Nowicki, David Mercer,Dan Squire, Wankyu Choi , Publisher: WROX (Wiley dreamTech), ISBN :81-265-0539
5.	The Complete Reference – Steven Holzner <a href="https://books.google.co.in/books?id=bGS4CmJY0I8C&amp;printsec=frontcover&amp;dq=PHP+ebook&amp;hl=en&amp;sa=X&amp;ved=0ahUKEwj14PuNoKLPahURwTgGHXadDbYQ6AEIVTAF#v=onepage&amp;q&amp;f=false">https://books.google.co.in/books?id=bGS4CmJY0I8C&amp;printsec=frontcover&amp;dq=PHP+ebook&amp;hl=en&amp;sa=X&amp;ved=0ahUKEwj14PuNoKLPahURwTgGHXadDbYQ6AEIVTAF#v=onepage&amp;q&amp;f=false</a>
6.	Programing PHP – RasmusLerdorf , Kevin Tatroe and Peter Macintyre <a href="https://www.pdfdrive.com/programming-php-d38208381.html">https://www.pdfdrive.com/programming-php-d38208381.html</a>
Website Reference Link:	
1.	PHP 7.4.22 : <a href="http://www.php.net">www.php.net</a>
2.	PHP Tutorial : <a href="https://www.w3schools.com/php/">https://www.w3schools.com/php/</a>
3.	Learn PHP: <a href="https://www.tutorialspoint.com/php/index.html">https://www.tutorialspoint.com/php/index.html</a>

Best IDE Tools:		
Sr.No	Name of IDE or Tools	Operating System
1	XAMPP Apache + PHP + Perl ( Version 7.3)	Window Operating System
2	XAMPP Apache + PHP + Perl	RedHat/Linux/Ubuntu





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**S.Y.B.C.A (Science) SEM III (CBCS– NEP2023Pattern)**

<b>Course Title</b>	<b>Software Engineering</b>	
<b>Course Code: 23SBCA33MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To learn and understand the principles of System and Software Engineering
2.	To be acquainted with methods of capturing, specifying, Visualizing and analyzing Software requirements.
3.	To learn design processes and software quality parameters

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Compare and contrast various Software Engineering models
2.	Decide on appropriate process model for a developing a software project
3.	Classify software applications and Identify unique features of various domains
4.	Prepare System Requirement Specification (SRS) for the given problem
5.	Design and analyse Data Flow diagrams



	<ul style="list-style-type: none"> <li>a. User requirement</li> <li>b. System requirements</li> </ul> <p><b>3. Requirement Engineering Tasks</b></p> <ul style="list-style-type: none"> <li>i. Inception</li> <li>ii. Elicitation</li> <li>iii. Elaboration</li> <li>iv. Negotiation</li> <li>v. Specification</li> <li>vi. Validation</li> </ul> <p><b>4. Requirement Gathering</b></p> <ul style="list-style-type: none"> <li>i. Collaborative Requirement Gathering</li> <li>ii. Quality Function Deployment(QFD)</li> <li>iii. Usage Scenarios</li> <li>iv. Elicitation Work Products</li> </ul> <p><b>5. Feasibility Study</b></p> <ul style="list-style-type: none"> <li>i. Technical Feasibility</li> <li>ii. Operational Feasibility</li> <li>iii. Economic Feasibility</li> </ul> <p><b>6. Fact Finding Techniques</b></p> <ul style="list-style-type: none"> <li>i. Interviews <ul style="list-style-type: none"> <li>a. Structured Interview</li> <li>b. Unstructured Interview</li> </ul> </li> <li>ii. Questionnaires</li> <li>iii. Record View</li> <li>iv. Observation</li> </ul>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p>
<b>Unit IV</b>	<b>Analysis And Design Tools</b>	<b>07</b>
	<p><b>1. Introduction to Analysis and Design</b></p> <p><b>2. Decision Tree</b></p> <p><b>3. Decision Table</b></p> <p><b>4. Data Flow Diagram(DFDs)</b></p> <ul style="list-style-type: none"> <li>i. Types Of DFDs</li> <li>ii. Levels of DFDs</li> </ul> <p><b>5. Data Dictionary</b></p> <ul style="list-style-type: none"> <li>i. Elements Of DD</li> <li>ii. Advantages and Disadvantages Of DD</li> </ul> <p><b>6. Input and Output Design</b></p> <p><b>7. Pseudo code</b></p> <p><b>8. Case studies</b></p>	<p><b>1</b></p> <p><b>2</b></p> <p><b>2</b></p> <p><b>1</b></p> <p><b>1</b></p>
<b>Unit V</b>	<b>Software Testing</b>	<b>03</b>
	<p><b>1. Introduction</b></p> <ul style="list-style-type: none"> <li>i. Need/Necessity of testing</li> <li>ii. Testing Terminology</li> </ul> <p><b>2. Definition of Software Testing</b></p> <ul style="list-style-type: none"> <li>i. Life cycle Of Software Testing</li> <li>ii. Types Of Testing <ul style="list-style-type: none"> <li>a. Manual Testing</li> </ul> </li> </ul>	<p><b>1</b></p> <p><b>1</b></p>





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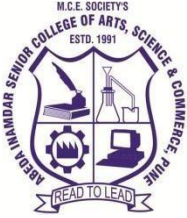
<b>Course Title</b>	<b>Lab I : Python Programming</b>	
<b>Course Code: 23SBCA34MM</b>	<b>No. Of Credits:02</b>	
<b>Course Type: MM(Major Mandatory)</b>	<b>Total Teaching Hours: 60</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To learn the syntax and semantics of the python Programming language
<b>2.</b>	To learn the object oriented programming concepts of python programming.
<b>3.</b>	To learn the modules and package in python.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	To implement object oriented program.
<b>2.</b>	To create user defined functions.
<b>3.</b>	To create modules in python.
<b>4.</b>	To create user defined packages.

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
<b>1</b>	<b>Assignment on Conditional statements and loops</b>	<b>02</b>
<b>2</b>	<b>Assignment on Data Types(List, Tuple, dictionary and Sets) in python</b>	<b>04</b>
<b>3</b>	<b>Assignment on Functions</b>	<b>03</b>
<b>4</b>	<b>Assignment on Modules and package</b>	<b>02</b>
<b>5</b>	<b>Assignment on Class and objects</b>	<b>03</b>
<b>Total Number of Sessions</b>		<b>14</b>

<b>Best IDE Tools:</b>		
<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
<b>1</b>	PyCharm Professional Edition	Windows
<b>2</b>	Python 3.8.10	Windows



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**S.Y.B.C.A (Science) SEM III (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Computer Networks</b>	
<b>Course Code: 23SBCA31MNA</b>		<b>No. Of Credits:02</b>
<b>Course Type: MN(Minor Theory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	Ability to build an understanding of the fundamental concepts of computer Networking.
<b>2.</b>	To able to Identify the different types of network topologies and protocols.
<b>3.</b>	Independently understand basic computer network technology.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Able to understand the basic concepts of networking
<b>2.</b>	Able to understand how networks connected through transmission media.
<b>3.</b>	Able to understand how networks connected through network devices.



<b>Unit IV</b>	<b>IP Addressing and Sub-netting</b>	<b>06</b>
	<ol style="list-style-type: none"> <li>1. Introduction to IPv4</li> <li>2. Introduction to IPv6</li> <li>3. IPv4 addressing and sub-netting</li> <li>4. Subnet mask calculations</li> <li>5. IPv6 addressing basics</li> </ol>	<ol style="list-style-type: none"> <li>1</li> <li>1</li> <li>2</li> <li>2</li> </ol>
<b>Unit V</b>	<b>Routing Protocols</b>	<b>09</b>
	<ol style="list-style-type: none"> <li>1. Forwarding</li> <li>2. Structure of a Router</li> <li>3. Routing Tables</li> <li>4. Intra – And Inter-Domain Routing</li> <li>5. Distance Vector Routing</li> <li>6. RIP</li> <li>7. OSPF</li> <li>8. BGP</li> <li>9. Multicast Routing</li> </ol>	

<b>Suggested Reading</b>	
<b>1.</b>	Computer Networks - Andrew Tanenbaum (III Edition)
<b>2.</b>	Data Communications & Networking - Behrouz Ferouzan (III Edition)
<b>3.</b>	Complete Guide to Networking - Peter Norton
<b>4.</b>	Computer Networks: A Systems Approach - <b>Larry Peterson, Bruce Davie</b>
<b>5.</b>	Computer Networking: A Top-down Approach-Book by Jim Kurose
<b>6.</b>	Gary A. Donahue:” Network Warrior” O’Reilly
<b>Website Reference Link:</b>	
<b>1.</b>	<b>Computer Networks -</b> <a href="https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm">https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm</a>
<b>2.</b>	Fundamentals of computer networking : <a href="https://www.javatpoint.com/fundamentals-of-computer-networking">https://www.javatpoint.com/fundamentals-of-computer-networking</a>
<b>3.</b>	<b>Basic computer network:</b> <a href="https://www.guru99.com/basic-computer-network.html">https://www.guru99.com/basic-computer-network.html</a>
<b>4.</b>	<b>Basic Computer networking:</b> <a href="https://www.geeksforgeeks.org/basics-computer-networking/">https://www.geeksforgeeks.org/basics-computer-networking/</a>





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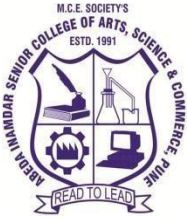
<b>Course Title</b>	<b>Computer Organization</b>	
<b>Course Code: 23SBCA31MNB</b>		<b>No. Of Credits:02</b>
<b>Course Type: MN(Minor Theory)</b>		<b>Total Teaching Hours :30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To study number system, logic gates
2.	To understand combinational & Sequential circuits.
3.	To provide a broad overview of architecture and functioning of computer systems
4.	To learn the basic concepts behind the architecture and organization of computers.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Data representation and Computers Arithmetic
2.	Design of Combinational Circuit
3.	Design of Sequential circuit.

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Data representation and Computers Arithmetic</b>	<b>8</b>
	<ol style="list-style-type: none"> <li>1. Introduction to Decimal, Binary and Hexadecimal Number Systems and their inter-conversions</li> <li>2. BCD code, Gray code and ASCII Code</li> <li>3. 1's and 2's complement of binary numbers</li> <li>4. Binary Addition , Binary Subtraction , Binary subtraction using 1'sand 2's complement Method</li> </ol>	
<b>Unit II</b>	<b>Logic Gates and Boolean Algebra</b>	<b>10</b>
	<ol style="list-style-type: none"> <li>1. Logic gates (With their symbols, Boolean Equation and Truth Table)</li> <li>2. Boolean theorems, Boolean Laws, De Morgan's Theorem, simplifying of Boolean expression using Boolean Algebra, Implementation of other gates using universal gates</li> <li>3. Karnaugh Maps: Introduction, Reduction technique using Karnaugh maps ,2/3/4 variable K-maps, Grouping of variables in K-maps, simplifying of Boolean expression using K-map</li> </ol>	
<b>Unit III</b>	<b>Combinational Circuits and Sequential Circuits</b>	<b>12</b>
	<ol style="list-style-type: none"> <li>1. Arithmetic Circuits: Half Adder, Full Adder, Parallel Adder, Half Subtractor, Universal Adder / Subtractor</li> <li>2. Study of Multiplexer and Demultiplexer</li> <li>3. Study of Encoder and Decoder</li> <li>4. Flip Flops: Introduction and Types</li> <li>5. Shift Registers: Introduction, Types of Shift registers, Ring Counter.</li> <li>6. Counters -Synchronous and Asynchronous type (3 -bit Up, Down and Up - Down counter)</li> <li>7. IC 7490: Internal Block Diagram and designing Mod-N counters</li> </ol>	

<b>Suggested Reading</b>	
<b>1.</b>	R.P. Jain, "Modern Digital Electronics", McGraw-Hill Publications.
<b>2.</b>	Floyd and Jain, " Digital Fundamentals", Pearson Publication
<b>3.</b>	Morris Mano , "Computer System Architecture", Prentice-Hall
<b>Website Reference Link:</b>	
<b>1.</b>	Tutorial Points <a href="https://www.tutorialspoint.com/microprocessor/microcontrollers_overview.htm">https://www.tutorialspoint.com/microprocessor/microcontrollers_overview.htm</a>
<b>2.</b>	Electronic Tutorials : <a href="https://www.electronics-tutorials.ws/boolean/bool_7.html">https://www.electronics-tutorials.ws/boolean/bool_7.html</a>



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**S.Y.B.C.A (Science) SEM III (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab II : Computer Networks</b>	
<b>Course Code: 23SBCA32MNA</b>	<b>No. Of Credits:02</b>	
<b>Course Type: MN(Minor Practical)</b>	<b>Total Teaching Hours:60</b>	

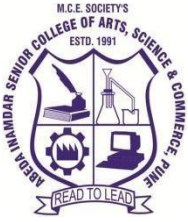
<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	Provide students with hands-on experience in configuring, managing, and troubleshooting computer networks.
<b>2.</b>	Help students understand the components of computer networks such as routers, switches, servers, and client devices, and their roles in network communication.
<b>3.</b>	Enable students to apply networking concepts learned in theory, such as IP addressing, subnetting, routing, switching, and network security, in practical scenarios.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Be proficient in configuring network devices such as routers, switches, and access points, including setting up IP addressing, subnetting, and routing protocols.
<b>2.</b>	Understand the network protocols such as TCP/IP, DHCP, DNS, and HTTP, and be able to configure and troubleshoot them in practical scenarios.
<b>3.</b>	Develop proficiency in capturing and analyzing network packets using Wireshark, gaining insights into network traffic patterns, protocols, and communication behaviors.

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
1.	To learn computer network administration commands and command line tools for system administration.	01
2.	To learn the basic Switch Configuration.	01
3.	To learn the Linux Operating Systems and Application Environments	02
4.	To learn the Learning about Windows Operating System.	02
5.	To learn the Operating Systems for Networked Environment.	02
<b>6.</b>	To learn the Wireshark for simple packet capture and observations.	<b>02</b>
<b>7.</b>	To learn the DNS using Wireshark.	<b>02</b>
<b>8.</b>	To learn the Packet Tracer: Building Network and Configuring Router.	<b>02</b>
<b>Total</b>		<b>14</b>

**Best IDE Tools:**

<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
<b>1</b>	Packet Tracer	Windows
<b>2</b>	Wireshark.	Windows/Kali Linux



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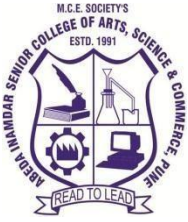
**S.Y.B.C.A (Science) SEM III (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab II-Computer Organization</b>	
<b>Course Code: 23SBCA32MNB</b>		<b>No. Of Credits:02</b>
<b>Course Type: MN(Minor Practical)</b>		<b>Total Teaching Hours :60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To study architecture and functioning of computer systems
<b>2.</b>	To learn the basic concept behind the architecture and organization of computers

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Design and implement combinational circuits
<b>2.</b>	Design and implement sequential circuits
<b>3.</b>	Translate real world problems into digital logic formulations

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
<b>1.</b>	Study of Basic Logic Gates (Verification of Truth tables)	<b>1</b>
<b>2.</b>	Study of Derived Logic Gates (Verification of Truth tables)	<b>1</b>
<b>3.</b>	Study Of De Morgan's Theorem	<b>1</b>
<b>4.</b>	Study of Binary to Gray & Gray to Binary Converter (K- Map based design)	<b>1</b>
<b>5.</b>	Study of Half Adder and Full Adder using Logic Gates.	<b>1</b>
<b>6.</b>	Study of Half Subtractor using Logic Gates.	<b>1</b>
<b>7.</b>	Study of Decimal to BCD (Binary) Converter using Gates.	<b>1</b>
<b>8.</b>	Study of Multiplexer and Demultiplexer	<b>1</b>
<b>9.</b>	Study of flip flops.	<b>1</b>
<b>10.</b>	Study of counter ICs: IC 7490 and designing Mod-N counters	<b>1</b>
<b>11.</b>	Study of Asynchronous Up/Down Counter	<b>1</b>
<b>12.</b>	Study of Synchronous Up/Down Counter	<b>1</b>
<b>13.</b>	Study of Shift Registers	<b>1</b>
<b>14.</b>	Study of Four-bit ALU	<b>1</b>
<b>Total Number of Sessions</b>		<b>14</b>



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**S.Y.B.C.A (Science) SEM III (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab III - Web Technology using PHP</b>	
<b>Course Code: 23SBCA31VS</b>		<b>No. Of Credits:02</b>
<b>Course Type: VSC(Vocational Skill Course)</b>		<b>Total Teaching Hours:60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To understand installation process
2.	To get familiar with basics of the Internet Programming
3.	To acquire knowledge and skills for creation of web site using client and server side.
4.	To understand process of developing Static web applications

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Design and implement static websites using appropriate client side and server side technologies.
2.	Build Static web site using PHP Programming.

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
1	Assignment on loops in PHP	2
2	Assignment on Control Statements	2
3	Assignment on Processing Forms & File Uploading	4
4	Assignment on Functions	2
5	Assignment on Strings	2
6	Assignment on Arrays	2
<b>Total Number of Sessions</b>		<b>14</b>

<b>Best IDE Tools:</b>		
<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
1	XAMPP Apache + PHP + Perl ( Version 7.3)	Window Operating System
2	XAMPP Apache + PHP + Perl	RedHat/Linux/Ubuntu

**SEM-IV**



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Data Structure using Python</b>	
<b>Course Code: 23SBCA41MM</b>	<b>No. Of Credits:02</b>	
<b>Course Type: MM(Major Mandatory)</b>	<b>Total Teaching Hours:30</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To understand analysis of algorithms.
<b>2.</b>	To learn different searching and sorting techniques.
<b>3.</b>	To understand different types of linked list.
<b>4.</b>	To learn use of stack and queue.
<b>5.</b>	To understand the use of tree as a data structure.
<b>6.</b>	To learn graph and its traversal methods.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Analyse the algorithms on the scale of their performance.
<b>2.</b>	Develop searching and sorting techniques to solve real world computing problems.
<b>3.</b>	Apply linked list data structure for developing applications.
<b>4.</b>	Implement various applications of stack and queue.
<b>5.</b>	Illustrate tree terminology and its traversal techniques.



<b>Unit No</b>	<b>Title with Contents</b>	<b>No .of Lectures</b>
<b>Unit I</b>	<b>Introduction to Data Structure</b>	<b>02</b>
	<b>1. Need of Data Structure</b> <b>2. Data object, Data Structure, Abstract Data Type (ADT)</b> <b>3. Types of Data Structures</b> <b>4. Algorithm Analysis – Frequency counts, Space and Time complexity</b> <b>5. Asymptotic notations – Big O, Omega (<math>\Omega</math>), Theta(<math>\theta</math>)</b>	<b>1</b>    <b>1</b>
<b>Unit II</b>	<b>Array as Data Structure</b>	<b>07</b>
	<b>1. Array representation –</b> i. Row major ii. column major <b>2. Application – Sorting and Searching</b> <b>3. Comparison based sorting methods -</b> i. Bubble Sort ii. Insertion Sort <b>4. Divide and Conquer strategy</b> i. Merge Sort, ii. Quick Sort <b>5. Searching techniques with time Complexity -</b> i. Linear search <b>ii. Binary search</b>	<b>1</b>   <b>1</b> <b>2</b>  <b>2</b>  <b>1</b>
<b>Unit III</b>	<b>Linked List</b>	<b>08</b>
	<b>1. Introduction</b> <b>2. Dynamic implementation of Linked List</b> <b>3. Types of linked lists –</b> i. Singly ii. Doubly iii. Circular <b>4. Operations on Linked List</b> i. Create ii. Traverse iii. Insert, iv. Delete, v. Search, vi. Reverse vii. Merge viii. Union ix. intersection	<b>2</b> <b>1</b> <b>2</b>  <b>3</b>



Suggested Reading	
<b>1.</b>	Fundamentals of Data Structures - Horowitz Sahani (Galgotia)
<b>2.</b>	Data Structures & Algorithms in Python, by John Canning Alan Broder Robert Lafore, Addison Wesley.
<b>3.</b>	Data Structures and Algorithms Using Python, by Rance D. Necaie, JOHN WILEY & SONS, INC,2011
<b>4.</b>	Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.
<b>5.</b>	Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L.
<b>6.</b>	Data Structures and Program Design Using Python, by Dheeraj Malhotra, Neha Malhotra, , MERCURY LEARNING AND INFORMATION,2021
Website Reference Link:	
<b>1.</b>	<b>Python Data Structures and Algorithms :</b> <a href="https://www.geeksforgeeks.org/python-data-structures-and-algorithms/">https://www.geeksforgeeks.org/python-data-structures-and-algorithms/</a>
<b>2.</b>	<b>Data Structures and algorithm in python :</b> <a href="https://www.javatpoint.com/data-structures-and-algorithms-in-python">https://www.javatpoint.com/data-structures-and-algorithms-in-python</a>
<b>3.</b>	<b>Learn Data structures and algorithm in python :</b> <a href="https://jovian.com/learn/data-structures-and-algorithms-in-python">https://jovian.com/learn/data-structures-and-algorithms-in-python</a>
<b>4.</b>	<b>Learn Data structures and algorithm with python :</b> <a href="https://www.codecademy.com/learn/learn-data-structures-and-algorithms-with-python">https://www.codecademy.com/learn/learn-data-structures-and-algorithms-with-python</a>

Best IDE Tools:		
Sr.No	Name of IDE or Tools	Operating System
<b>1</b>	PyCharm Professional Edition	Windows
<b>2</b>	Python 3.8.10	Windows



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Object Oriented Programming using Java</b>	
<b>Course Code: 23SBCA42MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr. No</b>	<b>Course Objectives</b>
<b>1.</b>	To learn implementation of object-oriented concepts with Java.
<b>2.</b>	To understand Inheritance and interfaces.
<b>3.</b>	To know the process of application development using Graphical User Interface (GUI).
<b>4.</b>	To acquire knowledge about handling databases using Java.

<b>Sr. No</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Identify classes, objects, class members and relationships for a given problem.
<b>2.</b>	Design end to end applications using object oriented constructs.
<b>3.</b>	Use Java APIs for program development.
<b>4.</b>	Handle abnormal termination of a program using exception handling

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Introduction to JAVA</b>	<b>06</b>
	<ul style="list-style-type: none"> <li>1. A Short History of Java</li> <li>2. Features of Java</li> <li>3. Java Environment – Compiler, Interpreter, JVM</li> <li>4. Simple java program</li> <li>5. Types of Comments</li> <li>6. Declaring single and multi-dimensional arrays</li> <li>7. Accepting input using Command line arguments</li> <li>8. Accepting input from console (UsingBufferedReader and Scanner class)</li> </ul>	<ul style="list-style-type: none"> <li>1</li> <li>2</li> <li>1</li> <li>2</li> </ul>
<b>Unit II</b>	<b>Classes and Object</b>	<b>06</b>
	<ul style="list-style-type: none"> <li>1. Defining Your Own Classes</li> <li>2. Access Specifiers (public, protected, private, default)</li> <li>3. Array of Objects</li> <li>4. Constructor, Overloading Constructors and use of “this” Keyword</li> <li>5. static blocks, static Fields and static methods</li> <li>6. Predefined classes – Object class methods(equals(), toString(),hashCode())</li> <li>7. Garbage Collection (finalize()Method)</li> </ul>	<ul style="list-style-type: none"> <li>1</li> <li>1</li> <li>1</li> <li>1</li> <li>1</li> <li>1</li> </ul>
<b>Unit III</b>	<b>Inheritance and Interface</b>	<b>08</b>
	<ul style="list-style-type: none"> <li>1. Inheritance Basics (extends Keyword) and Types of Inheritance</li> <li>2. Superclass, Subclass and use of Super Keyword</li> <li>3. Method Overriding and run time polymorphism</li> <li>4. Use of final keyword related to variable, method and class</li> <li>5. Use of abstract class and abstract methods Interface</li> <li>6. Defining and Implementing Interfaces</li> <li>7. Runtime polymorphism using interface Packages</li> </ul>	<ul style="list-style-type: none"> <li>1</li> <li>1</li> <li>2</li> <li>2</li> <li>1</li> <li>1</li> </ul>
<b>Unit IV</b>	<b>Exception Handling</b>	<b>04</b>
	<ul style="list-style-type: none"> <li>1. Exception class, Checked and Unchecked exception</li> </ul>	<ul style="list-style-type: none"> <li>1</li> </ul>

	<b>2. Catching exception and exception handling – try, catch, finally, throw and throws, multiple catch block</b>	<b>1</b>
	<b>3. Creating user defined exception</b>	<b>2</b>
<b>Unit V</b>	<b>User Interface with AWT and Swing</b>	<b>6</b>
	<b>1. What is AWT? What is Swing?</b>	<b>1</b>
	<b>3. Difference between AWT and Swing</b>	
	<b>4. The MVC Architecture And Swing</b>	
	<b>5. Layout Manager and Layouts,</b>	<b>1</b>
	<b>6. Components – JComponent, JLabel, JButton, JTextBox, JTextArea, JCheckBox, JRadioButton, JList, JComboBox, JMenu and JPopupMenu Class, JMenuItem</b>	<b>3</b>
	<b>7. Dialogs (Message, confirmation, input), JFileChooser</b>	<b>1</b>
	<b>Event Handling: Event sources, Listeners – ActionListener, ItemListener</b>	

### Suggested Reading

<b>1.</b>	“Core Java Volume – Fundamentals”, Author – Cay S. Horstmann, Latest Edition – 11th Edition, Publisher – PrenticeHall
<b>2.</b>	“Effective Java”, Author – Joshua Bloch, Latest Edition – 3rd Edition, Publisher – Addison Wesley
<b>3.</b>	“Java - The Complete Reference”, Author – Herbert Schildt, Latest Edition – 11th Edition, Publisher – McGraw Hill Education
<b>4.</b>	“Head First Java”, Author – Kathy Sierra & Bert Bates, Latest Edition – 2nd Edition Publisher – Shroff/O’Reilly

### Website Reference Link:

<b>1.</b>	Java Programming : <a href="https://www.programiz.com/java-programming">https://www.programiz.com/java-programming</a>
<b>2.</b>	Java Tutorial : <a href="https://www.geeksforgeeks.org/java/">https://www.geeksforgeeks.org/java/</a>
<b>3.</b>	Java Tutorial : <a href="https://www.javatpoint.com/java-tutorial">https://www.javatpoint.com/java-tutorial</a>
<b>4.</b>	Learn Java Programming: <a href="https://www.tutorialspoint.com/java/index.htm">https://www.tutorialspoint.com/java/index.htm</a>

### Best IDE Tools:

<b>Sr. No.</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
<b>1.</b>	ECLIPSE, NETBEANS & JDK	Window Operating System
<b>2.</b>	NETBEANS, ECLIPSE & JDK	Red Hat /Linux / Ubuntu



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Cloud Computing</b>	
<b>Course Code: 23SBCA43MM</b>	<b>No. Of Credits:02</b>	
<b>Course Type: MM(Major Mandatory)</b>	<b>Total Teaching Hours:30</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To understand the principles and paradigm of Cloud Computing
2.	To appreciate the role of Virtualization Technologies
3.	Ability to design and deploy Cloud Infrastructure
4.	Understand Cloud Security Issues And Solutions

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2.	Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple data centers to build and deploy cloud applications that are resilient, elastic and cost-efficient.
3.	Discuss system, network and storage virtualization and outline the role in enabling the cloud computing system model.
4.	Illustrate the fundamental concepts of cloud storage and demonstrate the use in storage systems such as Amazon S3.
5.	Analyze various cloud programming models and apply them to solve problems on the cloud.

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Introduction to Cloud Computing</b>	<b>08</b>
	<b>1. Overview,</b> <ul style="list-style-type: none"> <li>i. Layers and Types of Cloud, Desired</li> <li>ii. Features of a Cloud,</li> <li>iii. Benefits and Disadvantages of Cloud Computing,</li> <li>iv. Cloud Infrastructure Management, Infrastructure as a Service Providers,</li> <li>v. Platform as a Service Providers</li> <li>vi. Multitenant Technology.</li> </ul>	<b>4</b>
	<b>2. Cloud-Enabling Technology:</b> <ul style="list-style-type: none"> <li>i. Broadband Networks and Internet Architecture,</li> <li>ii. Data Center Technology,</li> <li>iii. Virtualization Technology.</li> </ul>	<b>2</b>
	<b>3. Infrastructure as a Service,</b> <ul style="list-style-type: none"> <li>i. Platform as a Service,</li> <li>ii. Software as a Service,</li> <li>iii. Cloud Deployment Models.</li> </ul>	<b>2</b>
<b>Unit II</b>	<b>Abstraction and Virtualization</b>	<b>07</b>
	<b>1. Introduction to Virtualization Technologies,</b> <ul style="list-style-type: none"> <li>i. Application Virtualization.</li> <li>ii. Network Virtualization.</li> <li>iii. Desktop Virtualization.</li> <li>iv. Storage Virtualization.</li> <li>v. Server Virtualization.</li> </ul>	<b>2</b>
	<ul style="list-style-type: none"> <li>ii. Network Virtualization.</li> <li>iii. Desktop Virtualization.</li> <li>iv. Storage Virtualization.</li> <li>v. Server Virtualization.</li> </ul>	<b>2</b>
	<b>2. Load Balancing and Virtualization,</b> <ul style="list-style-type: none"> <li>i. Software-based load balancers</li> <li>ii. Hardware-based load balancers</li> </ul>	<b>1</b>
	<b>3. Understanding Hypervisors,</b> <ul style="list-style-type: none"> <li>i. Type 1 Hypervisor</li> <li>ii. Type 2 Hypervisor</li> </ul>	
	<b>4. Virtual Machines Provisioning and Manageability Virtual Machine Migration Services,</b>	
	<b>5. Provisioning in the Cloud Context Virtualization of CPU, Memory , I/O Devices,</b>	
	<b>6. Virtual Clusters and Resource management</b>	
<b>Unit III</b>	<b>Programming, Environments and Applications</b>	<b>08</b>
	<b>1. Features of Cloud and Grid Platforms,</b> <ul style="list-style-type: none"> <li>i. Programming Support of Google App Engine,</li> <li>ii. Programming on Amazon AWS and Microsoft Azure,</li> <li>iii. Emerging Cloud Software Environments</li> </ul>	<b>4</b>
	<b>2. Applications:</b> <ul style="list-style-type: none"> <li>i. Moving application to cloud,</li> <li>ii. Microsoft Cloud Services, Google Cloud</li> </ul>	<b>4</b>







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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab I : Data Structure using Python</b>	
<b>Course Code: 23SBCA44MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	Design an efficient algorithm for the given problem and implement it Using Python Programming.
<b>2.</b>	Apply appropriate data structures for the given problem.
<b>3.</b>	Determine the time and space complexity of a given algorithm.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	To understand algorithms and analysis of algorithms
<b>2.</b>	To learn static and dynamic data structures

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
<b>1</b>	<b>Assignment on sorting techniques</b>	<b>03</b>
<b>2</b>	<b>Assignment on Linked List</b>	<b>03</b>
<b>3</b>	<b>Assignment on Stack</b>	<b>03</b>
<b>4</b>	<b>Assignment on Queue</b>	<b>02</b>
<b>5</b>	<b>Assignment on Tress</b>	<b>03</b>
<b>Total Number of Sessions</b>		<b>14</b>

<b>Best IDE Tools:</b>		
<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
<b>1</b>	PyCharm Professional Edition	Windows
<b>2</b>	Python 3.8.10	Windows



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Introduction to Cyber Security</b>	
<b>Course Code: 23SBCA41MNA</b>		<b>No. Of Credits:02</b>
<b>Course Type: MN(Minor)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To define the fundamentals of cybersecurity, including key terms and concepts.
2.	To understand protocols, firewalls, and intrusion detection/prevention systems.
3.	To apply security measures to operating systems and end-user devices.
4.	To understand basic encryption and decryption techniques.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Identify and analyze various types of cyber threats, including malware, phishing, ransom ware, and other forms of cyber-attacks.
2.	Gain knowledge of cryptographic principles and techniques to secure data and communication.
3.	Understand legal and regulatory requirements related to cybersecurity.
4.	Implement secure coding practices for web development.

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Introduction to Cybersecurity</b>	<b>2</b>
	<p>1.1. Overview of Cyber Security,  1.2. Internet Governance – Challenges and Constraints,  1.3. Cyber Threats: - Cyber Warfare-Cyber Crime- Cyber Terrorism-Cyber Espionage  1.4. Need for a Comprehensive Cyber Security Policy  1.5. Need for a Nodal Authority  1.6. Need for an International convention on Cyberspace  1.7 CIA Triad.</p>	
<b>Unit II</b>	<b>Cyber Security Threats and Vulnerabilities</b>	<b>8</b>
	<p>2.1 Overview of Security threats and Vulnerability:  2.1.1 Vulnerability and Threats  2.1.2 Types of attacks on confidentiality,  2.1.3 Types of attacks Integrity and Availability.  2.1.4 Types of Malware and Threats (Spyware, Virus and Worms, Trojan and backdoors,  )  2.2 Web attack: Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks  2.3 Network Vulnerabilities: Overview of vulnerability scanning,  2.1.5 Open Port / Service Identification, Banner /Version Check  2.1.6 Traffic Probe, Vulnerability Probe  2.1.7 Vulnerability Examples, OpenVAS,  2.1.8 Metasploit  2.1.9 Networks Vulnerability Scanning using Netcat, Socat  2.1.10 Network Sniffers and Injection tools</p>	
<b>Unit III</b>	<b>Network Defense tools</b>	<b>8</b>
	<p>3.1 Firewall: Introduction, Linux Firewall, Windows Firewall.  3.2 Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall  3.3 How a Firewall Protects a Network, Packet Characteristic to Filter  3.4 Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding.  3.5 VPN: the basic of Virtual Private Networks.  3.6 Snort: Introduction Detection System</p>	

<b>Unit IV</b>	<b>Web Application Tools</b>	<b>8</b>
	<p><b>4.1 Scanning for web vulnerabilities tools:</b></p> <p>4.1.1 Nikto</p> <p>4.1.2 W3af</p> <p><b>4.2 HTTP utilities –</b></p> <p>4.2.1 Curl</p> <p>4.2.2 OpenSSL</p> <p>4.2.3 Stunnel.</p> <p><b>4.3 Application Inspection tools –</b></p> <p>4.3.1 Zed Attack Proxy</p> <p>4.3.2 Sqlmap</p> <p>4.3.3 DVWA</p> <p>4.3.4 Webgoat.</p> <p><b>4.4 Password Cracking and Brute-Force Tools: 4.4.1</b></p> <p>John the Ripper</p> <p>4.4.2 L0htcrack</p> <p>4.4.3 Pwdump</p> <p>4.4.4 HTC-Hydra.</p>	
<b>Unit V</b>	<b>Introduction to Cyber Crime, law and Investigation</b>	<b>4</b>
	<p><b>5.1 Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors</b></p> <p><b>5.2 Cyberspace and Criminal Behavior, Clarification of Terms</b></p> <p><b>5.3 Traditional Problems Associated with Computer Crime</b></p> <p><b>5.4 Introduction to Incident Response, Digital Forensics</b></p> <p><b>5.5 Computer Language, Network Language, Realms of the Cyber world.</b></p> <p><b>5.6 Internet crime and Act: A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.</b></p> <p><b>5.7 Steganography, DOS and DDOS attack, SQL injection, Buffer.</b></p>	

<b>Suggested Reading</b>	
<b>1.</b>	W Stallings, “Cryptography and Network Security: Principles and Practice, 6/e”, Prentice Hall
<b>2.</b>	Cryptography and Network Security, 2 EDITION, by Atul Kahate
<b>3.</b>	A. Menezes, P. van Oorschot, S. Vanstone. “Handbook of Applied Cryptography”, CRC press, 1997.
<b>4.</b>	Douglas R. Stinson, “Cryptography: Theory and Practice 3/e”, CRC Press, 2006
<b>5.</b>	Nina Godbole, Sunit Belapure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives” ,Wiley: April 2011 India Publications Released.
<b>6.</b>	James Graham Richard Howard Ryan Olson, “Cyber Security Essentials”-
<b>Website Reference Link:</b>	
<b>1.</b>	<b>Cyber Security Tutorial :</b> <a href="https://www.geeksforgeeks.org/cyber-security-tutorial/">https://www.geeksforgeeks.org/cyber-security-tutorial/</a>
<b>2.</b>	<b>Cyber Security Tutorial: A Step-by-Step Guide :</b> <a href="https://www.simplilearn.com/tutorials/cyber-security-tutorial">https://www.simplilearn.com/tutorials/cyber-security-tutorial</a>
<b>3.</b>	<b>Cyber Security Tutorial for Beginners (Full Course Lecture Series) Starter Tutorials :</b> <a href="https://www.youtube.com/playlist?list=PL_RcVnBPGmSLAGyNa6wiAf8bbVwxYYzCj">https://www.youtube.com/playlist?list=PL_RcVnBPGmSLAGyNa6wiAf8bbVwxYYzCj</a>



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>8051 Microcontroller Programming</b>	
<b>Course Code: 23SBCA41MNB</b>		<b>No. Of Credits:02</b>
<b>Course Type: Minor (Theory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To study the basics of 8051 microcontroller
<b>2.</b>	To understand the internal architecture of 8051 Microcontrollers.
<b>3.</b>	To understand and acquire knowledge in programming 8051 Microcontroller using assembly and Embedded C
<b>4.</b>	To study the interfacing techniques of 8051 microcontroller

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Understands basics and architecture of 8051 Microcontroller
<b>2.</b>	Write 8051 Assembly level programs using 8051 instructions Set and C
<b>3.</b>	Interface simple switches, simple LEDs, LCD , DC motor and Stepper Motor to 8051 using 8051 I/O ports.
<b>4.</b>	Design 8051 Microcontroller based applications.
<b>5.</b>	The students can design mini project based on 8051 microcontrollers using Assembly and/or C language

<b>Unit No</b>	<b>Title with Contents</b>	<b>No .of Lectures</b>
<b>Unit I</b>	<b>The 8051 Architecture</b>	<b>08</b>
	<ol style="list-style-type: none"> <li>1. <b>Introduction to the concepts of microprocessors and microcontrollers</b></li> <li>2. <b>Architecture of 8051microcontroller</b></li> <li>3. <b>Features of 8051microcontroller</b></li> <li>4. <b>Functional Pin out diagram and description of pins</b></li> <li>5. <b>Special function registers (SFRs)</b></li> <li>6. <b>Memory Organization</b></li> <li>7. <b>Interrupts</b></li> </ol>	
<b>Unit II</b>	<b>8051 Instruction Set and Programming</b>	<b>14</b>
	<ol style="list-style-type: none"> <li>1. <b>Classification of Instruction Set:</b> Data transfer group, Arithmeticgroup, Logical group, Branching group, Bit Manipulation Group.</li> <li>2. <b>Addressing modes</b> - Immediate, register, direct, register indirect andindexed addressing modes</li> <li>3. <b>Features of machine language</b>, assembly language, middle-level andhigh-level languages.</li> <li>4. <b>Programs using Assembly Language</b> <ol style="list-style-type: none"> <li>i. Arithmetic Operations</li> <li>ii. Sum of n-numbers</li> <li>iii. Block transfer</li> <li>iv. Finding smallest and largest number from a set of numbers</li> </ol> </li> <li>5. <b>Assembly languageprogramming for interfacing LED</b></li> <li>6. <b>Embedded C and Programming.</b></li> </ol>	
<b>Unit III</b>	<b>Interfacing the 8051 with Peripherals</b>	<b>08</b>
	<ol style="list-style-type: none"> <li>1. <b>Interfacing of LEDs</b></li> <li>2. <b>Interfacing of 7-Segment LED Display</b></li> <li>3. <b>Interfacing of Switches</b></li> <li>4. <b>Interfacing of 16x2 LCD Display</b></li> <li>5. <b>Interfacing of DC Motor</b></li> <li>6. <b>Interfacing of Stepper motor</b></li> <li>7. <b>Interfacing of Servo motor</b></li> <li>8. <b>Interfacing of different sensors</b></li> <li>9. <b>Interfacing ADC and DAC</b></li> </ol>	

<b>Suggested Reading</b>	
1.	<b>Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. Mc Kinlay , The 8051 Microcontroller and Embedded Systems – using assembly and C, Pearson</b>
2.	<b>Kenneth J. Ayala, The 8051 Microcontroller, 3rd Edition, Delmar Cengage Learning</b>
3.	<b>Manish K Patel ,The 8051 Microcontroller Based Embedded Systems , McGraw Hill</b>
4.	<b>Rao, Dr. K Uma, The 8051 Microcontrollers: Architecture, Programming and Applications, Pearson Education India, New Delhi</b>





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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab II – Introduction to Cyber Security</b>	
<b>Course Code: 23SBICA42MNA</b>		<b>No. Of Credits:02</b>
<b>Course Type: MN(Minor)</b>		<b>Total Teaching Hours: 60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	Develop practical skills in configuring and managing various cybersecurity tools and technologies.
2.	Understand and implement network security measures such as firewalls, intrusion detection/prevention systems, and VPNs.
3.	Secure network infrastructure against common attacks.
4.	Implement encryption and decryption processes.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Demonstrate practical proficiency in configuring and managing various cybersecurity tools
2.	Conduct comprehensive vulnerability assessments on networks.
3.	Implement and configure network security measures, including firewalls, intrusion detection/prevention systems, and virtual private networks (VPNs).
4.	Implement encryption and decryption processes using industry-standard algorithms.

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
1.	<b>Installation and Configuration of Kali Linux</b>	<b>01</b>
2.	<b>Assignment on setup virtual Environment using platform like VMware or virtual box</b>	<b>01</b>
3.	<b>Assignment on to Configure a small network with routers, switches, and firewalls using Packet Tracer or GNS3.</b>	<b>03</b>
4.	<b>Assignment on analyzing network traffic and network attacks using Wire Shark tool.</b>	<b>03</b>
5.	<b>Assignment on vulnerability scanning using OpenVAS tool</b>	<b>02</b>
6.	<b>Assignment on implementing IDS using Snort on the network.</b>	<b>02</b>
7.	<b>Assignment on phishing awareness exercises</b>	<b>02</b>
<b>Total Number of Sessions</b>		<b>15</b>



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab II: 8051 Microcontroller and Programming</b>		
<b>Course Code: 23SBCA42MNB</b>		<b>No. Of Credits:02</b>	
<b>Course Type: MN(Minor Practical)</b>		<b>Total Teaching Hours: 60</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To get hands on training of Embedded C
2.	To study experimentally interfacing of 8051 microcontroller
3.	To design, build and test modulator and demodulators of digital communication
4.	To build and test experimentally various techniques of wired communication

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	To design and build his/her own microcontroller based projects
2.	To acquire skills of Embedded C programming
3.	To know multiplexing and modulation techniques useful in developing wireless application
4.	Do build and test own network and do settings.

Assignment No	Assignment Name	No. Of Sessions
1.	Assembly language programs for i. Addition of two 8-bit numbers (Using Registers & Memory) ii. Subtraction of two 8-bit numbers. (Using Registers & Memory)	1
2.	Assembly language programs for i. Multiplication of two 8-bit numbers using MUL instruction. ii. Division of two 8-bit numbers using DIV instruction.	1
3.	Assembly language programs for Code Conversion i. Transfer block of data from one memory locations to another memory locations ii. Sum of two arrays.	1
4.	Assembly language programs for Transfer block of data from one memory locations to another memory locations	1
5.	Assembly language programs for Sum of two arrays.	1
6.	Traffic light controller using 8051 microcontrollers	1
7.	Interfacing LCD to 8051Microcontroller	1
8.	Interfacing 7 segment Display to 8051Microcontroller	1
9.	Speed Control of stepper motor using 8051 microcontrollers	1
10.	Speed Control of DC motor using 8051 microcontrollers	1
11.	Interfacing Servo Motor to 8051Microcontroller	1
12.	Interfacing DAC to 8051Microcontroller	1
13.	Interfacing ADC to 8051Microcontroller	1
14.	Interfacing IR sensor to 8051Microcontroller	1
15.	Interfacing PIR sensor to 8051Microcontroller	1
16.	Interfacing temperature sensor to 8051Microcontroller	1
17.	Develop a 4 bit binary counter with 8051 and display out put on LCD	1
<b>Total Number of Sessions</b>		<b>17</b>

The practical course consists of 10 experiments. After studying the theory and practical student can design and develop working models using 8051 Microcontroller

- The practical course consists of 10 experiments out of which ONE (Compulsory) will be working model using 8051 Microcontroller.
- These will be evaluated in an oral examination for 15% marks at internal and external semester examination.
- Each Practical batch will have maximum 12 students
- **List of Major Equipment/ Instrument with Broad Specifications**
  - i) Microcontroller 8051 trainer Kit
  - ii) 8051 Simulator software (Free downloadable )
  - iii) Computer System(p-IV and latest version)
  - iv) Peripheral Interfacing Trainer kits



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**S.Y.B.C.A (Science) SEM IV (CBCS– NEP 2023Pattern)**

<b>Course Title</b>	<b>Lab III: Object Oriented Programming using Java</b>	
<b>Course Code: 23SBCA41SE</b>		<b>No. Of Credits:02</b>
<b>Course Type: SEC(Skill Enhancement Course)</b>		<b>Total Teaching Hours :60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To learn implementation of object-oriented concepts with Java.
<b>2.</b>	To understand the concept of exceptional handling
<b>3.</b>	To know the process of application development using Graphical User Interface (GUI).

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Design end to end applications using object oriented constructs.
<b>2.</b>	Apply collection classes for storing java objects
<b>3.</b>	Use Java APIs for program development.

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
<b>1</b>	<b>Assignment on classes and method implementation</b>	<b>02</b>
<b>2</b>	<b>Assignment on Inheritance and Interface</b>	<b>03</b>
<b>3</b>	<b>Assignment on Exception Handling</b>	<b>03</b>
<b>4</b>	<b>Assignment on I/O</b>	<b>03</b>
<b>5</b>	<b>Assignment on Interface with AWT and Swing</b>	<b>03</b>
<b>Total Number of Sessions</b>		<b>14</b>

<b>Best IDE Tools:</b>		
<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
<b>1</b>	Eclipse, Netbeans&Jdk	Window Operating System
<b>2</b>	Netbeans, Eclipse &Jdk	Red Hat /Linux / Ubuntu