SHIVAJI UNIVERSITY, KOLHAPUR

NAACA++Grade withCGPA3.52

Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus for

B.Sc. Computer Science (Optional)

(Under Faculty of Science and Technology)

PART-II SEMESTER- III &IV

(Syllabus to be implemented from Academic year 2026-27)

B.Sc. Computer Science Optional Part II (Level-5.0)

Multiple Entry and Multiple Exit Option (NEP-2020)

B.Sc. Computer Science Optional (Part - II (Level-5.0))

SEM III		Teaching Scheme						
		Theory and Practical			University Assessment		Internal Assessment(IA)	
Sr. No.	Course Code	Lectures (Per week)	Practical Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Maximum Marks	Minimum Marks
1	**Subject I Major V:** Web Technology	2	-	2	30	12	20	08
2	**Subject I Major VI**: Object Oriented Programming Using C++	2	-	2	30	12	20	08
3	**Subject I Practical III:** Practical Based on Subject I Major V & Major VI	-	4*	2	30	12	20	08
4	**Minor V:** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	30	12	20	08
5	**Minor VI :** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	30	12	20	08
6	**Minor Practical III:** Practical based on Minor V and Minor VI	-	4*	2	30	12	20	08
7	**OE– III (T/P):** As per students choice and can be opted from other than B.Sc. (i.e. B.Com or BA) Basket	-	4*	2	30	12	20	08
8	**VSC–I (P)** Major Specific: Angular JS	-	4*	2	30	12	20	08
9	**SEC-I (T):** Essentials of Cyber Security	-	4*	2	30	12	20	08
10	**AEC-I:** Formal Communication	2	-	2	30	12	20	08
11	**CC-I:**Basics of Yoga	2	-	2	30	12	20	08
	Total (A)			**22**	**330**	**-**	**220**	**-**

SEM IV		Teaching Scheme						
		Theory and Practical			University Assessment		Internal Assessment(IA)	
Sr. No.	Course Code	Lectures (Per week)	Practical Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Maximum Marks	Minimum Marks
1	**Subject II Major VII:** PHP and MySQL Using OOP'S	2	-	2	30	12	20	08
2	**Subject II Major VIII**: Data Structure Using C++	2	-	2	30	12	20	08
3	**Subject II Practical IV:** Practical Based on Subject II Major VII & Major VIII	-	4*	2	30	12	20	08
4	**Minor VII:** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	30	12	20	08
5	**Minor VIII:** As per students choice and availability but must be continued with Minor II and Minor V	2	-	2	30	12	20	08
6	**Minor Practical IV:** Practical based on Minor VII and Minor VIII	-	4*	2	30	12	20	08
7	**OE– IV (T/P):** As per students choice and can be opted from other than B.Sc. (i.e. B.Com or BA) Basket	-	4*	2	30	12	20	08
8	**SEC-II (P):**Basics Python Programming	-	4*	2	30	12	20	08
9	AEC-II : Soft skills	2	-	2	30	12	20	08
10	**VEC – II (T)** Environment Studies	2	-	2	30	12	20	08
11	**CEP-I (P):** Field work	-	-	2	30	12	20	08
	Total (B)	-	-	**22**	**330**	**-**	**220**	**-**
	Total (A+B)	-	-	**44**	**660**	**-**	**440**	**-**

*: 4 Practical hours per batch with batch size 30 students

• **OE:** Open Elective	• **SEC:** Skill Enhancement Course
• **VSC:** Vocational Skill Course	• **AEC:** Ability Enhancement Course
• **CC:** Co-Curricular Course	• **CEP:** Community Engagement Program

B.Sc. Computer Science Optional Part-II (Level-5.0)

With Computer Science as Minor

SEM III		Teaching Scheme						
		Theory and Practical			University Assessment		Internal Assessment(IA)	
Sr. No.	Course Code	Lectures (Per week)	Practical Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Maximum Marks	Minimum Marks
1	**Minor V:** HTML and CSS	2	-	2	30	12	20	08
2	**Minor VI:** Programming with C++	2	-	2	30	12	20	08
3	**Minor Practical III:** Practical Based on Subject Minor V & VI	-	4*	2	30	12	20	08

SEM IV		Teaching Scheme						
		Theory and Practical			University Assessment		Internal Assessment(IA)	
Sr. No.	Course Code	Lectures (Per week)	Practical Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Maximum Marks	Minimum Marks
1	**Subject II Minor VII:** PHP	2	-	2	30	12	20	08
2	**Subject II Minor VIII:** Data Structure Using C++	2	-	2	30	12	20	08
3	**Subject II Practical VI:** Practical Based on Subject Minor	-	4*	2	30	12	20	08

B.Sc. Computer Science [Optional](Semester III)(NEP2.0)(Leel–5.0)
Course: Subject I Major V
Course Title: Web Technology (Major)
Total Contact Hours: 30 Hrs.(30 Lectures of 60 minutes)
Marks: 50 **Credits:** 02

Course Outcomes: Upon successful completion of this course, students will be able to

1. Understand the principles of web design.
2. Construct basic web sites using HTML and Cascading Style Sheets.
3. Build dynamic web pages with validation using JavaScript.
4. Develop a modern web application that meets the current industry requirement.

UNIT 1 **(15 Hours)**

Introduction to Internet, HTML, CSS and JavaScript

Fundamentals:-Introduction Internet, WWW, Web Browsers, Web Servers. URL and URI , Overview of different protocols**:-**HTTP,SMTP, FTP ,HTML :-Introduction , History and evolution of HTML , HTML Versions , Standard HTML Document Structure Basic Text Formatting Elements<b>,,<i>,<s>,<emp>,<u>,<small>,<big>,<tt>. , Images<img>,HypertextLinks<a>,and ,Lists-Ordered and Unordered, <input> (Type – Text, Password, Button, Submit, Reset) , Table tags , Frames , Marquee , Navigation menus , Semantic tags , Cascading Style Sheets :-Introduction , Types of CSS , Basic syntax , Selectors–element, id, class, group, universal, Style Properties of color, font, text, size and border

UNIT 2 **(15 Hours)**

JavaScript:-Introduction **,** Document Object Model **,** Variables, Data types and Operators**,** Control Statement –if, if-else, break **,**Looping Statements–while, for **,** Element Access in Javascripts– getElementById() and getElementsByName() **,** Event and event handling –onClick(), onBlur() , onFocus(),onKeyPress() **,** Dialog boxes– alert(),prompt(), confirm()**.**

Text Book/Reference book:

1. Web Programming– John Dean, John and Bartlett Learning
2. Internet Fundamentals & Concepts –Shubhra Garg, S.K.Kataria & Sons
3. PHP and MySQL by Dreamtech Publications
4. Angular: Up and Running: Learning Angular, Step by Step by Shyam Seshadri, O′Reilly

B.Sc. Computer Science Optional (Semester–III)(NEP2.0)(Level–5.0)

Course: Subject I Major VI
Course Title: Object Oriented Programming Using C++ **(Major)**
Total Contact Hours: 30 Hrs. (30 Lectures of 60 Minutes)
Marks: 50 **Credits:**02

Course Outcomes:

After successful completion of this course, students will able to:

1) Understand the features of object-oriented programming and C++ concept.
2) Apply the concepts of object, classes and constructor.
3) Learn C++ Programs based on object, class, inheritance, abstraction, encapsulation, dynamic binding and polymorphism.
4) Understand dynamic memory management techniques using pointers, constructors, and destructors etc.

UNIT 1 **(15 Hours)**

Basics of OOP and Introduction to C++

Introduction to Object Oriented Programming, Difference between POP & OOP , Basic Concepts of OOP , Features of OOP , Data types , Keywords , Variable

Definition**: -** Declaration , Initialization **,** Dynamic Initialization and reference variables

Operators:- DMA operators (new, delete) , Scope resolution operator **,** Manipulators (setw, endl, setprecision) , Functions:- Definition **,** Declaration **,** Function Call (by value, by pointer, by reference) **,** default arguments **,** const arguments **,** inline function

UNIT 2 **(15 Hours)**

Object Oriented Programming

Class ,Class specifications , Class declaration , Class definition , Adding data members and member functions , Access Modifiers , Member function definition - inside the class and outside the class , Object definition and memory allocation of object, Use of this pointer, Static Members - data members and member function , Friend function and friend class , Characteristics of friend function, Declaration and Definition of friend function , Use of friend class , Constructor and Destructor , Constructor - Definition, Characteristics , Types : - Default, parameterized, copy , Destructor:- Definition, Characteristics,

Operator overloading:- Concept and Rules , Definition of operator function , Overloading unary and binary operators , Inheritance :-Concept , Types - Single, Multilevel, Multiple, Hierarchical, Hybrid , Visibility of derived members , Diamond problem with hybrid inheritance (virtual inheritance) , Virtual base class, Polymorphism :- Definition , Types- Compile-time and Run-time , Pointer to object , Virtual Function– Rules for Virtual Function, Pure virtual function (abstract class)

Text Books / Reference Books:

1. Object Oriented Programming in C++ - Rajesh K. Shukla
2. Object Oriented Programming with C++ - Poonam Ponde
3. Object Oriented Programming with C++ - E Balagurusamy
4. Mastering C++ - K.R.Venugopal
5. C++ Programming - D. Ravichandran
6. A Tour of C++ (2nd Edition) - Bjarne Stroustrup
7. The C++ Programming Language (4th Edition) - Bjarne Stroustrup

B.Sc. Computer Science (Optional)(Part-II)(Semester-III)(NEP 2.0)
Major Practical- III
Computer Science Practical based on Major VI (Major)
Practical based on Major V &VI - Web Technology and Oriented Programming Using C++
Teaching Scheme:Practical–4 Lectures/Week/batch
Credits:02 Total Marks:50

List of Practical:

Following is a sample list of assignments for practical; instructors are advised to provide more lab assignments to students to meet the course specified outcomes.

Sr. No.	Name of the Practical
1.	Design a welcome page by using the tags like title, head and body
2.	Design a webpage to display use of all the head tags
3.	Design a webpage to showcase use of marquee tags
4.	Design a html page to display an history of your college using various text formatting tags
5.	Write Html program to display a table with 5 rows and 4 columns. Provide appropriate heading to the form
6.	Design HTML Page to display the table of your last semester examination
7.	Design HTML page to demonstrate a Clickable image
8.	Write a CSS code to change the square into circle when mouse is over to the square shape
9.	Write a CSS code to create 3 different colors box which partially overlapped to each other
10.	Design your personal website using external CSS
11.	Write a JavaScript to use all the dialog boxes
12.	Write a JavaScript function to calculate square of given number
13.	Write a JavaScript function demonstrating for loop
14.	Write a C++ program based on branching and looping statements.
15.	Write a C++ program To Calculate Factorial of a Given Number
16.	Write a C++ program For Converting Temperature Celsius Into Fahrenheit
17.	Write a C++ program based on implementation of class having data member, member function inside the class.
18.	Write a C++ program based on implementation of class having data member, member function outside the class.
19.	Write a C++ program to create a class called Rectangle that has private member variables for length and width. Implement member functions to calculate the rectangle's area and perimeter.
20.	Write a C++ program to create a class called Person that has private member variables for name, age and country. Implement member functions to set and get the values of these variables.
21.	Write a C++ program based on static data members and static member function.

22.	Write a C++ program based on usage of constructor with its types.
23.	Write a C++ program based on destructor.
24.	Write a C++ program based on usage of Inline and friend function.
25.	Write a C++ program based on implementation of inheritance with its types.
26.	Write a C++ program based on implementation of function overloading.
27.	Write a C++ program based on implementation of unary, binary operator overloading.
28.	Write a C++ program based on implementation overloading operator using friend function.

B.Sc. Computer Science [Optional](Semester III)(NEP2.0)(Leel–5.0)
Course: Minor V
Course Title: HTML and CSS (Minor)
Total Contact Hours: 30 Hrs.(30 Lectures of 60 minutes)

Marks: 50 **Credits:** 02

Course Outcomes: Upon successful completion of this course, students will be able to

1. Understand the principles of web design.
2. Construct basic web sites using HTML and Cascading Style Sheets.
3. Build dynamic web pages with validation using JavaScript.
4. Develop a modern web application that meets the current industry requirement.

UNIT 1 **(15 Hours)**

Introduction to Internet, HTML, CSS and JavaScript

Fundamentals:-Introduction Internet, WWW, Web Browsers, Web Servers. URL and URI , Overview of different protocols**:-**HTTP,SMTP, FTP ,HTML :-Introduction , History and evolution of HTML , HTML Versions , Standard HTML Document Structure Basic Text Formatting Elements<b>,,<i>,<s>,<emp>,<u>,<small>,<big>,<tt>, Images<img>,HypertextLinks<a>,and ,Lists-Ordered and Unordered, <input> (Type – Text, Password, Button, Submit, Reset) , Table tags , Frames , Marquee , Navigation menus , Semantic tags , Cascading Style Sheets :-Introduction , Types of CSS , Basic syntax , Selectors–element, id, class, group, universal, Style Properties of color, font, text, size and border

UNIT 2 **(15 Hours)**

JavaScript:-Introduction **,** Document Object Model **,** Variables, Data types and Operators**,** Control Statement –if, if-else, break **,**Looping Statements–while, for **,** Element Access in JavaScripts– getElementById() and getElementsByName() **,** Event and event handling –onClick(), onBlur() , onFocus(),onKeyPress() **,** Dialog boxes– alert(),prompt(), confirm()**.**

Text Book/Reference book:

1. Web Programming– John Dean, John and Bartlett Learning
2. Internet Fundamentals & Concepts –Shubhra Garg, S.K.Kataria & Sons
3. PHP and MySQL by Dreamtech Publications
4. Angular: Up and Running: Learning Angular, Step by Step by Shyam Seshadri, O′Reilly

B.Sc. Computer Science Optional (Semester–III)(NEP2.0)(Level–5.0)

Course: Subject I Minor VI

Course Title: Programming with C++ (Minor)

Total Contact Hours: 30 Hrs. (30 Lectures of 60 Minutes)

Marks: 50 **Credits:**02

Course Outcomes:

After successful completion of this course, students will able to:

1) Understand the features of object-oriented programming and C++ concept.
2) Apply the concepts of object, classes and constructor.
3) Learn C++ Programs based on object, class, inheritance, abstraction, encapsulation, dynamic binding and polymorphism.
4) Understand dynamic memory management techniques using pointers, constructors, and destructors etc.

UNIT 1 **(15 Hours)**

Basics of OOP and Introduction to C++

Introduction to Object Oriented Programming, Difference between POP & OOP , Basic Concepts of OOP , Features of OOP , Data types , Keywords , Variable

Definition**: -** Declaration , Initialization **,** Dynamic Initialization and reference variables

Operators:- DMA operators (new, delete) , Scope resolution operator **,** Manipulators (setw, endl, setprecision) , Functions:- Definition **,** Declaration **,** Function Call (by value, by pointer, by reference) **,** default arguments **,** const arguments **,** inline function

UNIT 2 **(15 Hours)**

Object Oriented Programming

Class ,Class specifications , Class declaration , Class definition , Adding data members and member functions , Access Modifiers , Member function definition - inside the class and outside the class , Object definition and memory allocation of object, Use of this pointer, Static Members - data members and member function , Friend function and friend class , Characteristics of friend function, Declaration and Definition of friend function , Use of friend class , Constructor and Destructor , Constructor - Definition, Characteristics , Types : - Default, parameterized, copy , Destructor:- Definition, Characteristics,

Operator overloading:- Concept and Rules , Definition of operator function , Overloading unary and binary operators , Inheritance :-Concept , Types - Single, Multilevel, Multiple, Hierarchical, Hybrid , Visibility of derived members , Diamond problem with hybrid inheritance (virtual inheritance) , Virtual base class, Polymorphism :- Definition , Types- Compile-time and Run-time , Pointer to object , Virtual Function– Rules for Virtual Function, Pure virtual function (abstract class)

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5. C++ Programming - D. Ravichandran
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7. The C++ Programming Language (4th Edition) - Bjarne Stroustrup

B.Sc. Computer Science (Optional)(Part-II)(Semester-III)(NEP 2.0)

Minor Practical

Computer Science Practical based on Minor VI (Minor)

HTML and CSS, Programming with C++

Teaching Scheme:Practical–4 Lectures/Week/batch

Credits:02 Total Marks:50

List of Practical:

Following is a sample list of assignments for practical; instructors are advised to provide more lab assignments to students to meet the course specified outcomes.

Sr. No.	Name of the Practical
1.	Design a welcome page by using the tags like title, head and body
2.	Design a webpage to display use of all the head tags
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4.	Design a html page to display an history of your college using various text formatting tags
5.	Write Html program to display a table with 5 rows and 4 columns. Provide appropriate heading to the form
6.	Design HTML Page to display the table of your last semester examination
7.	Design HTML page to demonstrate a Clickable image
8.	Write a CSS code to change the square into circle when mouse is over to the square shape
9.	Write a CSS code to create 3 different colors box which partially overlapped to each other
10.	Design your personal website using external CSS
11.	Write a JavaScript to use all the dialog boxes
12.	Write a JavaScript function to calculate square of given number
13.	Write a JavaScript function demonstrating for loop
14.	Write a C++ program based on branching and looping statements.
15.	Write a C++ program To Calculate Factorial of a Given Number
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18.	Write a C++ program based on implementation of class having data member, member function outside the class.
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25.	Write a C++ program based on implementation of inheritance with its types.
26.	Write a C++ program based on implementation of function overloading.
27.	Write a C++ program based on implementation of unary, binary operator overloading.
28.	Write a C++ program based on implementation overloading operator using friend function.

B.Sc. Computer Science Optional (Semester–III) (NEP2.0)(Level–5.0)

Course Title: VSC–I (P): Major Specific: Angular JS (Major)

Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)

Marks: 50 **Credits:** 02

Course Outcomes:

After successful completion of this course, students will able to:

1) Understand fundamentals of Angular JS and its architecture
2) Create routing solutions
3) Apply filter in Angular JS application
4) Explore Angular JS component

List of Practical

1. Downloading and Installing Angular-Js
2. Create Student app With Angular Js Application Structure and File Organization
3. Create Index.Html and Create Directives, Ng-App and Angular Expressions
4. Practical on Ng-Model and Ng-Bind Directives
5. Practical onNg-Init Directive
6. Practical on MVC(Model View Controller)
7. Practical on Data-Binding and Its Types
8. Practical on Events, Event Handling and Click Events
9. Practical onMouse, Keyboard and Copy Paste Events
10. Practical onNg-Change Directive
11. Practical onNg-Repeat Directive
12. Practical onDate , Order-By Filter
13. Practical onNg-Show And Ng-Hide Directives
14. Practical onNg-Include Directive
15. Displaying ValidationErrors , Custom Validation
16. Practical onServices using Angular-Js
17. Practical onInterval and Timeout Services
18. Practical onWindow Service
19. Practical on Routing Creating Single Page Application usingAngular-Js
20. Practical onScope and Its Types

B.Sc. Computer Science Optional (Semester–III) (NEP2.0)(Level–5.0)
Course Title: SEC-I (T): Essentials of Cyber Security (Major)
Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)

Course Outcomes:

After successful completion of this course, students will able to:

1. Understand importance of cyber security and security management.
2. Learn different security threats.

UNIT 1 **(15 Hours)**

The introduction to Cyber Security**,** The importance of Cyber Security , History of Cyber security , Important Terms used in Cyber security , Major Components of Cyber security, Types of Cyber Threats, The Cyber Attack Lifecycle, Impacts of Cyber Attacks ,Understanding Cyber Threats :- Malware, Phishing, Ransomware, Denial-of-Service (DoS) and Distributed Denial-of-Service (DDoS) Attacks, Advanced Persistent Threats (APTs), Zero-Day Exploits , Insider , Threats , Social Engineering ,Defensive Cyber Security Strategies : Introduction , Implementing , Strong Access Controls , Securing Networks and Systems , Encrypting Data , Implementing , Security Policies and Procedures, Conducting Regular Security Assessments, Implementing Backup and Recovery Solutions, Foundational Principles of Defensive Cyber security , Network Security, Endpoint Security

UNIT 2 **(15 Hours)**

Defensive Cyber Security Strategies: Identity and Access Management (IAM) , Data Protection , Incident Response and Management , Threat Intelligence and Monitoring , Human Factors in Cyber security, Regulatory Compliance and Legal Considerations, Cyber Security in Corporate Environments**:** Introduction , Corporate Cyber Security Frameworks and Standards , Network Security in Corporate Environments , Endpoint Security for Corporations , Application Security in Corporations, Identity and Access Management (IAM) , Data Protection and Privacy , Building a Comprehensive Cyber Security Program , Protecting Corporate Networks and Systems , Ensuring Compliance with Regulations , Employee Training and Awareness , Incident Response and Recovery , Securing Personal Devices and Data**:** Introduction , Fundamentals of Device Security , Securing Mobile Devices , Protecting Personal Computers, IoT Device Security , Data Protection and Privacy , Securing Online Accounts , Safe Internet Practices , Social Media Security, Securing Personal Communication, Children's Online Safety, Identity Theft and Fraud Prevention, Digital Hygiene and Maintenance

Text Book

1. Essentials of Cyber Security by Dr. Kabir G. Kharade, Dr. Vijaykumar S. Kumbhar Dr. Shraddha K. Kharade, Edited by Dr. Kavita S. Oza Published by Shivaji University, Kolhapur (English and Marathi Edition)

Reference Books:

1. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin,

2. Cybersecurity: The Essential Guide written by S.B.Gaikwad, K.G.Kharade, Rashmi Agrawal, R.K.Kamat published by Pacific Books International

B.Sc. Computer Science Optional (Semester–III) (NEP2.0) (Level–5.0)

Course: AEC-I

Course Title: Formal Communication (Major)

Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)

Marks: 50 **Credits:** 02

Course Outcomes:

The course will enable students to;

1. Introduce communication techniques
2. Have professional correspondence techniques
3. Enhance writing skills

UNIT 1 **(15 Hours)**

Communication : -Nature and Importance of Communication, Objectives of Communication, Importance of Communication, Process and barriers to Communication, Elements of Communication, Forms of Communication Verbal Communication , Techniques: Art of Speaking, Speech Styles. Oral Presentation- Preparation of Formal Speech, Meetings, Interviews, Group Discussion, Debate, Elocution, Extempore

UNIT 2 **(15 Hours)**

Non-verbal Communication: Meaning, Characteristics & classification of Non-verbal Communication, Body Language, Gestures, Postures. Listening & observation skills. Rapid review of Grammar:- Corrections of common errors, Verb and its subject, forms of verb, Use of phrases and idioms, Use of infinitive Gerund and Participle, Errors & Use of Adjective and adverb, Punctuation and capitalisation

Reference Books:

1. R.K. Chaddha Communication Techniques and skills – DhanpalRai Publication, NewDelhi.
2. Pravil S. R. Bhatia, Professional Communication Skills- S. Chand and Co.,NewDelhi.
3. J.D.O'Connor, Better English pronounciation.
4. Wren and Martin, Highschool English Grammer and Composition – Chand and Co.,New Delhi.

B.Sc. Computer Science Optional (Semester–III) (NEP2.0) (Level–5.0)

Course: CC-I

Course Title: Basics of Yoga (Major)

Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)

Marks: 50 **Credits:02**

UNIT 1 **(15 Hours)**

Introduction to Yoga

Yoga Definition, Objectives of yoga Education Difference between Yoga Asana, and physical exercises, Importance of Yoga in daily life, Methods and benefits of Asanas, Pranayama and Concentration, Knowledge of five yama with more emphasis on 'Asteya', Knowledge of five Niyama with emphasis on 'Santosh', Knowledge of Aahar-Vihar, Methods and benefits of Sukshma, Vyayama, Asanas and prayers. Types of Yoga: Jnana Yoga, Bhakti Yoga, Karma Yoga, Hatha Yoga, Raja Yoga.

UNIT 2 **(15 Hours)**

Yoga Literature and Asanas

Role of yoga in character building, Therapeutic values of yoga, Introduction of yoga literature, Life history of Arvindo, Vivekanand and other yogis, Knowledge of Bandha, Mudra and Chakras, Methods and benefits of Asans, Pranayama and Concentration Effects of Asanas and Pranayama on physiology of human body, Concept of Nishkama Karma Yoga, Role of Yoga practices in eveloping concentration, will power and discipline, Techniques of stress management, Methods and benefits of Asanas, Pranayama and concentration

References:

1. Light on Yoga by B.K.S. Iyengar
2. The Yamas &Niyamas: Exploring Yoga's Ethical Practice by Deborah Adele

B.Sc. Computer Science [Optional] (Semester–IV)(NEP2.0)(Level–5.0)

Course Title: PHP and MySQL Using OOP'S (Major)

Total Contact Hours: 30Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory- 02 Lectures/Week **Marks:** 50 **Credits:**02

Course Outcomes: Students will be able

1. To understand basic concept of PHP.
2. To Learn how to developing applications in PHP using MySQL.
3. To learn and develop various PHP technology applications that definitely meets the current industry needs.

UNIT I **(15 Hours)**

Introduction to PHP Scripting

Introduction: Evaluation, Features, PHP Script(PHP tags <?php... ?>, SGML- style tags<?...?>,ASP style <% ... %>, HTML Script Tag), Comment(single and multiline), echo command, PHP script execution on terminal and web browser. Variable: Basics, Data types (Boolean, Integers, Floating points Doubles, Strings, NULL, Arrays, Resources), Variable naming rules, scope(Local,Global, static, function parameter), unset variable, Functions(gettype(), isset(), is_array(), is_bool(), is float(), is_int(), is_null(), is_string(), is_resource()), Constant:define() function to define constant, constant() to retrieve value of constant, difference between constant and variable, PHP predefined constants Operators: Arithmetic, Comparison, Relational, Assignment, Increment-Decrement, Ternary, Bitwise, Casting, Other operators(., $, @, {}, '', =>), Operator Precedence

Strings: Single Quoted and Double Quoted, escape sequences, Multiline String, Concatenation operator(.), string functions(chr(), strlen(), Itrim(), rtrim(), trim(), strtoupper(), strtolower(), strcmp(), substr(), strrev(), echo(), print(), printf()), Decision Making Statements: if, if... else, if ... elseif...else, switch statement, Iterative Statements: for, while, do... while, foreach, break and continue Statement, Exit statements: exit, die, User Defined Functions: Declaring functions, function arguments(byval, byref, default arguments, variable number of arguments), return statement(by val, by ref), recursion, global scope, static variables, Dynamic Function call Arrays: Concept, Types(Numerical/List, Associative/Maps, MultiDimentional), empty array, Initialisation of arrays([] operator, array() function, range() function), inserting element in array, Display entire array(print_r(), var_dump()), Sorting functions(sort(), rsort(), asort(), arsort(), ksort(), krsort(), natsort(), natcasesort(), array_multisort(), usort()), is_array() function, mergearrays array_merge()) and using + operator, array as stack(array_push(), array_pop(), array_shift(). array_unshift()), reverse array (array_reverse()), array_keys() and array_value(), key().

UNIT II **(15 Hours)**

MySql connectivity

MySql Database:

Connect(mysql_connect()/mysqli_connect()),

Close(mysql_close()/mysqli_close()), Select a database(mysql_select_db() /mysqli_select_db()), execute mysql query and create cursor(mysql_query() /mysqli_query()), Fetch rows from tables as row(mysql_fetch_row()/ mysqli_fetch_row()) as numeric as well as associative array using cursor (mysql_fetch_array()/mysqli_fetch_array(), mysql_fetch_assoc()/, mysqli_fetch_assoc()),release memory of cursor(mysql_free_result()/ mysqli_free_result()).

Text Book/Reference book:

1. PHP and MySQL ByDreamtech Publications
2. PHP Concepts Unleashed For Novice - Vol 1-By Poornima Naik, Kavita Oza, Evincepub Publishing
3. PHP A Beginner's Guide - Vikram Vaswami
4. PHP for Beginners - By Ivan Bayross and SharanamShah(Shroff Publishers & Distributors)
5. Beginning PHP 6, Apache, MySQL Web Development- By Timothy Boronczyk,
6. Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Zeremy Stolz, Michael K. Glass
7. PHP and MySQL by Rajendra Salokhe(Aruta Publications)
8. Learning PHP 7 by Antonio Lopez 5.3 by Matt Doyle
9. Beginning PHP 9. PHP-MySQL-Dummies-3rd-edition by Janet Valade

B.Sc. Computer Science Optional (Semester–IV)(NEP2.0)(Level–5.0)
Course: Subject I Major VIII
Course Title: Data Structure Using C++ (Major)
Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)
TeachingScheme:Theory–02Lectures/Week Marks:50 Credits:02

Course Outcomes:
Students will be able to

1. Understand the basic concepts such as Data Types, Linear and NonLinear Data structures.
2. Ability to choose appropriate data structures to represent data items in real world problems.
3. Ability to design programs using a variety of data structures such as array, stacks, queues, linked list
4. Able to analyze and implement various kinds of searching and sorting techniques.

UNIT	Contents	Hours Allotted
01	Introduction to Data Structures: Array and Stack Concept of Abstract Data Types: 1.1.1 Definitions, Data Object, Data structure (D-Data, A-Axioms, O-Operations) 1.1.2Classification (Primitive, Non-Primitive, Linear, Non-Linear) Sorting: 1.2.1Definition 1.2.2 Stable-Unstable Sorting 1.2.3 Adaptive-Non Adaptive Sorting 1.2.4 Order of Sorting (Increasing, Decreasing, Non Increasing, Non Decreasing) 1.3 Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Quick sort 1.4 Searching: Linear and Binary Search 1.5 Stack: 1.5.1 Definition 1.5.2 Operations (Push, Pop, Peek, Isfull, Isempty), 1.5.3 Implementation using array 1.6 Applications of stack: Well-Parentheses, Expression Evaluation - Notations: Infix, Prefix, Postfix, Conversion from Infix to Postfix and Infix to Prefix)	15
02	Queue, Linked List and Trees 2.1Queue 2.1.1 Definition of queue 2.1.2 Operations (Enqueue, Dequeue, Peek, Isfull, Isempty) 2.1.3 Types of queue (Linear, Circular, Priority) 2.1.4 Implementation Linear Queue using array (Compaction) 2.1.5 Applications of Queue 2.2 Linked List: 2.2.1Concept of linked list 2.2.2 Types of Linked List (Singly-Doubly, Linear-Circular) 2.2.3 Implementation of Linked list 2.2.4 Operations on linear linked list (Insertion, Deletion, Display, Search) 2.2.5 Application-Implementation of stack and queue using linked list. 2.3 Trees:	15

	2.3.1 Definition 2.3.2 Terminologies (Root, Child, Parent, Siblings, Descendant, Ancestor, Leaf/External node, Branch node/Internal node, Degree, Edge, Path, Level, Depth, Height of node, Height of tree, Forest) 2.3.3Binary Tree – Definition, Types (Full/Proper/Plane, Complete, Perfect, Skewed, Balanced) 2.2.4 Binary Search Tree – Definition, Representation 2.2.5 Tree Traversal:Preorder, Inorder, Postorder	

Text Books / Reference Books:

1. Data Structure using C++ by E Balagurusamy
2. Data Structure using C and C++ by Rajesh Shukla
3. Data Structure using C and C++ by Tanenbaum
4. Data Structure using C++ by Yashwant Kanetkar
5. Data Structure using C++ by D.S.Malik

B.Sc. Computer Science (Optional)(Part-II) (Semester-IV)(NEP 2.0)
Major Practical- III
Computer Science Practical based on Major VII
Lab Course based on PHP and MySQL Using OOP'S (Major)
Teaching Scheme:Practical–4 Lectures/Week/batch
Credits:02 Total Marks: 50

List of Practical:

Following is a sample list of assignments for practical, instructors are advised to provide more lab assignments to students to meet the course specified outcomes.

B.Sc. Computer Science (Optional) (Part-II) (Semester-IV) Practical-IV (Practical based on Major VII& VIII- PHP and MySQL Using OOP'S and Data Structure Using C++)	
Sr. No.	**Name of the Practical**
1	Design a web page to input temperature in degree Celsius. Convert the temperature to degree Fahrenheit using PHP script
2	Design a web page to input a number. Using PHP script check whether given number is Odd/Even
3	Design a web page to input a number. Using PHP script check whether given number is Palindrome/Armstrong and display message in Web page accordingly.
4	Design a web page to accept a number. Using PHP script check whether given number is Prime or Not
5	Write a PHP script that will display array elements, smallest element in array, largest element in array and Sum of elements of array. (Use hard coded array)
6	Write PHP script to display „n‟ terms of Fibonacci series using user defined function.
7	Write PHP script to display factorial of natural number using user defined function.
8	Create Employee database in MySQL with table Employee Master (EmpId, EmpName, Emp Department). Create a web page having a form with the above fields, connect the web page to MySQL and perform Insert, Update and Delete operations through the web page.
9	Use the Employee database (Specified in Sr. No.8) and perform the following operation through the web page i. Display all employee details. ii. Display Employees from a specific department. iii. Display count of employees in a particular department.
10	Create Student Database in MySQL with the following table: StudentMaster (RollNo, StudentName, AdmittedClass, DateofBirth). Design a complete web form to perform CRUD operation on the above table

B.Sc. Computer Science [Optional] (Semester–IV)(NEP2.0)(Level–5.0)

Course Title: PHP (Minor)

Total Contact Hours: 30Hrs. (30 Lectures of 60 minutes)

Teaching Scheme: Theory- 02 Lectures/Week **Marks:** 50 **Credits:** 02

Course Outcomes: Students will be able

1. To understand basic concept of PHP.
2. To Learn how to developing applications in PHP using MySQL.
3. To learn and develop various PHP technology applications that definitely meets the current industry needs.

UNIT I **(15 Hours)**

Introduction to PHP Scripting

Introduction: Evaluation, Features, PHP Script(PHP tags <?php... ?>, SGML- style tags<?...?>,ASP style <% ... %>, HTML Script Tag), Comment(single and multiline), echo command, PHP script execution on terminal and web browser. Variable: Basics, Data types (Boolean, Integers, Floating points Doubles, Strings, NULL, Arrays, Resources), Variable naming rules, scope(Local,Global, static, function parameter), unset variable, Functions(gettype(), isset(), is_array(), is_bool(), is float(), is_int(), is_null(), is_string(), is_resource()), Constant:define() function to define constant, constant() to retrieve value of constant, difference between constant and variable, PHP predefined constants Operators: Arithmetic, Comparison, Relational, Assignment, Increment-Decrement, Ternary, Bitwise, Casting, Other operators(., $, @, {}, '', =>), Operator Precedence

Strings: Single Quoted and Double Quoted, escape sequences, Multiline String, Concatenation operator(.), string functions(chr(), strlen(), Itrim(), rtrim(), trim(), strtoupper(), strtolower(), strcmp(), substr(), strrev(), echo(), print(), printf()), Decision Making Statements: if, if... else, if ... elseif...else, switch statement, Iterative Statements: for, while, do... while, foreach, break and continue Statement, Exit statements: exit, die, User Defined Functions: Declaring functions, function arguments(byval, byref, default arguments, variable number of arguments), return statement(by val, by ref), recursion, global scope, static variables, Dynamic Function call Arrays: Concept, Types(Numerical/List, Associative/Maps, MultiDimentional), empty array, Initialisation of arrays([] operator, array() function, range() function), inserting element in array, Display entire array(print_r(), var_dump()), Sorting functions(sort(), rsort(), asort(), arsort(), ksort(), krsort(), natsort(), natcasesort(), array_multisort(), usort()), is_array() function, mergearrays array_merge()) and using + operator, array as stack(array_push(), array_pop(), array_shift(). array_unshift()), reverse array (array_reverse()), array_keys() and array_value(), key().

UNIT II **(15 Hours)**

MySql connectivity MySql Database:

Connect(mysql_connect()/mysqli_connect()),

Close(mysql_close()/mysqli_close()), Select a database(mysql_select_db() /mysqli_select_db()), execute mysql query and create cursor(mysql_query() /mysqli_query()), Fetch rows from tables as row(mysql_fetch_row()/ mysqli_fetch_row()) as numeric as well as associative array using cursor (mysql_fetch_array()/mysqli_fetch_array(), mysql_fetch_assoc()/, mysqli_fetch_assoc()),release memory of cursor(mysql_free_result()/ mysqli_free_result()).

Text Book/Reference book:

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2. PHP Concepts Unleashed For Novice - Vol 1-By Poornima Naik, Kavita Oza, Evincepub Publishing
3. PHP A Beginner's Guide - Vikram Vaswami
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7. PHP and MySQL by Rajendra Salokhe(Aruta Publications)

B.Sc. Computer Science Optional (Semester–IV)(NEP2.0)(Level–5.0)
Course Title: Data Structure Using C++ (Minor)
Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)
TeachingScheme:Theory–02Lectures/Week Marks:50 Credits:02

Course Outcomes:
Students will be able to

1. Understand the basic concepts such as Data Types, Linear and NonLinear Data structures.
2. Ability to choose appropriate data structures to represent data items in real world problems.
3. Ability to design programs using a variety of data structures such as array, stacks, queues, linked list
4. Able to analyze and implement various kinds of searching and sorting techniques.

UNIT	Contents	Hours Allotted
01	Introduction to Data Structures: Array and Stack Concept of Abstract Data Types: 1.1.1 Definitions, Data Object, Data structure (D-Data, A-Axioms, O-Operations) 1.1.2Classification (Primitive, Non-Primitive, Linear, Non-Linear) Sorting: 1.2.1Definition 1.2.2 Stable-Unstable Sorting 1.2.3 Adaptive-Non Adaptive Sorting 1.2.4 Order of Sorting (Increasing, Decreasing, Non Increasing, Non Decreasing) 1.3 Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Quick sort 1.4 Searching: Linear and Binary Search 1.5 Stack: 1.5.1 Definition 1.5.2 Operations (Push, Pop, Peek, Isfull, Isempty), 1.5.3 Implementation using array 1.6 Applications of stack: Well-Parentheses, Expression Evaluation - Notations: Infix, Prefix, Postfix, Conversion from Infix to Postfix and Infix to Prefix)	15

02	Queue, Linked List and Trees 2.1Queue 2.1.1 Definition of queue 2.1.2 Operations (Enqueue, Dequeue, Peek, Isfull, Isempty) 2.1.3 Types of queue (Linear, Circular, Priority) 2.1.4 Implementation Linear Queue using array (Compaction) 2.1.5 Applications of Queue 2.2 Linked List: 2.2.1Concept of linked list 2.2.2 Types of Linked List (Singly-Doubly, Linear-Circular) 2.2.3 Implementation of Linked list 2.2.4 Operations on linear linked list (Insertion, Deletion, Display, Search) 2.2.5 Application-Implementation of stack and queue using linked list. 2.3 Trees: 2.3.1 Definition 2.3.2 Terminologies (Root, Child, Parent, Siblings, Descendant, Ancestor, Leaf/External node, Branch node/Internal node, Degree, Edge, Path, Level, Depth, Height of node, Height of tree, Forest) 2.3.3Binary Tree – Definition, Types (Full/Proper/Plane, Complete, Perfect, Skewed, Balanced) 2.2.4 Binary Search Tree – Definition, Representation 2.2.5 Tree Traversal:Preorder, Inorder, Postorder	15

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3. Data Structure using C and C++ by Tanenbaum
4. Data Structure using C++ by Yashwant Kanetkar
5. Data Structure using C++ by D.S.Malik

B.Sc. Computer Science (Optional)(Part-II) (Semester-IV)(NEP 2.0)
Minor Practical- III
Computer Science Practical based on Minor VII
Lab Course based on PHP and Data Structure Using C++ (Minor)
Teaching Scheme:Practical–4 Lectures/Week/batch
Credits:02 Total Marks: 50

List of Practical:

Following is a sample list of assignments for practical, instructors are advised to provide more lab assignments to students to meet the course specified outcomes.

Sr. No.	Name of the Practical
1	Design a web page to input temperature in degree Celsius. Convert the temperature to degree Fahrenheit using PHP script
2	Design a web page to input a number. Using PHP script check whether given number is Odd/Even
3	Design a web page to input a number. Using PHP script check whether given number is Palindrome/Armstrong and display message in Web page accordingly.
4	Design a web page to accept a number. Using PHP script check whether given number is Prime or Not
5	Write a PHP script that will display array elements, smallest element in array, largest element in array and Sum of elements of array. (Use hard coded array)
6	Write PHP script to display „n" terms of Fibonacci series using user defined function.
7	Write PHP script to display factorial of natural number using user defined function.
8	Create Employee database in MySQL with table EmployeeMaster (EmpId, EmpName, Emp Department). Create a web page having a form with the above fields, connect the web page to MySQL and perform Insert, Update and Delete operations through the web page.
9	Use the Employee database (Specified in Sr. No.8) and perform the following operation through the web page i. Display all employee details. ii. Display Employees from a specific department. iii. Display count of employees in a particular department.
10	Create Student Database in MySQL with the following table: StudentMaster (RollNo, StudentName, AdmittedClass, DateofBirth). Design a complete web form to perform CRUD operation on the above table
11	**Stack And Application:**(Using Array) i) Implementation and Operations on Stack ii) Check Expression is Well-Parenthesised or not "Use [,(,{ brackets"

	iii) Conversion of infix expression to postfix and prefix “Use (only”
12	**Queue:**(Using Array) i) Implementation and Operations on Linear Queue ii) Implementation and Operations on Circular Queue
13	**Sorting**: i) Bubble sort ii)Insertion sort iii)Selection sort iv)Quick Sort(recursive function)
14	**Searching**: i) Linear Search ii) Binary Search
15	**Linked List**: i) Implementation and Operations on Linear Linked List ii) Implementation and Operations on Circular Linked List(Use Count) iii) Implementation and Operations on Circular Linked List
16	**Stack ,Queue and Binary Search Tree using Linked List**: i) Implementation and Operations using Linear Linked List on Stack ii) Implementation and Operations using Linear Linked List on Queue

B.Sc. Computer Science Optional (Semester–IV)(NEP2.0) (Level–5.0)
Course: Subject I Major VI

Course Title: SEC-II(T/P) Basics of Python Programming (Major)

Total Contact Hours: 30 Hrs. (30 Lectures of 60 Minutes)

Teaching Scheme:Theory–02Lectures/Week Marks:50 **Credits:**02

Sr. No.	Name of the Practical
1	Program to display name and address.
2	Program to Accept two number and display addition, subtraction, multiplication, division and modules.
3	Program to calculate factorial of given number.
4	Display the first n (n > 0) terms of the fibonacci sequence
5	Extract digits of an integer number (left to right and right to left)
6	Check if a given positive integer number is a palindrome or not
7	Compute character grade from the marks ($0 \leq$ marks ≤ 100) of a subject. Grading Scheme: 80-100 : A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using both else-if
8	Check if a given positive integer number Armstrong number or not
9	Compute prime factors of a positive integer number

B.Sc. Computer Science Optional (Semester–IV) (NEP2.0) (Level–5.0)
Course: AEC-II
Course Title: Soft Skills (Major)
Total Contact Hours: 30Hrs. (30 Lectures of 60 Minutes)
Marks:50 **Credits:**02

Course Outcomes:
The course will enable students to;

1.To empower the students towards general and technical writing, oral communications.

2.To empower listening skills: letter writing, technical report writing, and business communication.

UNIT 1 **(15 Hour)**

Expression: Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech

UNIT 2 **(15 Hour)**

Writing: Technical/business letter, Resume Preparation, organisation of writing material, poster presentation, writing technical document, preparing software user manual, preparing project documentation.

Reference Books:

1. Business Correspondence & Report Writing, Sharma, TMH
2. Business Communication Strategies, Monipally, TMH
3. English for Technical communication, Laxminarayanan,Scitech
4. Business Communication, Kaul,PHI
5. Communication Skill for Effective Mgmt., Ghanekar,EPH

B.Sc. Computer Science (Optional) (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: VEC-II
Course Title: Environment Studies
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Marks: 50 Credits: 02

- To be taken from Environmental Science BoS

B.Sc. Computer Science (Optinal)(Semester – IV) (NEP 2.0) (Level – 5.0)
Course: CEP-I

Title of course: CEP-I: Field work

- **Field work as per NEP 2.0 (CEP, CC), University circular enclosed**