

 Estd. 1962 "A++" Accredited by NAAC (2021) With CGPA 3.52	SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA PHONE:EPABX-2609000, www.unishivaji.ac.in , bos@unishivaji.ac.in शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र दूरध्वनी-ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी ०२३१-२६०९०९४ ०२३१-२६०९४८७	
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Ref.No.SU/BOS/Science/146

Date: 26/05/2026

The Principal,
 All Concerned Affiliated Colleges/Institutions
 Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-III (Sem.V & VI) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper B.Sc. Part-III (Sem.V & VI) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc.Part-III (Sem. V & VI) as per NEP-2020 (2.0)			
1.	Animation (Entire)	6.	Food Science and Technology (Entire)
2.	Food Science (Entire)	7.	Food Technology & Management (Entire)
3.	Biotechnology (Entire)	8.	Environmental Science (Entire)
4.	Computer Science (Entire)	9.	Sugar Technology (Entire)
5.	Information Technology (Entire)		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2026-2027 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in>Syllabus>Syllabus as per NEP2020.

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2026 & March/April 2027. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,



Dy Registrar

Encl: as above

for information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

SHIVAJI UNIVERSITY, KOLHAPUR



NAAC A++ Grade with CGPA 3.52

As per
National Education Policy (NEP-2020)

Syllabus for
Bachelor of Science (B.Sc.)
Information Technology
(Under Faculty of Science and Technology)

PART-III SEMESTER V & VI

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

B.Sc. (Information Technology) Part III Semester V & VI
(NEP-2020)

Syllabus to be implemented from Academic Year 2026-27

Semester V

B.Sc. (Information Technology) Part-III SEMESTER-V (Duration-Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment (IA)		
		Lectures Per week	Practical Per week	Credit	Maximum Marks	Minimum Marks	Examination time	Maximum Marks	Minimum Marks	Examination Hours
1	Major IX: C # Programming	2	-	2	40	16	90	10	04	20
2	Major X: Core Java	2	-	2	40	16	90	10	04	20
3	Major Practical V(a): C# Lab	-	4	2	40	16	90	10	04	20
4	Major Practical V (b): Core Java Lab	-	4	2	40	16	90	10	04	20
5	Major Elective I ✓ PHP Using MySQL ✓ Machine Learning	2	-	2	40	16	90	10	04	20
6	Major Practical I ✓ PHP Using MySQL Lab ✓ Machine Learning Lab	-	4	2	40	16	90	10	04	20
7	Open Elective V: To be selected from OE Basket	2	-	2	40	16	90	10	04	20
8	VSC II (Major Specific): Android Programming	-	4	2	40	16	90	10	04	20
9	AEC III: Corporate Culture & Communication	2	-	2	40	16	90	10	04	20
10	OJT: On Job Training	-	-	4	80	32	180	20	08	40
	Total (A)			22	440			110		

B.Sc. (Information Technology) Part-III Semester-VI (Duration-Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures Per week	Practical Per week	Credit	Maximum Marks	Minimum Marks	Examination time	Maximum Marks	Minimum Marks	Examination Hours
1	Major XI: ASP.NET	2	-	2	40	16	90	10	04	20
2	Major XII: Advanced Java	2	-	2	40	16	90	10	04	20
3	Major Practical VI: ASP.NET Lab	-	4	2	40	16	90	10	04	20
4	Major Practical VI: Advanced Java Lab	-	4	2	40	16	90	10	04	20
5	Major Elective II ✓ Linux Operating System ✓ Artificial Intelligence	2	-	2	40	16	90	10	04	20
6	Major Practical II ✓ Linux Operating System Lab ✓ Artificial Intelligence Lab	-	4	2	40	16	90	10	04	20
7	VSC III (Major Specific) R-Programming	-	4	2	40	16	90	10	04	20
8	SEC III Computer Network Security	2	-	2	40	16	90	10	04	20
9	AEC IV: Professional Ethics & Corporate Skills	2	-	2	40	16	90	10	04	20
10	IKS: IKS for Computer Science	2	-	2	40	16	90	10	04	20
11	FP: Field Project	-	-	2	40	16	90	10	04	20
	Total (B)			22	440			110		

Exit option after Level 6: Students can exit with Bachelor of Science in Information Technology

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: C # Programming

Course Outcomes:

After completion of this course students will be able to:

1. Understand working of .NET Framework.
2. Demonstrate concept of object oriented programming using C#
3. Study importance and applications of exception handling
4. Understand working of file handling in C#.

UNIT-I

(15 Hours)

Overview, component Architecture of .Net framework, Features of .NET, Evolution of .net framework, Meta data and assembly, CLR, Managed and unmanaged code, MSIL, JIT Compiler, CTS, CLS, Compilation and execution process, NET base classes, namespace.

Introduction to C#, Entry point method, command line arguments, CSC. EXE, Different valid forms of main, Global stack and heap memory, reference type and data type, Typecasting- Implicit and Explicit Boxing and Unboxing. Pass by value and pass by reference and out parameters.

UNIT-II

(15 Hours)

Class, static and non-static methods, Delegate-Syntax, importance, example. Inheritance, Polymorphism, Interface, Abstract Class, Partial Class, DLL, Difference between DLL and EXE. Introduction to exception, Importance in C#, try, Catch, Finally blocks, Exception classes, Handling Exceptions, User defines exceptions and System defines exceptions. Form Controls: Label, Button, Textbox, Checkbox, RadioButton, Timer, calendar, ListBox, Image and overview of remaining all common controls its properties and events.

Reference Books:

1. C# 4.0 The Complete Reference Schildt McGraw Hill
2. Inside C#- By Tom Archer, Andrew White chapel (Microsoft Pub)
3. Programming in C#-E Balagurusamy

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: Core Java

Course Outcomes:

After completion of this course students will be able to:

1. Understand Java history, features, JVM, and basic programming concepts.
2. Write and execute simple Java programs using data types, operators, and control statements.
3. Use strings, packages, and Swing components to develop basic GUI applications.
4. Implement multithreading and handle exceptions in Java programs.

Unit-I

(15Hours)

History of java, Features of Java, Comparison between C++ and java, Java Virtual Machine (JVM) Tokens, Java Keywords, Data Types-integer(byte, short, int, long), floating point(float, double), char, boolean, Operators-arithmetic, relational, logical, unary, ternary, bitwise, anchoring and looping statement, Typecasting-Implicit and Explicit, Command line arguments, Writing simple java program, Compiling and executing Java program. String-String and String Buffer class Defining package, System Package swing:- Introduction, Swing container classes-Frame, JDialog Swing component classes-JTextField, JTextArea, JButton, JComboBox, JLabel, JList, JMenuBar, JTabbedPane, JOptionPane, JPanel, JTree, JMenuLayoutManager-FlowLayout, BorderLayout, GridLayout, GridBagLayout

Unit-II

(15 Hours)

Multithreading, Exception Handling and Applets Creating threads, extending Thread class-declaring the class, run() method, Stopping and blocking threads, Life cycle of thread, Using thread method, Thread priority Definition of exception, Syntax of exception handling code Multiple catch statement, Using finally statement Introduction to Abstract Window Toolkit(AWT)

Reference Books:

1. Programming with JAVA, A Primer by E Balaguruswamy
2. Herbert Schildt, Java2: The Complete Reference, Tata McGraw-Hill
3. Java Programming- Rajendra Salokhe (Aruta Pub)

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Major Practical V (a):

C# Lab

Course Outcomes:

After completion of this course students will be able to:

1. Implement command line argument.
2. Apply type casting, control structure, looping statement.

List of Experiments

1. Program on parameter passing mechanism.
2. Program on command line argument.
3. Program on type casting.
4. Program on looping statements.
5. Program on control structure.
6. Program on DLL and EXE
7. Program on array.
8. Program on static and non-static methods.
9. Program on Inheritance.
10. Program on Interface.
11. Program on abstract class.
12. Program on partial class.
13. Program on exception handling- Arithmetic exception, Array exception, File Exception, Null Reference Exception.
14. Program on user define exception.
15. Program on form control.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM V (Level- 5.5)

Major Practical V (a):

Core Java Lab

Course Outcomes:

After completion of this course students will be able to:

1. Implement multithreading concepts and manage thread life cycle.
2. Handle runtime errors using Java exception handling mechanisms.

List of Experiments

1. Write a Java program to display “*Welcome to Java Programming*”.
2. Write a Java program to accept two numbers using command line arguments and display their sum.
3. Write a Java program to demonstrate implicit and explicit type casting.
4. Write a Java program to check whether a given number is prime using branching and looping statements.
5. Write a Java program to demonstrate the use of String and StringBuffer classes.
6. Create a user-defined package and access its class from another program.
7. Design a Swing application using JFrame, JLabel, JTextField, and JButton to accept a user’s name and display a greeting message.
8. Develop a Swing program to demonstrate FlowLayout, BorderLayout, and GridLayout.
9. Write a Swing program to perform addition of two numbers using event handling.
10. Write a Java program to create a thread by extending the Thread class.
11. Write a Java program to create a thread using the Runnable interface.
12. Write a Java program to demonstrate the life cycle of a thread.
13. Write a Java program to demonstrate thread priorities.
14. Write a Java program to demonstrate multiple catch blocks in exception handling.
15. Write a Java program to demonstrate the use of the finally block.
16. Write a Java applet program to display “*Hello Applet*” and explain the applet life cycle.
17. Write a Java applet to draw shapes (line, rectangle, circle) using AWT.
18. Develop a simple calculator using Swing components and event handling.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM V (Level- 5.5)
Title of course: Elective Paper-I PHP Using MySQL

Course Outcomes:

After completion of this course students will be able to;

1. Improving skill of basics PHP concepts.
2. Ability to understand branching and looping.
3. Ability to understand arrays.
4. Ability to understand database connectivity

UNIT I

(15 Hours)

Introduction to PHP Overview of PHP and its features, Advantages of PHP, Installation and configuration of XAMPP/WAMP, Client–Server architecture and server environment, PHP Language Basics PHP syntax and structure. Comments in PHP. Variables, constants, and data types. Expressions and operators. Flow control statements. Looping structures(for,while,do-while,for each). Working with Arrays Introduction to arrays. Types of arrays. Creating and initializing arrays. Common array-related functions. Working with Date and Time Date and time concepts in PHP. Using date and time functions. Formatting dates and time values. PHP with HTML Including HTML code in PHP scripts. Embedding PHP code within web pages. Functions in PHP Defining and calling functions. Function parameters and return values. User-defined and system-defined functions. Parameterized functions. Date and time functions. Mail function. Common predefined functions. Strings in PHP Creating and accessing strings. Searching and replacing strings. Encoding and escaping strings. Comparing strings. Formatting strings. Regular expressions.

UNIT II

(15 Hours)

MySQL DATABASES IN PHP: Interacting with MySQL using PHP: Introduction to MySQL, Features of MYSQL , PHP and MYSQL Integration. Working with phpMyAdmin : Creating and using a database. Selecting a database. creating/dropping a table. loading data into a table, Retrieving information from a table. selecting all data. selecting particular rows. selecting particular columns, writing queries. working with NULL values, counting rows. Working with MySQL using PHP: Establish database connection using mysqli_connect() with parameters (hostname, username, password, database) and handle errors using mysqli_connect_error(); close connection using mysqli_close() Select database using mysqli_select_db() and handle selection

errors. Execute SQL queries (DDL, DML, DQL) using `mysqli_query()` and store the result set (cursor). Fetch records using `mysqli_fetch_row()` (numeric), `mysqli_fetch_assoc()` (associative), and `mysqli_fetch_array()`.

Reference Books:

1. PHP and MySQL By Dreamtch Publications.
2. PHP A Beginner's Guide- Vikram Vaswami
3. PHP and MySQL by Rajendra Salokhe (Aruta Publication)
4. Beginning PHP 9. PHP-MySQL – Dummies -3rd-edition by Janet Valade

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: Elective Paper-I Machine Learning

Course Outcomes:

After completion of this course students will be able to:

1. Understand the basics, history, and types of machine learning.
2. Explain regression analysis and classification techniques.
3. Describe clustering methods and association rule mining.
4. Understand dimensionality reduction and semi-supervised learning.
5. Explain reinforcement learning concepts and applications.

UNIT I

(15 HOURS)

Introduction to Data and Machine Learning Basics History of Machine Learning Machine Learning Vs Statistical Learning Emerging application of machine learning Types of Machine Learning Supervised Learning Unsupervised Learning Reinforcement Learning Understanding Regression Analysis and classification Techniques Linear Regression Multiple Regression Logistic Regression

UNIT II

(15 HOURS)

Classification Techniques and Clustering Decision Tree SVM, Naïve Bayes, KNN Clustering K means clustering Association Rule Mining Apriori Algorithm Dimensionality Reduction Semi-supervised Learning Reinforcement learning

Reference Books:

1. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, and Jian Pei. 3rd Edition. Morgan Kaufmann (Elsevier), 2011.
2. Data Mining: Introductory and Advanced Topics by Margaret H. Dunham and S. Sridhar. Pearson Education, 2006.
3. Machine Learning by Tom M. Mitchell. McGraw-Hill, 1997.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: PHP Using MySQL Lab

Course Outcomes:

After completion of this course students will be able to;

1. Understand basic PHP concepts such as variables, operators, loops, functions, and arrays.
2. Develop dynamic web pages using PHP with form handling and validation.
3. Create and manage MySQL databases and perform SQL operations.
4. Build database-driven web applications using PHP and MySQL (CRUD operations).

List of Experiments

1. Design a web page to display information about the installed PHP environment. Using PHP script.
2. Design a web page to demonstrate PHP variables and constants. Using PHP script:
 - Declare variables of different data types (integer, float, string, boolean).
 - Define a constant using define().
 - Display values and data types using var_dump().
3. Design a web page to input a number and perform the following using PHP:
 - Display multiplication table using **for loop**.
 - Display sum of digits using **while loop**.
 - Reverse the number using **do-while loop**.
4. Design a web page to input two numbers. Using PHP script:
 - Perform arithmetic operations (+, -, ×, ÷, %).
 - Use relational operators to compare both numbers.
 - Display the largest number using if-else.
5. Write a PHP script to demonstrate different types of arrays:
 - Create an indexed array of 5 cities.
 - Create an associative array of student details.
 - Create a multidimensional array for marks of 3 students.
 - Use count(), sort(), and array_sum() functions.
6. Design a web page to display current date and time in different formats:
 - dd-mm-yyyy
 - Day, Month Year
 - 12-hour and 24-hour format
 - Calculate number of days between two dates entered by user
7. Write a PHP script to:

- Define a user-defined function to calculate simple interest.
 - Define a parameterized function to check whether number is positive, negative or zero.
 - Use predefined functions such as sqrt(), strlen(), and date().
8. Design a web page to input a string and perform following operations:
- Find length of string.
 - Convert string to uppercase and lowercase.
 - Replace a word using str_replace().
 - Compare two strings.
 - Display substring using substr().
9. Design a web page to validate user input using Regular Expressions:
- Validate Email ID.
 - Validate Mobile Number (10 digits).
 - Validate Password (minimum 8 characters, at least 1 number and 1 special character).
Display appropriate messages on web page.
10. Using phpMyAdmin, create a database employee_db. Create a table employee with appropriate fields. Insert records and write SQL queries to:
- Select all records
 - Select only employee names and salaries
 - Select employees with salary greater than 30000
11. Write a PHP program to establish a connection with MySQL database college_db using mysqli_connect(). Display an appropriate message if the connection fails using mysqli_connect_error(). Close the connection properly.
12. Create a College Database with table CourseMaster (CourseId, CourseName, Duration, Fees). Design a complete web form to perform Insert, Update, Delete and Display operations.
13. Create a database named library_db using phpMyAdmin. Create a table books with fields (book_id, title, author, price, quantity). Insert at least 5 records and display all records using SQL queries.
14. 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.
15. Write PHP script to display n terms of Fibonacci series using user defined function.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: Machine Learning Lab

Course Outcomes:

After completion of this course students will be able to;

1. Apply Python programming, NumPy, and Pandas libraries for data loading, reprocessing, and exploratory data analysis.
 2. Implement supervised learning algorithms such as Linear Regression, Multiple Regression, and Logistic Regression for prediction and classification problems.
 3. Design and evaluate classification models using Decision Tree, Support Vector Machine, Naïve Bayes, and K-Nearest Neighbors algorithms.
 4. Apply unsupervised learning techniques including K-Means clustering, Hierarchical clustering, Association Rule Mining, and Dimensionality Reduction using PCA.
-
1. To understand basic Python programming and perform numerical operations using NumPy and Pandas.
 2. To load a dataset and perform preprocessing operations such as handling missing values and normalization.
 3. To analyze and visualize the dataset using statistical and graphical methods.
 4. To implement Simple Linear Regression and predict output values.
 5. To predict a dependent variable using multiple independent variables.
 6. To perform binary classification using Logistic Regression.
 7. To compare regression and classification techniques.
 8. To demonstrate the complete supervised learning workflow.
 9. To implement Decision Tree classification.
 10. To classify data using SVM.
 11. To implement Naïve Bayes classifier.
 12. To implement KNN classification.
 13. To compare Decision Tree, SVM, and KNN.
 14. To cluster data using K-Means algorithm.
 15. To perform hierarchical clustering.
 16. To generate association rules using Apriori algorithm.
 17. To reduce feature dimensions using PCA.
 18. To compare model performance before and after PCA.
 19. To implement semi-supervised learning.
 20. To implement Q-learning algorithm.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: VSC II (Major Specific) Android Programming

Course Outcomes:

After completion of this course students will be able to;

1. Understand Android application structure and development environment.
2. Design user interfaces using layouts and UI components.
3. Implement activity lifecycle and event handling mechanisms.
4. Apply intents for communication between application components.
5. Develop Android applications using menus and notifications.

List of Android Lab Programs

1. Create “Hello World” application. That will display “Hello world” in the middle of the screen in the emulator.
2. Write an Android Program to Demonstrate Alert Dialog.
3. Create spinner with strings taken from Resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create an Android application, where the user can enter player name and points in one View and display it in another view.
5. Create an Application as login Form with Validation. (Check Username and password)
6. Create a list of all courses in your college and on selecting a particular course teacher-in charge of that course should appear at the bottom of the screen.
7. Create an application that allows the user to enter a number in the textbox named ‘getnum’. Check whether the number in the textbox ‘getnum’ is palindrome or not and Print the message accordingly when the user clicks on the button ‘check’.
8. Create a list of all courses in your college and on selecting a particular course teacher-in charge of that course should appear at the bottom of the screen.
9. Create an application with three option button, on selecting a button colour of the screen will change.
10. Create and login application as above on successful login pop up the message
11. Create an application to insert, update, delete, and retrieve operation on the database in android studio change
12. Write a program in Android Addition of two number.
13. Write a program of Square of two numbers in Android programming.
14. Write a program of to Calculate Square root numbers Android programming
15. Write a Program to Create Fibonacci Series number numbers in Android program.
16. Write a Program to Create Stop Watch in Android program.
17. Write a Program to Create Unit Counter App in Android program.
18. Write a Program to Create Dark Mode App for Android Phone.
19. Write a Program to Create Number Counter App for Android Phone.
20. Write a Program to Create Age Counter App for Android.

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

Title of course: Corporate Culture & Communication

Course Outcomes:

After completion of this course students will be able to:

1. Develop effective professional communication skills
2. Understand organizational and cross-cultural workplace behavior
3. Enhance ethical, digital, and AI-era communication competence.
4. Prepare students for corporate and global work environments.
5. Communicate effectively in professional environments.
6. Draft business documents and reports.

UNIT I

(15 Hours)

Business Communication: Introduction to Business Communication: Meaning and definition of business communication, Objectives and importance in organizations .Types: internal & external communication Role of communication in AI-driven businesses. Communication Process and Models: Elements of communication process , Models of Communication Cycle, Characteristics of Professional communication ,Barriers to communication ,Overcoming communication barriers. Verbal and Non-Verbal Communication: Verbal communication: oral and written Non-verbal communication: body language, kinesics, proxemics, Paralanguage and visual communication –Impact of non-verbal cues in professional settings. Written Business Communication: Principles of effective business writing .Business letters: inquiry, complaint, adjustment, Emails, memos, notices ,Report writing: short reports and summaries AI tools in business writing (email drafting, grammar tools), Oral Communication & Presentation Skills: Meetings: types and conduct ,Interviews: preparation and participation, Public speaking and presentation skills, Use of visual aids and AI presentation tools

UNIT II

(15 Hours)

Business Culture and Professional Ethics: Concept of Culture in Business : Meaning and elements of culture Organizational culture: types and significance, Corporate culture in technology-based organizations, Cultural diversity in the workplace Cross Cultural Communication: High-context and low-context cultures, Hofstede's cultural dimensions Cross-cultural challenges in global business, Communication in multicultural teams ,AI and globalization of workplace communication. Professional Ethics and Corporate Etiquette: Meaning and importance of business ethics, Ethical issues in communication, Corporate etiquette: workplace behavior, dress code , Email, meeting, and virtual etiquette, Ethics in AI communication and data usage. Digital Communication and AI Workplace Culture: Digital communication tools and platforms, Social media communication for business, Remote work culture and virtual collaboration, Impact of AI on organizational communication, Future trends in business communication.

Reference Books:

1. Bovee, C. L. & Thill, J. V. Business Communication Today
2. Lesikar, R. V. Business Communication: Theory and Application
3. Hofstede, G. Cultures and Organizations
4. Guffey, M. E. Business Communication: Process and Product

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM V (Level- 5.5)

On Job Training (OJT)

Course Outcomes:

After successful completion of the On-Job Training, students will be able to:

1. Understand the organizational structure, work culture, and professional environment.
2. Apply theoretical knowledge gained during academic study to real-world workplace situations.
3. Develop technical skills relevant to their discipline using industry tools, technologies, and practices.
4. Understand professional skills such as communication, teamwork, time management, and work ethics.
5. Identify and analyze real-world problems and propose appropriate solutions.
6. Develop employability skills and gain practical exposure required for career readiness.

Student has to make a presentation of the work carried out during On Job Training in front of panel external and internal examiners. He has to submit the report of work carried out as part of On Job Training.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: ASP.NET

Course Outcomes:

After completion of this course students will be able to:

1. Understand working of Asp.Net web application
2. Demonstrate Asp.Net server controls.
3. Study database operations using ADO.Net.
4. Understand importance and working of state management.

UNIT I

(15 HOURS)

Introduction to ASP.Net: Web browser, web server, HTTP request response structure, HTML form elements, GET/POST method, Client side and Server side programming. Web form life cycle, page events, Visual studio IDE. Server Controls: Textbox, List controls, Link button, Image map, Image, Image button, File Upload, Calendar, Literal control, Radio button, Checkbox Validation Controls. Navigation controls- Menu, Tree View, Sitemap Path Master Page, Sitemap, Sitemap Data source.

UNIT II

(15 HOURS)

ASP.NET State Management: Cross page postback property of button, Response.Redirect, Server.Transfer, Response.Write, Client Side: Hiddenfield control, View State, Cookies, Server Side: Session, Application, Global.asax. Database and ADO.Net: Sql Server Database. Data controls- Grid view, List view, Form View, Details View, Repeter, SqlDataSource. Introduction to ADO.Net, ADO.NET Architecture- Connection, command, data reader, Data adapter, data set, Understanding connected layer of ADO.NET and disconnected layer of ADO.NET. Basic of Crystal Report

Reference Books:

1. ASP.NET Black Book – Steven Holzner, Dreamtech Press.
2. Professional ASP.NET 2.0 – Wallace B. McClure et al., Wrox Press.
3. ASP.NET Using C# – Rajendra Salokhe, Tata McGraw-Hill.
4. ASP.NET: The Complete Reference – Herbert Schildt, McGraw-Hill Education.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option(NEP-2020)
PART III SEM VI (Level- 5.5)

Title of course: Advanced Java

Course Outcomes:

After completion of this course students will be able to:

1. Understand JDBC concepts, drivers, APIs, and database connectivity in Java.
2. Explain servlet architecture, life cycle, session management, and cookies.
3. Describe JSP features, scripting elements, directives, and actions.
4. Understand MVC architecture and the role of Servlets and JSP in web applications.
5. Gain a basic overview of web frameworks (Spring) and web application security.

UNIT I

(15 HOURS)

JDBC Introduction, JDBC driver and its types, JDBC connection steps JDBC API- DriverManager class, Connection interface, Statement interface, Prepared Statement interface and ResultSet interface, Simple JDBC program Java Servlet, Introduction to servlet Life cycle of servlet Servlet API- javax.servlet and javax.servlet.http javax.servlet package interfaces(Servlet,ServletConfig, ServletContext), classes(GenericServlet) javax.servlet.http- interfaces(HttpServletRequest,HttpServletResponse), classes(HttpServlet) Introduction to Session, session tracking techniques Cookies- types of cookies.

UNIT II

(15 HOURS)

Java Server Pages Introduction to JSP, JSP vs Servlet, Life cycle of JSP JSP scripting elements- JSP scriptlet tag, JSP expression tag, JSP declaration tag, JSP implicit objects, JSP directive elements, JSP action elements- jsp:forward, jsp:include, Simple JSP application MVC & Web Framework Basics MVC architecture ,Role of Servlets and JSP in MVC, Introduction to frameworks (Spring overview),Web application security basics

Reference Books:

1. Herbert Schildt, Java2: The Complete Reference, Tata McGraw-Hill
2. Object Oriented Programming with JAVA Essentials and Applications ,McGraw Hill
3. Core and Advanced Java, Black Book- dreamtech
4. Murach's Java Servlets and JSP

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM VI (Level- 5.5)
Title of course: Subject I Practical VI
ASP.NET Lab

Course Outcomes:

After completion of this course students will be able to:

1. Understand and implement ASP.NET web controls, validation controls, data controls, and state management techniques.
2. Develop database-driven web applications using ADO.NET (connected and disconnected architecture) and JDBC with CRUD operations.

List of experiment

1. Program on server controls
2. Program on SqlDataSource.
3. Program on datacontrols.
4. Program on validation controls.
5. Program on ADO.Net connected architecture.
6. Program on ADO.Net disconnected architecture.
7. Program on Response Redirect.
8. Program on cross page posting.
9. Program on hiddenfield control.
10. Program on client side state management.
11. Program on server side state management.
12. Program to design master page for university website.
13. Program to generate crystal report from student database.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM VI (Level- 5.5)
Title of course: Subject I Practical VI
Advanced Java Lab

Course Outcomes:

After completion of this course students will be able to:

1. Understand and implement ASP.NET web controls, validation controls, data controls, and state management techniques.
2. Develop database-driven web applications using ADO.NET (connected and disconnected architecture) and JDBC with CRUD operations.
3. Design and develop web applications using Servlets and JSP, including session tracking and form handling.
4. Apply MVC architecture concepts and gain basic understanding of Spring MVC framework and web application architecture.

List of experiment

1. JDBC – Connect Java program to a database and perform CRUD operations.
2. Servlet – Create a simple servlet to display a welcome message.
3. Servlet – Handle HTML form data using HttpServletRequest.
4. Servlet – Implement session tracking using cookies.
5. Servlet – Demonstrate session tracking using HttpSession.
6. JSP – Create a simple JSP page using scriptlet, expression, and declaration tags.
7. JSP – Retrieve and display HTML form data using JSP.
8. JSP – Demonstrate JSP actions: <jsp:include> and <jsp:forward>.
9. MVC – Build a mini MVC application using Servlet (Controller), JSP (View), and POJO (Model).
10. Overview of Spring MVC and web application architecture (conceptual).

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option(NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: Elective Paper-I Linux Operating System

Course Outcomes:

After completion of this course students will be able to:

1. Understand JDBC concepts, drivers, APIs, and database connectivity in Java.
2. Explain servlet architecture, life cycle, session management, and cookies.
3. Describe JSP features, scripting elements, directives, and actions.
4. Understand MVC architecture and the role of Servlet and JSP in web applications.

UNIT I

(15 HOURS)

Introduction to Linux: Operating System Basics, History of Linux, Architecture of Linux, Operating System Services, Shell, Types of Shell, Kernel, Login and Logout, General Purpose Utilities (banner, cal, date, calendar, who, tty, uname, password, lock, echo, tput, bc, clear, script, wc, echo, test, expr), Finding Information of commands. File System: Basic file system management, Files Types, Boot block, Super block, inode table, Storage and Accessibility of files, File and Directory Manipulation commands, File ownership and permission, File system commands, File locating command (find), File permissions. System Calls: Open, Read, Write, Close

UNIT II

(15 HOURS)

Process: Process Basics and its options, Mechanism of Process Creation, Process States and Transitions, Killing Process with Signals, Process Management (background processing: No logging out, Log out safely, job scheduling using at and batch command, Nice, Corn). BASH Shell Scripting: Shell Scripts, Choosing a Shell, Operators in BASH shell (Arithmetic, Relational, Logical, Assignment, Reassignment, Bit wise), Invoking the Shell Variables, Getting input from keyboard, Special Variables, Conditional Control Statement, Iterative Control Statements, Using test and to evaluate expressions.

Reference Books:

1. LINUX with Operating System Concepts by Richard Fox, CRC Press
2. Linux Commands- Instant Reference by Bryan PF affenberge
3. The Design of the Unix Operating System- Bach Page | 8
4. Unix Shell Programming- Yashwant Kanetkar
5. Unix Concepts and Application – Sumita bhadas
6. Linux : The Complete Reference- Richard Peterson

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: Elective Paper-I Artificial Intelligence

Course Outcomes:

After completion of this course students will be able to:

1. Understand the foundations, history, and applications of Artificial Intelligence.
2. Explain expert systems, their architecture, and applications.
3. Understand fuzzy sets, fuzzy logic, and their operations.
4. Describe machine learning paradigms and their types.
5. Explain intelligent agents and their architectures.
6. Understand natural language processing concepts, parsers, and semantic analysis.

UNIT I

(15 HOURS)

Review of AI: History, foundation and Applications Expert System and Applications: Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems, Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools Fuzzy Sets and Fuzzy Logic: Fuzzy Sets, Fuzzy set operations, Types of Membership Functions, Multivalued Logic, Fuzzy Logic.

UNIT II

(15 HOURS)

Machine Learning Paradigms: Machine Learning systems, supervised and un-supervised learning, inductive learning, deductive learning, clustering, support vector machines, case based reasoning and learning. Intelligent Agents: Agents vs. software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications Natural Language Processing: Sentence Analysis phases, grammars and parsers, types of parsers, semantic analysis, universal networking language, dictionary.

Reference Books:

1. Artificial Intelligence- A Modern Approach, StuartJ. Russell and Peter Norvig
2. Artificial Intelligence, Patrick Henry Winston
3. The McGraw-Hill Companies-Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B Nair

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option(NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: Elective Paper-I Linux Operating System Lab

Course Outcomes:

After completion of this course students will be able to:

1. Understand Linux operating system concepts, file system structure, and basic system calls.
2. Use Linux commands for file management, process handling, and system utilities.
3. Analyze and manage processes including background execution and job scheduling.
4. Develop BASH shell scripts using operators, variables, conditional and iterative control statements.

List of Experiments

1. Study and execute basic Linux commands (banner, cal, date, who, tty, uname, echo, wc, clear).
2. Display detailed system information using uname, hostname, whoami, pwd.
3. Create, copy, move and delete files and directories using touch, cp, mv, rm, mkdir, rmdir.
4. Study different file types using ls -l and file command.
5. Display contents of files using cat, more, less, head and tail.
6. Study and change file permissions using chmod command.
7. Change file ownership using chown and chgrp commands.
8. Locate files using find command with different options.
9. Study disk usage using df and du commands.
10. Write a C program to demonstrate system calls: open(), read(), write(), close().
11. Study process management commands using ps, top and jobs.
12. Execute a process in background and foreground using & operator.
13. Kill a running process using kill command and signals.
14. Schedule jobs using at, batch and cron commands.
15. Write a shell script to perform arithmetic operations on two numbers.
16. Write a shell script to check whether a number is positive, negative or zero.
17. Write a shell script to find factorial of a number using loop.
18. Write a shell script to display multiplication table of a number.
19. Write a shell script to check whether a file exists and display its type.
20. Write a shell script demonstrating use of special variables and conditional & looping statements.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: Elective Paper-I Artificial Intelligence Lab

Course Outcomes:

After completion of this course students will be able to:

1. Design and implement basic AI search techniques.
2. Develop rule-based expert systems and analyse their architecture.
3. Apply fuzzy logic and fuzzy set operations.
4. Implement supervised and unsupervised machine learning algorithms.

List of Experiment:

1. Write a program to implement basic AI search techniques such as Breadth First Search.
2. Design and implement a simple rule-based expert system using IF–THEN rules.
3. Implement the components of an expert system including knowledge base and inference engine.
4. Simulate a blackboard architecture for problem solving using multiple knowledge sources.
5. Implement a simple Truth Maintenance System for belief revision.
6. Develop a domain-specific expert system using an expert system shell.
7. Write a program to perform fuzzy set operations such as union, intersection, and complement.
8. Design and implement a fuzzy logic system with fuzzification, inference, and defuzzification.
9. Implement a supervised learning algorithm such as linear regression or decision tree.
10. Implement an unsupervised learning technique using clustering algorithms.
11. Write a program to implement Support Vector Machine for classification problems.
12. Design and implement a Case-Based Reasoning system.
13. Design and implement a simple reflex agent and evaluate its performance.
14. Simulate a multi-agent system and demonstrate cooperation or competition.
15. Implement communication between agents using basic Agent Communication Language constructs.
16. Write a program to perform sentence analysis and tokenization.
17. Implement grammar rules and parsers for sentence analysis.
18. Write a program to perform basic semantic analysis and word sense disambiguation.
19. Design a simple UNL representation for given natural language sentences.
20. To design and implement a rule-based expert system for basic medical diagnosis.

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option(NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: VSC II (Major Specific) R Programming

Course Outcomes (COs)

After completion of this course students will be able to:

1. Understand the R environment, RStudio, and basic R syntax.
2. Apply variables, operators, data types, and built-in functions in R.
3. Create and manipulate R data structures such as vectors, matrices, arrays, lists, and data frames.
4. Perform matrix and array operations for data analysis tasks.

List of R Programming Lab Programs

1. Write an R program to find the remainder of two numbers using the modulus operator.
2. Write a program to Addition of Two Numbers in R.
3. Write a program to Swapping two numbers in R programming.
4. Write a program to Calculate of factorial numbers in R programming
5. Write a program to square of numbers in R programming
6. Create a graph that show the number of each crab type in each in R programming.
7. Create a dataset in and do statistical analysis on the data using R.
8. Write a program implement vector in R programming
9. Create a display student information list in R programming.
10. Write an R program to check whether a number is even or odd using operators.
11. Write a program Multidimensional array in R programming.
12. Write a program using if-else statement using R.
13. Write a program do-while loop in R programming.
14. Write a recursive function to calculate the power of a number.
15. Write a program to display prime numbers in R programming.
16. Actual arguments are the real values passed to a function when it is called.” in R programming.
17. Write a program to display string concatenation in R.
18. Write a program to creating a data frame in R.
19. Write a program to three dimensional array in R.
20. Write a program to transpose a matrix in R?

B.Sc. Information Technology

Multiple Entry and Multiple Exit Option(NEP-2020)

PART III SEM VI (Level- 5.5)

Title of course: SEC III Computer Network Security

Course Outcomes:

After completion of this course students will be able to;

1. Understand basic security goals, attacks, and security services.
2. Explain symmetric and asymmetric encryption techniques and key management.
3. Describe integrity mechanisms like hash functions and digital signatures.
4. Understand network and transport layer security (IPsec, SSL/TLS, VPNs).
5. Identify firewalls, intrusion detection systems, and wireless security issues.
6. Recognize malware, email security methods, and common web security threats.

UNIT I

(15 HOURS)

Security Goals: The CIA Triad (Confidentiality, Integrity, Availability). Security Attacks: Passive (eavesdropping, traffic analysis) vs. Active (masquerade, replay, modification, DoS). Security Services & Mechanisms: Authentication, Access Control, Non-repudiation. Model for Network Security: The components of a secure communication channel. Symmetric Encryption: Caesar cipher, Transposition techniques, and the Block cipher principle (DES/AES overview). Asymmetric Encryption: Principles of Public Key Cryptography, RSA Algorithm (Mathematical steps). Key Management: Diffie-Hellman Key Exchange and Man-in-the-Middle (MITM) attacks. Integrity: Cryptographic Hash Functions (MD5, SHA) and Digital Signatures.

UNIT II

(15 HOURS)

IP Security (IPsec): Authentication Header (AH) and Encapsulating Security Payload (ESP). Transport Layer Security: SSL (Secure Sockets Layer) and TLS (Transport Layer Security) architecture and handshakes. HTTPS: How web browsers secure data using SSL/TLS. VPNs: Tunneling basics and Virtual Private Networks. Firewalls: Types (Packet filtering, Stateful inspection, Application-level gateways). Intrusion Detection: IDS vs. IPS (Intrusion Prevention Systems), Honeypots. Wireless Security: Vulnerabilities in Wi-Fi, WEP, WPA, and WPA2/3 overview. Email Security: PGP (Pretty Good Privacy) and S/MIME. Malicious Software: Viruses, Worms, Trojan horses, Ransomware, and Botnets. Web Security Threats: Cross-Site Scripting (XSS) and SQL Injection basics.

Reference Books:

1. Cryptography and Network Security by William Stallings (The standard "bible" for this subject).
2. Computer Networking: A Top-Down Approach by Kurose and Ross (Security chapter).
3. Network Security: Private Communication in a Public World by Charlie Kaufman.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM VI (Level- 5.5)

Title of course: AEC IV: Professional Ethics & Corporate Skills

Course Outcomes:

After completion of this course students will be able to:

1. Explain the fundamental concepts of professional ethics, moral values, and codes of conduct relevant to corporate and professional environments.
2. Analyze ethical dilemmas using structured ethical decision-making frameworks, considering bias, empathy, and conflicts of interest.
3. Apply philosophical and psychological approaches to evaluate ethical behavior, integrity, courage, and emotional intelligence in professional life.
4. Assess ethical issues related to research, academics, intellectual property, confidentiality, employee rights, and workplace diversity.
5. Evaluate professional responsibilities related to safety, risk management, environmental protection, and sustainable development.
6. Demonstrate ethical leadership and corporate skills by analyzing CSR and sustainability case studies in national and global business contexts.

UNIT I

(15 Hours)

Foundations of Ethics, Meaning and scope of ethics, Morals, values, and ethics: personal and professional, Individual vs professional ethics, Sense of professional and engineering ethics, Code of professional conduct (with reference to National Society of Professional Engineers), Ethical Decision Making, Ethical dilemmas and moral reasoning, Ethical decision-making models and roadmap, Bias, empathy, and internal obstacles, Conflict of interest and cultural relativism.

UNIT II

(15 Hours)

Business Ethics and Corporate Behaviour, Philosophical approaches to business ethics, Ethical issues in business and organizations, Ethical leadership and corporate governance, Resisting unethical authority and domination, Global business ethics, Psychological and Professional Perspectives, Psychological and philosophical approaches to ethics, Myths about morality, Courage, integrity, emotional intelligence, Ethics in research and academics: academic integrity and intellectual honesty, Ethics in the Workplace, Ethical issues in diverse workplaces, Employee rights, confidentiality, and discrimination, Sustainability and Corporate Skills, Ecology, engineering, and economy, Risk-benefit analysis and risk reduction, Corporate Social Responsibility (CSR), CSR in India and corporate sustainability

Reference Books:

1. Subramanian.R. Professional Ethics, Oxford Publication, 2013.
2. Nagarasan. R.S. Professional Ethics and Human Values. New Age International Publications, 2006.
3. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM VI (Level- 5.5)
Title of course: IKS for Computer Science

Course Outcomes:

After completion of this course students will be able to:

1. Explain core concepts and philosophy of Indian Knowledge Systems
2. Relate ancient Indian logic and mathematics to modern computer science
3. Apply IKS-inspired algorithms in computational problem-solving
4. Analyze the role of Sanskrit grammar in NLP and AI
5. Design ethical and sustainable AI systems using IKS principles
6. Evaluate real-world case studies integrating IKS with modern technology

UNIT I

(15 Hours)

Definition and scope of Indian Knowledge Systems, Importance of ancient knowledge in contemporary science and technology, The IKS corpus: Vedas, Upanishads, Smritis, Sutras, Shastras, Objectives, nature, scope, and unique characteristics of IKS, Unique number representation systems: Bhūta Saṃkhyā System, Kaṭapayādi System, Pingala's binary system (Laghu–Guru) and its importance in computing, Sanskrit phonetics and linguistics, Panini's Ashtadhyayi, Algorithmic nature of Paninian grammar, Role of Sanskrit in computational linguistics, Morphological analysis and syntax parsing.

UNIT II

(15 Hours)

Applications: POS tagging, Machine translation, AI-driven language models for Indian languages, Knowledge pyramid and epistemology in IKS, Nyaya logic in knowledge representation, Pramāṇa, Prameya, Samsāya as AI reasoning models, Ethical AI inspired by Indian philosophy, Sustainable and socially responsible AI systems Case Studies: Compiler Design, Recursion, Encryption Decryption, Computer Graphics, Algorithm Time Complexity, Binary Combinations, Vedic Mathematics for Signal Processing, Paninian Grammar for NLP and AI language models, Machine Learning inspired by Nyaya Logic

Reference Books:

1. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
2. Bhartiya Knowledge Systems by M.C. Bora, Khanna Publishing House
3. Kautilya The Arthashastra. Translated by R. Shamasastri
4. Kapoor, Kapil, and Singh Avadesh Kumar, Indian Knowledge System Vol.1, DK Print World, Ltd., 2005.
5. Mahadevan B., Bhat V R, Nagendra Pavana R.N., Indian Knowledge System Concepts and Application, PHI Learning Pvt. Ltd., 2022.

B.Sc. Information Technology
Multiple Entry and Multiple Exit Option (NEP-2020)
PART III SEM VI (Level- 5.5)

Field Project

Course Outcomes:

After completion of this course students will be able to:

1. Identify and analyze real-world problems through field investigation or entrepreneurial inquiry.
2. Apply academic knowledge to practical or entrepreneurial contexts.
3. Demonstrate skills in planning, data collection, analysis, and solution development.
4. Develop entrepreneurial mindset and innovation through project-based learning.
5. Exhibit teamwork, leadership, and communication in a real-world setting.
6. Prepare comprehensive project documentation and demonstrate findings through presentation.

Students have to do their project by identified real world problems of society, with guidelines provided by Shivaji University, Kolhapur