

Sheth T. J. Education Society's
Sheth N.K.T.T College of Commerce and
Sheth J.T.T College of Arts, Thane (W) (Autonomous)
T.Y.B.Sc. (IT) 2026-27

	Semester V	Credits		Semester VI	Credits
Major (Mandatory)			Major (Mandatory)		
BSA501	Advanced Web Programming	2	BSS601	Security in Computing	2
BSAP502	Advanced Web Programming Practical	2	BSSP602	Security in Computing Practical	2
		2	BSM603	Machine Learning	2
BSS503	Software Project Management		BSMP604	Machine Learning Practical	2
BSNP504	Next Generation Technologies and Software project management Practical	2	BSD605	DevOps	2
		2			
BSI505	IKS: Indian Knowledge Systems in Information Technology				
Major (Elective)			Major (Elective)		
BST506	Internet of Things	2	BSG606	Geographic Information System	2
BSTP507	Internet of Things Practical	2	BSGP607	Geographic Information System Practical	2
		2			
BSE508	Enterprise Java	2	BSC608	Cloud Computing	2
BSEP509	Enterprise Java Practical	2	BSCP609	Cloud Computing Practical	2
BSL510	Linux System Administration	2		Exploratory Data Analysis	2
BSLP511	Linux System Administration Practical	2	BSE610	Exploratory Data Analysis Practical	2
			BSEP611		
Minor		2	Minor		
BSN512	Artificial Intelligence	2	BSB612	Business Intelligence	2
BSNP513	Artificial Intelligence Practical		BSBP613	Business Intelligence Practical	2
VSC		2	SEC	-	
BSM514	MERN Practical				
OJT					
BSO515	Project Dissertation	2	BSP514	Project	4
	Total	22		Total	22

Dr. Yogeshwari Patil
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NEP Coordinator

Dr. Dilip Patil
Principal

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Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc (Information Technology)		Semester:V
Course Category: Major Mandatory		
Name of the Dept: Science and Technology		
Course Title: Advanced Web Programming		
Course Code: BSA501		Course Level: 5.5
Type: Theory		
Course Credit: 02		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To provide a strong foundation in .NET framework concepts, C# programming, and ASP.NET Web Forms for developing dynamic web applications. 2. To develop practical skills in building data-driven web applications using ADO.NET, server controls, state management, validation, and exception handling techniques.		
Course Outcomes: After completion of the course learners will be able to CO1. develop interactive web applications using C#, ASP.NET Web Forms, server controls, validation techniques, and state management methods. CO2. design and implement database-driven web applications using ADO.NET, SQL queries, data providers, and data-bound controls.		
Description of the course:	This course introduces the .NET framework, focusing on C# programming and ASP.NET Web Forms for building dynamic web applications. It covers server controls, state management, validation, and exception handling. Students also learn to develop database-driven applications using ADO.NET, SQL queries, and data-bound controls such as GridView and DetailsView. By the end, students can design and implement interactive, data-driven web applications.	

Unit No.	Content	Hours
I	.NET Technology and Framework: C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library The C# Language: C# Language Basics, Variables and Data Types, Objects, and Namespaces and Assemblies. ASP.NET Web Forms, Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls	15
II	Exception Handling, User defined Exceptions, Page Tracing, Client and Server side state management, View State, Transferring Information Between Pages, Cookies- creation, retrieval, reading, Types of Cookies, Using Master Pages and Content Pages ADO.NET Components, Data Providers, SQL Basic command and queries, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. Working with Data Source Controls, Data Controls: GridView, DetailsView and FormView.	15
	Total Hours	30

References:

Sr.No.	Title	Author/s Publisher	Publisher	Edition	Year
1	Beginning Visual C# 2010	K. Watson, C. Nagel, J.H Padderson	Wrox (Wiley)		2010
2	Murach's ASP.NET 4.6 Web Programming in C#2015	Mary Delamater and Anne Bohem	SPD	Sixth	2016
3	ASP.NET 4.0 Programming	J. Kanjilal	Tata McGraw Hill		2011

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Programme Name: B.Sc (Information Technology)		Semester: V
Course Category: Major Mandatory		
Name of the Dept: Science and Technology		
Course Title: Advanced Web Programming Practical		
Course Code: BSAP502		Course Level: 5.5
Type: Practical		
Course Credit: 02		
Total Hours: 60 Hours		
Total Marks: 50 Marks		
Course Objectives: 1. To develop programming skills in C# for building console and web-based applications using object-oriented concepts and basic algorithms 2. To enable students to design and develop dynamic ASP.NET web applications using server controls.		
Course Outcomes: After completion of the course learners will be able to CO1: design and implement C# applications demonstrating object-oriented programming concepts and logical problem-solving techniques. CO2: develop and deploy ASP.NET web applications using server controls, state management, validation techniques, data access operations, and data-bound controls.		
Description of the course:		This course provides hands-on experience in developing applications using C# and ASP.NET. It covers fundamental programming concepts such as arithmetic operations, Fibonacci series, and prime number testing, along with object-oriented features like delegates and interfaces. The course also focuses on building dynamic web applications using ASP.NET server controls, validation controls, state management techniques, cookies, master pages, user controls, navigation controls, and data-bound controls such as GridView and DetailsView. Students will learn to design interactive web forms, manage application state, and perform database operations including inserting, deleting, sorting, and paging of records. Overall, the course aims to enhance practical skills in developing dynamic, data-driven web applications using Microsoft technologies.

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Sr No.	Content (List of Practicals)	Hours
1	Write the program for the following: - Create an application to print on screen the output of adding, subtracting, multiplying and dividing two numbers entered by the user in C#. - Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers.	
2	Write the program for the following: - Create a simple application to perform addition and subtraction using delegate. - Create a simple application to demonstrate use of the concepts of interfaces.	
3	Write the program for the following: Create a simple web page with various server controls to demonstrate setting and use of their properties. (Example : AutoPostBack)	
4	Write the program for the following: - Create a simple application to demonstrate your vacation using calendar control. - Demonstrate the use of Treeview operations on the web form.	
5	Write the program for the following: Create a Registration form to demonstrate use of various Validation controls	
6	Write the program for the following: - Create Web Form to demonstrate use of Adrotator Control. - Create Web Form to demonstrate use User Controls	
7	Write the program for the following: - Create Web Form to demonstrate use of Website Navigation controls. - Create a web application to demonstrate use of Master Page and content page.	
8	Write the program for the following: - Create a web application to demonstrate various states of ASP.NET Pages. - Create a web application to demonstrate the use of different types of Cookies	
9	Write the program for the following: Create a web application for inserting and deleting records from a database.	
10	Write the program for the following: - Create a web application to demonstrate use of GridView button column and GridView events along with paging and sorting. - Create a web application to demonstrate data binding using DetailsView and FormView Control.	
	Total Hours	60

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Programme Name: B.Sc. (Information Technology)		Semester: V
Course Category: Major Mandatory		
Name of the Dept: Science and Technology		
Course Title: Software Project Management		
Course Code: BSS503		Course Level:5.5
Type: Theory		
Course Credit: 2		
Hours Allotted: 30 Hours		
Total Marks: 50 Marks		
Course Objectives: 1. To provide fundamental knowledge of software project management concepts and software development life cycle models. 2. To develop understanding of software development strategies, estimation techniques, risk and resource management, contract management, team organization, quality management, and project closure practices.		
Course Outcomes: After completion of the course learners will be able to CO1: explain software project management fundamentals, analyze project feasibility and apply appropriate SDLC models and planning approaches for software projects. CO2: estimate software effort, manage risks and resources & understand contract and team management practices, apply quality assurance and testing methods, and prepare project closure documentation.		
Description of the course:	This course provides an introduction to the principles and practices of Software Project Management. It covers project planning, evaluation, risk management, resource allocation, and software development life cycle models. Students learn various development approaches such as Agile, prototyping, and incremental models along with effort estimation techniques. The course also includes contract management, team organization, quality management, software testing, and project closure processes. It equips students with the knowledge required to manage software projects effectively from initiation to completion.	

Unit No.	Content	Hours
I	Fundamentals of Software Project Management Introduction to Project, Characteristics of a project, what is Management? Features of Management, Software Project Management, Software Project vs Other Project, Project management life cycles, Categories of Software Projects, Project Charter, Stakeholders, Business Case, Traditional V/S Modern Project Management Practices. Project Evaluation, Risk and Program Management Project Portfolio Management, Cost Benefit, Cost Evaluation Techniques, Software Risk, Risk Evaluation, Risk Management, Tools for Risk Management, Program Management Framework, Stages in Program Management Project Planning and Software Development Approaches Business need, goal, objective, Work Breakdown, Software, Project and its types, Project Methodology, Software Process Model, Software Development Lifecycle, SDLC Models	15
II	Software Development Strategies and Effort Estimation Software Prototyping, Incremental Delivery, DSDM, RAD, Agile, Software Effort Estimation, Software Estimation Techniques, Risk Management and Resource Planning Risk and its categories, Risk Management, Resources and its types, Creating a Framework, Review Process, Software Configuration Management Contract, Team, and Quality Management Contracts and its types, typical terms of contracts, Recruitment Process, Stress Management, Maslow's Hierarchy of Needs, Organization and Team Structures, Software Quality and model, Software Quality Management, Software Testing, Project closure, Project Closure Report	15
	Total Hours	30

References:

Sr. No	Title	Author	Publisher	Edition	Year
1.	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall	TMH	6 th	2018
2.	Project Management and Tools & Technologies – An overview	Shailesh Mehta	SPD	1 st	2017
3.	Software Project Management	Walker Royce	Pearson		2005

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Programme Name: B.Sc (Information Technology)		Semester: V
Course Category: Major Mandatory		
Name of the Dept: Science and Technology		
Course Title: Next Generation Technology and Software Project Management Practical		
Course Code: BSNP504		Course Level:5.5
Type: Practical		
Course Credit: 02		
Hours Allotted: 60 Hours		
Total Marks: 50 Marks		
Course Objectives: 1. To develop practical skills in MongoDB database operations such as CRUD, queries, and aggregation. 2. To enable students to build basic interactive web applications using jQuery and JSON. 3. To introduce students to Agile project management concepts and tools. 4. To provide hands-on experience in creating and managing projects using Jira Cloud. 5. To manage tasks, issues, and workflows in a collaborative environment.		
Course Outcome: After completion of the course learners will be able to CO1. perform database operations such as CRUD and simple queries using MongoDB. CO2. develop basic web functionalities using jQuery and handle data using JSON. CO3. create and manage projects using Agile methodologies in Jira. CO4. handle issues, assign tasks, and track project progress effectively. CO5. generate basic reports and use boards (Scrum/Kanban) for project monitoring.		
Description of the course:	This course provides practical exposure to modern technologies including MongoDB for database operations, jQuery and JSON for developing interactive web applications, and Agile project management using Jira Cloud. Students will learn to perform basic database operations, handle data interchange, and manage projects using Scrum and Kanban methodologies. The course emphasizes hands-on learning to build technical and project management skills aligned with industry requirements.	

Note:

- Install MongoDB Community Server and MongoDB Compass.
- Use Visual Studio Code or any code editor.
- A modern web browser like Google Chrome or Mozilla Firefox should be used to execute and test jQuery programs.
- jQuery library can be included using a CDN link or by downloading it locally.

Sr No.	Content	Hours
	Unit I (List of Practical)	
1	Create and drop a database in MongoDB.	
2	Create, display, and drop collections in MongoDB.	
3	Insert documents into a MongoDB collection.	
4	Retrieve documents using basic query operations.	
5	Update documents in a MongoDB collection.	
6	Delete documents from a MongoDB collection.	
7	Perform simple queries using conditions and projection in MongoDB.	
8	Implement aggregation functions such as sum, average, minimum, and maximum.	
9	Apply jQuery selectors, events, and basic effects (hide/show).	
10	Create, parse, and display JSON data in a web application.	
	Unit II (List of Practical)	
1	Create a Jira Cloud account and set up a new project.	
2	Create and configure Scrum or Kanban project in Jira.	
3	Add team members and assign roles in Jira.	
4	Create and configure issue types such as Epic, Story, Task, and Bug.	
5	Create and manage issues under an Epic in Jira.	
6	Assign issues with priority and due dates.	
7	Design and customize workflows with transitions in Jira.	
8	Create and manage Scrum board and perform sprint planning.	
9	Configure Kanban board and track issue progress.	
10	Generate reports and dashboards for project tracking in Jira.	
	Total Hours	60

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Programme Name: B.Sc. Information Technology		Semester: V
Course Category: Major Mandatory: IKS		
Name of the Dept: Science and Technology		
Course Title: Indian Knowledge Systems in Information Technology-I		
Course Code: BSI505		Course Level:5.5
Type: Theory		
Course Credit: 2		
Hours Allotted: 30 Hours		
Total Marks: 50 Marks		
Course Objectives: 1. To analyze key knowledge-generation methods in the Indian Knowledge System and examine contributions from Nyāya, Vaiśeṣika, Vedic mathematics, and ancient computational traditions in modern data science. 2. To integrate IKS perspectives into data ethics and responsible AI, and apply them to develop culturally rooted, multidisciplinary data science solutions.		
Course Outcomes: After completion of the course learners will be able to CO1: apply classical Indian logical, mathematical, and algorithmic traditions to analyze and solve problem in data-intensive environment CO2: compare and contrast epistemological frameworks to evaluate methods for generating reliable knowledge generation in data-intensive environments.		
Description of the course:	This course explores Indian Knowledge Systems through philosophy, mathematics, logic, linguistics, and science, highlighting their relevance to information technology. It examines epistemology, algorithms, number systems, logic, Sanskrit grammar, artificial intelligence, mechanical computation, and modern digital preservation. The syllabus connects ancient Indian thought with contemporary computing, interdisciplinary research, ethical technology, and future innovations across education, governance, culture, and emerging global technologies	

Unit No.	Content	Hours
I	Foundations of Indian Knowledge Systems and Mathematical Logic for Computing Introduction to Indian Knowledge Systems (IKS), Philosophical Foundations: Pramana and Schools of Thought (Nyaya, Vedanta, Mimamsa), IKS and Information Technology: Knowledge Representation and Computational Thinking, Decimal Number System and Place Value Concept, Concept of Zero and Its Computational Significance, Binary Systems and Combinatorics in Pingala's Chanda's Shastra, Aryabhata's Computational Methods, Algorithmic Thinking in Ancient Indian Mathematics	15
II	Indian Logic, Linguistics, and Applications in Modern Computing Fundamentals of Nyaya Logic and Indian Syllogism, Inference Systems and Reasoning Models, Comparison of Indian and Western Logic, Kautilya's Arthashastra and Decision-Making Models, Applications of Indian Logic in AI and Computing Systems, Panini's Ashtadhyayi and Rule-Based Systems, Sanskrit Grammar and Formal Language Theory, Generative Grammar and Programming Concept, Compiler Design Concepts and Sanskrit Grammar, Natural Language Processing and Computational Linguistics	15
	Total Hours	30

Reference Books

- Mahadevan, B., Bhat, Vinayak Rajat, and Nagendra Pavana R. Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning, 2022.
- Kapil Kapoor and Avadesh Kumar Singh. Indian Knowledge Systems. D.K. Printworld.
- Kak, Subhash and Rao, T. R. N. Computing Science in Ancient India. Center for Advanced Computer Studies, University of Southwestern Louisiana, 1998.
- Bhanu Murthy, T. S. A Modern Introduction to Ancient Indian Mathematics. New Age International, 1992.
- Kim Plofker. Mathematics in India. Princeton University Press, 2009.
- C. K. Raju. Cultural Foundations of Mathematics. Pearson Education.
- Briggs, Rick. Knowledge Representation in Sanskrit and Artificial Intelligence. AI Magazine, 1985.

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Programme Name: B.Sc (Information Technology)		Semester: V
Course Category: Major Elective		
Name of the Dept: Science and Technology		
Course Title: Internet of Things		
Course Code: BST507		Course Level:5.5
Type: Theory		
Course Credit: 02		
Hours Allotted: 30		
Total Marks: 50 Marks		
Course Objectives: 1: To understand the fundamental architecture, communication protocols, and design principles of IoT systems. 2: To develop knowledge of IoT hardware platforms, communication mechanisms, and deployment strategies.		
Course Outcomes: After completion of the course learners will be able to CO1: explain IoT architecture, protocols, and embedded platforms used in real-world applications. CO2: analyze IoT implementation challenges including security, deployment, and ethical considerations.		
Description of the course:		This course introduces the fundamental concepts and architecture of the Internet of Things (IoT). It covers internet communication principles, embedded systems, and prototyping of connected devices. Students will learn about IoT hardware platforms like Arduino and Raspberry Pi along with cloud and API integration basics. The course also discusses IoT security, business models, and ethical considerations in connected systems.

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Unit No.	Content	Hours
I	Introduction and Internet Principles 1. Overview of Internet of Things 2. Design Principles for Connected Devices 3. Internet Communication Basics Embedded Systems and Prototyping Basics 1. Basics of Embedded Systems 2. IoT Hardware Platforms 3. Introduction to Prototyping	15
II	Communication and Cloud Integration 1. APIs and Web Services in IoT 2. Real-Time IoT Communication 3. Basics of Cloud Integration in IoT Deployment, Security and Ethics in IoT 1. Moving to Manufacturing 2. Security in IoT 3. IoT Business Models (Overview) 4. Ethics in IoT	15
	Total Hours	30

References:

Sr. No	Title	Author	Publisher	Edition	Year
1.	Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	Wiley	First	2014
2.	Internet of Things – Architecture and Design	Design Raj Kamal	McGraw Hill	First	2017
3.	Getting Started with the Internet of Things	Cuno Pfister	O'Reilly	Sixth	2018
4.	Getting Started with Raspberry Pi	Matt Richardson and Shawn Wallace	SPD	Third	2016

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Programme Name: B.Sc. (Information Technology)		Semester: V
Course Category: Major Elective		
Name of the Dept: Science and Technology		
Course Title: Internet of Things Practical		
Course Code: BSTP507		Course Level:5.5
Type: Practical		
Course Credit: 02		
Hours Allotted: 60 Hours		
Total Marks: 50 Marks		
Course Objectives: 1: To develop practical skills in configuring Raspberry Pi and interfacing sensors, actuators, and external devices for IoT applications. 2: To enable students to implement cloud-based monitoring and web-controlled IoT systems using ESP8266 and Raspberry Pi.		
Course Outcome: After completion of the course learners will be able to CO1: design and implement IoT applications using Raspberry Pi, ESP8266, sensors, RFID, and camera modules. CO2: develop real-time IoT systems with cloud integration, remote access, and basic network configuration.		
Description of the course:		This practical course provides hands-on experience in developing IoT applications using Raspberry Pi and ESP8266. Students learn device configuration, GPIO interfacing, sensor integration, and cloud connectivity. The course covers real-time monitoring, web-based control, RFID, camera interfacing, and IoT communication using platforms like ThingSpeak and Telegram. It emphasizes practical implementation of embedded systems and cloud-enabled IoT solutions.

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Sr No.	Content (List of Practicals)	Hours
	Starting Raspbian OS, Familiarizing with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.	
1	Displaying One LED blinking with Raspberry Pi.	
2	Displaying different LED patterns with Raspberry Pi.	
3	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.	
4	Raspberry Pi Based Oscilloscope.	
5	Controlling Raspberry Pi with Telegram.	
6	Interfacing Raspberry Pi with RFID.	
7	Controlling LED using Web Browser (ESP8266)	
8	IoT-Based Temperature Monitoring using ThingSpeak (Cloud Integration)	
9	Interfacing Pi Camera with Raspberry Pi	
10	Installing Windows 10 IoT Core on Raspberry Pi (Demo Practical)	
	Total Hours	60

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Programme Name: B.Sc. (Information Technology)		Semester: V
Course Category: Major Elective		
Name of the Dept: Science and Technology		
Course Title: Enterprise Java		
Course Code: BSE508		Course Level:5.5
Type: Theory		
Course Credit: 2		
Hours Allotted: 30 Hours		
Total Marks: 50 Marks		
Course Objectives: - To understand the fundamentals of Java EE, Servlets, JDBC connectivity, request handling, cookies, and session management for developing dynamic web applications. - To learn the development of enterprise web applications using JSP and Enterprise JavaBeans (EJB)		
Course Outcomes: After the completion course learners will be able to: CO1: understand Java EE architecture and develop dynamic web components. CO2: develop enterprise web applications using JSP and EJB components.		
Description of the course:		This course introduces Java Enterprise Edition (Java EE) technologies for developing enterprise web applications. It covers Servlets, JSP, JDBC, cookies, sessions, and Enterprise JavaBeans (EJB) for building dynamic and scalable server-side applications.

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Unit No.	Content	Hours
I	Understanding Java EE: Introduction to Enterprise Application, java enterprise edition, JavaEE Technologies, JavaEE Architecture, Types of System Architecture, JavaEE Server, JavaEE Containers. Introduction to Java Servlets: Need for Dynamic Content, Java Servlet Technology, benefits of Servlets, applications of Servlets ,Servlet API and Lifecycle: Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, Working with Databases: Introduction to JDBC, JDBC Architecture, Accessing Database, The ServletGUI and Database Example. Request Dispatcher: Resquest dispatcher Interface, Methods of Request dispatcher, Request dispatcher Application. COOKIES: Kinds Of Cookies, Application of Cookies, Creating Cookies Using Servlet, SESSION: Introduction to Sessions? Lifecycle Of Http Session, Session Tracking With ServletAPI,	15
II	Introduction To Java Server Pages: Need for Java Server Pages Disadvantages Of JSP, JSP v\vs Servlets, Life Cycle of a JSP Page, working and execution of JSP. Getting Started With Java Server Pages: Comments, JSP Document, JSP Elements, Action Elements: Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean , Implicit Objects, Scope And EL Expressions: Implicit Objects, Character Quoting Conventions, Unified Expression Language[Unified El], Expression Language. Introduction To Enterprise Java beans: Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans. Working With Session Beans: use of Session Beans, Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Life cycle of Enterprise Beans, Packaging Enterprise Beans. Working with Message Driven Beans: Life cycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example.	15
	Total Hours	30

References:

Sr. No	Title	Author	Publisher	Edition	Year
1.	Java EE 7 For Beginners	Sharanam Shah, Vaishali Shah	SPD	First	2017
2.	Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development	Elder Moraes	Packt	First	2018
3.	Advanced Java Programming	Uttam Kumar Roy	Oxford Press		2015

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Programme Name: B.Sc. (Information Technology) Semester: V	
Course Category: Major Elective	
Name of the Dept: Science and Technology	
Course Title: Enterprise Java Practical	
Course Code: BSEP509	Course Level:5.5
Course Credit: 2	
Hours Allotted: 60 Hours	
Total Marks: 50 Marks	
Course Objectives: • To develop enterprise web applications using Java EE technologies such as Servlets, JSP, JDBC, cookies, and sessions. • To implement enterprise components using EJB including session beans and message-driven beans for building scalable web applications.	
Course Outcomes: After the completion of course, learners will able to: CO1: develop dynamic web applications using Servlets, JSP, JDBC, request dispatcher, cookies, and session management. CO2: design and implement enterprise applications using different types of EJB components and database connectivity.	
Description of the course:	This practical course focuses on developing enterprise web applications using Java EE technologies such as Servlets, JSP, JDBC, cookies, sessions, and Enterprise JavaBeans (EJB). Students implement database-driven and dynamic web applications through hands-on programming exercises.

Sr. No.	Content (List of Practicals)	Hours
1.	Implement the following Simple Servlet applications.	
a.	Create a simple calculator application using servlet.	
b.	Create a servlet for a login page. If the username and password are correct then it says message "Hello <username>" else a message "login failed"	
2	Implement the following Simple Servlet applications Using JDBC	
a.	Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.	
b.	Develop a JSP application to authenticate user login with database.	
3.	Implement the following Servlet applications with Request Dispatcher	
a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.	
b.	Develop servlet application for accepting user registration details and displaying it on another page (At least 6 Values) by using Request Dispatcher.	
4.	Implement the following Servlet applications.	
a.	Develop Simple Servlet Question Answer Application using Database.	
b.	Create a Servlet application to upload and download a file.	
5.	Implement the following Servlet applications with Cookies and Sessions.	
a.	Create a servlet that uses Cookies to store the number of times a user has visited servlet.	
b.	Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.	
6.	Implement the following JSP applications.	
a.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).	
b.	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.	
7.	Implement the following JSP using Implicit Objects, Scope And EL Expressions	

a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.	
b.	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.	
c.	Create a JSP page to demonstrate the use of Expression language.	
8.	Implement the following EJB Applications.	
a.	Create a Currency Converter application using EJB.	
b.	Develop a Simple Room Reservation System Application Using EJB.	
9.	Implement the following EJB applications with different types of Beans.	
a.	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.	
b.	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].	
10.	Implement the following EJB applications with different types of Beans.	
a.	Develop simple shopping cart application using EJB [Stateful Session Bean].	
b.	Develop simple Marks Entry Application to demonstrate accessing Database using EJB.	
	Total Hours	60

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Programme Name: B.Sc. (Information Technology)		Semester: V
Course Category/Vertical: Major Elective		
Name of the Dept: Science and Technology		
Course Title: Linux System Administration		
Course Code: BSL510		Course Level: 5.5
Type: Theory		
Course Credit: 2 credits		
Hours Allotted: 30 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To understand and administer the Linux operating system environment by learning the fundamentals of Red Hat Enterprise Linux 2. To configure and manage essential network and server services in Linux, such as Domain Name System, Network File System, Apache HTTP Server,		
Course Outcomes: After completion of the course learners will be able to CO1: install and configure network services in Linux such as Domain Name System and Network File System to enable name resolution and file sharing in a network environment. CO2: deploy and manage web server services using Apache HTTP Server and configure basic server settings to host and manage web applications on a Linux system.		
Description of the course:	This course provides a comprehensive introduction to Linux system administration using Red Hat Enterprise Linux . It covers the fundamentals of Linux, open-source concepts, the origins of the Linux operating system, and the roles and responsibilities of a Linux system administrator. The course also focuses on system configuration and administration tasks such as managing system and network configuration files, administering users and groups, implementing sudo privileges, and applying file system quotas. Students gain practical knowledge of installing and upgrading software packages using the RPM Package Manager and checking software versions	

Unit No.	Content	Hours
I	Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. Installing Red Hat Linux RedHat Linux File System: Understanding the Red Hat Linux File System Structure, Using File System Commands Working With Linux – Supported File Systems, Linux Disk Management Red Hat System Configuration Files: Examining the System Configuration Files, Examining the Network Configuration Files, Administering Users and Groups: Understanding the Root Account, Implementing Sudo, Working With Users and Groups, Using File System Quotas, Installing and Upgrading Software Packages: Using the Red Hat Package Manager, Checking Software Versions, Obtaining Newer Software, Installing Software, Using Scripts to Automate Tasks: Understanding Bash Programming, Using Processes and Job Control, Creating Backups, Automating Scripts, Writing, Testing, and Debugging Scripts, Selecting a Scripting Language	15
II	The Network File System: NFS Overview, Configuring an NFS Server, Examining NFS Security Connecting to Microsoft Networks: Installing Samba, Configuring the Samba Server, Configuring the Samba Client, Using a Windows Printer from the Linux Computer, Testing the Samba Server The Domain Name System: Understanding DNS, Installing the Software, Understanding Types of Domain Servers, Examining Server Configuration Files, Configuring a Caching Server, Configuring a Slave Server, Configuring a Master Server, Using DNS Tools Configuring FTP Services : What FTP Software is Available?, Installing WU-FTPD, Configuring the Server, Maintaining the Server, Strengthening FTP Security. Configuring Mail Services : E-Mail Explained, Introducing SMTP, Configuring Sendmail, Configuring the E-Mail Client, Using Elm, Maintaining E-Mail Security, Using Newsgroups Configuring a Web Server: Introducing Apache, How Web Servers Work, Installing Apache, Configuring Apache,	15
	Total Hours	30

References:

1. Red hat Linux Networking and System Administration Terry Collings and Kurt Wall Wiley 3rd edition
2. Red Hat Enterprise Linux 6 Administration Sander van Vugt John Wiley and Sons 2013
3. Linux Administration: A Beginner's Guide Wale Soyinka **TMH 5th edition.**

**Sheth T. J. Education Society's
Shath N.K.T.T College of Commerce and
Sheth J.T.T College of Arts, (Autonomous)
Thane (W)**

Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc. (Information Technology)		Semester: V
Course Category: Major Elective		
Name of the Dept: Science and Technology		
Course Title: Linux System Administration Practical		
Course Code: BSLP511		Course Level: 5.5
Type: Practical		
Course Credit: 2 credits		
Hours Allotted: 60 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To understand and administer the Linux operating system environment by learning the fundamentals of Red Hat Enterprise Linux 2. To configure and manage essential network and server services in Linux, such as Domain Name System, Network File System, Apache HTTP Server		
Course Outcomes: After completion of the course learners will be able to CO1: install and configure network services in Linux such as Domain Name System and Network File System to enable name resolution and file sharing in a network environment. CO2: deploy and manage web server services using Apache HTTP Server and configure basic server settings to host and manage web applications on a Linux system.		
Description of the course:	This course introduces students to Linux system administration using Red Hat Enterprise Linux. It covers installation of Linux, working with the Graphical User Interface (GUI) and Command Line Interface (CLI), and managing system processes, users, groups, and permissions. Students learn package management using RPM, storage and networking configuration, and server setup for file sharing using Network File System (NFS), Samba, and File Transfer Protocol (FTP). The course also includes configuration of network services such as Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), mail server, and web server using Apache HTTP Server. Additionally, students gain practical knowledge of shell scripting, boot management with GRUB, storage management, backup, and repository creation.	

Syllabus: NEP 2020 w.e.f 2026-27

Sr. No.	Content (List of Practicals)	Hours
1	Installation of RHEL 6.X	
2	Graphical User Interface and Command Line Interface and Processes	
a.	Exploring the Graphical Desktop	
b.	The Command Line Interface	
c.	Managing Processes	
3.	Working with Users, Groups, and Permissions	
4.	Working with RPM Storage and Networking	
a.	Using Query Options	
b.	Extracting Files From RPMs	
c.	Configuring and Managing Storage	
d.	Connecting to the Network	
5	Configuring Server for File Sharing	
a.	Configuring NFS Server and Client	
b.	Configuring Samba	
c.	Configuring FTP	
6.	DNS, DHCP and Mail Server	
a.	Configuring DNS	
b.	Configuring DHCP	
c.	Setting Up a Mail Server	
7	Web Server	
a.	Configuring Apache on Red Hat Enterprise Linux	
b.	Writing a Script to Monitor Activity on the Apache Web Server	
8.	Shell Scripts	
a.	Writing Shell Scripts	
b.	Configuring Booting with GRUB	
9	Storage Devices and Links, Backup and Repository	
a.	Working with Storage Devices and Links	
b.	Making a Backup	
10.	Creating a Repository	
	Total Hours	60

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Sheth J.T.T College of Arts, Thane (W) (Autonomous)**

Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc. (Information Technology)		Semester: V
Course Category: Minor		
Name of the Dept: Science and Technology		
Course Title: Artificial Intelligence		
Course Code: BSN512		Course Level: 5.5
Type: Theory		
Course Credit: 2		
Hours Allotted: 30		
Total Marks: 50 Marks		
Course Objectives: 1. Comprehensive understanding of intelligent systems, AI problem-solving techniques, search algorithms, and the development of intelligent agents. 2. To explore uncertainty reasoning, probabilistic models and machine learning techniques, including supervised learning, decision trees, neural networks, and deep learning for solving real-world problems		
Course Outcomes: After completion of the course learners will be able to CO1: design and implement intelligent agents, apply various search techniques, and formulate AI problems effectively to solve complex challenges. CO2: effectively apply uncertainty reasoning and advanced machine learning techniques, to solve complex real-world problems.		
Description of the course:		This course introduces the fundamentals of Artificial Intelligence (AI), focusing on intelligent agents, problem-solving techniques, and search algorithms. It covers uninformed and informed search methods, uncertainty reasoning using Bayesian networks, and key machine learning concepts like decision trees, neural networks, and support vector machines. Students will learn to apply these techniques in real-world AI applications. The course emphasizes both theoretical understanding and practical implementation.

Syllabus: NEP 2020 w.e.f 2026-27

Unit No.	Content	Hours
I	Intelligent Systems and Intelligent Agents: Introduction to AI, AI Problems and AI techniques, Solving problems by searching, Problem Formulation. State Space Representation Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. Searching Techniques: Uninformed Search: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening. Informed Search: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*	15
II	Uncertainty and Reasoning: Uncertainty, Representing Knowledge in an Uncertain Domain, Bayesian Network, Conditional Probability, Joint Probability, Bayes' theorem, Belief Networks Machine Learning: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines, Introduction to deep learning.	15
	Total Hours	30

Reference:

Sr. No	Title	Author	Publisher	Edition	Year
1.	Artificial Intelligence: A Modern Approach	Stuart J. Russell and Peter Norvig	Pearson	Fourth Edition	2020
2.	Artificial Intelligence: Foundations of Computational Agents	David L Poole, Alan K. Mackworth	Cambridge University Press	Second Edition	

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Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc (Information Technology)		Semester: V
Course Category: Minor		
Name of the Dept: Science and Technology		
Course Title: Artificial Intelligence Practical		
Course Code: BSNP513		Course Level: 5.5
Course Credit: 02		
Total Hours: 60 Hours		
Total Marks: 50 Marks		
Course Objectives: 1. To teach students how to implement search algorithms and AI techniques to solve problems and machine learning tasks. 2. To provide practical experience in applying AI algorithms and creating PL/SQL triggers and packages for efficient problem-solving and database management.		
Course Outcomes: After completion of the course learners will be able to CO1: implement various search algorithms and AI techniques to solve complex problems and optimize solutions in real-world scenarios. CO2: gain practical skills in machine learning, decision trees, and PL/SQL, enabling them to build intelligent systems and manage databases effectively.		
Description of the Course:		This course focuses on advanced AI techniques and algorithms, emphasizing search strategies, problem-solving, and decision-making. Students will learn and implement both uninformed and informed search algorithms like DFS, BFS, Hill Climbing, and A*. The course also covers machine learning techniques, including linear regression, classification, and decision trees, along with game theory concepts like Alpha-Beta pruning. Practical applications include solving classic AI problems like the N-Queens, map coloring, and the water jug problem. By the end, students will be equipped with the tools to apply AI in real-world scenarios and optimization problems.

Syllabus: NEP 2020 w.e.f 2026-27

Sr No.	Content (List of Practicals)	Hours
1	Generate the state-space possibilities for the following problems a. Water jug problem b. Number puzzle	
2	Write the program to compute the following Uninformed Search Algorithms for suitable problem a. Depth First Search b. Breadth First Search	
3	Write the program to compute the following Informed Search Algorithms for suitable problem a. Hill Climbing b. Simulated Annealing c. A* algorithm	
4	Write the program to compute the following Algorithms for suitable problem a. Simulate solution for 4-Queen / N-Queen problem b. Constraint satisfaction problem: Map Coloring	
5	Write the program to compute the following Search Algorithms for suitable problem a. Alpha Beta Pruning b. Water jug problem	
6	Write the program to compute the following Algorithms for suitable problem a. Simple Inferencing	
7	Write the program to compute the following Algorithms for suitable problem a. Linear Regression b. Classification problem	
8	Write the program to implement decision tree for suitable problem. a. Two Class decision b. Multi Class decision	
	Total Hours	60

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Syllabus: NEP 2020 w.e.f 2026-27

Programme Name: B.Sc (Information Technology)		Semester: V
Course Category/Vertical: VSC		
Name of the Dept: Science and Technology		
Course Title: MERN Practical		
Course Code: BSM514		Course Level: 5.5
Type: Practical		
Course Credit: 2 credits		
Hours Allotted: 60 Hours		
Marks Allotted: 50 Marks		
Course Objectives: 1. To develop backend applications using Node.js, Express, MongoDB, and Socket.IO, including CRUD operations, real-time communication, file handling, and module creation. 2. To build frontend applications using React and Angular, including form handling, validation, API integration, and dynamic data rendering.		
Course Outcomes: After completion of the course learners will be able to CO1: develop server-side applications using Node.js, Express, MongoDB, including CRUD operations, real-time chat, and file uploads. CO2: To build interactive front-end applications using React and Angular with form validation, API integration, and component-based design.		
Description of the course:	This course introduces students to full-stack web development using modern JavaScript technologies. It covers the development of server-side applications using Node.js, Express.js, and MongoDB, including CRUD operations, file uploads, and real-time chat applications using Socket.IO. Students will also learn how to create and publish custom Node modules. On the front-end, the course focuses on building dynamic user interfaces using React and Angular. Students will develop applications such as TODO lists using components and hooks, implement form validation, fetch data from APIs, and perform user data operations through API integration. The course provides practical knowledge for developing modern, scalable web applications.	

Syllabus: NEP 2020 w.e.f 2026-27

Pract No.	Content (List of Practical)	Hours
1	Create Chat application by using Socket.IO	
2	Perform CRUD operations by using Express with MongoDB	
3.	Perform File (image/doc) Upload operation by using MongoDB Creating and Publishing Your Own Node Module	
4.	Create TODO list by using react hooks with different components.	
5	Create and validate the user form in React. Fetch the API data and render the list on React app.	
6	In Angular create TODO list with different components.	
7	Create and validate the user form in Angular (Reactive Form/Template driven Form).	
8	Fetch the API data and render the list on Angular app.	
9.	In Angular create and update the user data by using API	
	Total Hours	60

Scheme of Examination

Course with Credit	External Examination	Internal Examination	Total
Credit 4	60 marks	40 marks	100 marks
Credit 2	30 marks	20 marks	50 marks

Internal Examination Structure(Theory)

Internal examination	40 marks	20 marks
Project Presentation/Case Study /Quiz/Group Discussion	10 marks	5 marks
Assignment /Active class Participation/Attendance	10 marks	5 marks
Class test	20 marks	10 marks
Total	40 marks	20 marks

Structure for Class Test(For 10 Marks)

For 10 Marks	
Q1. Multiple Choice Questions	5 Marks
Q2. Answer in one or two sentences	5 Marks

Structure for Class Test(For 20 Marks)

For 20 Marks	
Q1. Multiple Choice Questions	10 Marks
Q2. Answer in one or two sentences	10 Marks

External Examination (For 60 Marks)

Q. No.	External	Marks: 60
Q .1	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 2	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 3	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 4	Answer the following questions (Any 3) A B C D E F	15 Marks

External Examination (For 30 Marks)

Q. No.	External	Marks: 30
Q .1	Answer the following questions (Any 3) A B C D E F	15 Marks
Q. 2	Answer the following questions (Any 3) A B C D E F	15 Marks

Practical Exam: 50 marks

A Certified copy journal is essential to appear for the practical examination.

1	Practical Question 1	20
2	Practical Question 1	20
3	Journal	5
4	Viva Voce	5

OR

1	Practical Question 1	40
2	Journal	5
3	Viva Voce	5