AC –03/2025
Item No. –ii

As per NEP 2020

SRDSP Mandal's
Shri Pancham Khemraj Mahavidyalaya, Sawantwadi-416510
(Autonomous)
Affiliated to University of Mumbai

Title of the program: Science
B.Sc. (Information Technology)

A. U.G. Certificate in Information Technology
B. U.G. Diploma in in Information Technology
C. **B.Sc. (Information Technology)**

Syllabus for
Sem-V and Sem-VI

Ref: GR dated 20th April 2023 for Credit structure of UG
(With Effect from the academic year 2025-26 progressively)

Sr. No.	Headings	Particulars	
1.	Title of the Program	**A**	U.G. Certificate in Information Technology
		B	U.G. Diploma in in Information Technology
		C	**B. Sc. (Information Technology)**
2.	Eligibility	**C**	**Undergraduate Diploma in Information Technology**
3.	Duration of the Program	**A**	One Year
		B	Two Years
		C	**Three Years**
4.	Intake Capacity	60/Division	
5.	Scheme of Examination		60% External: 40% Internal Semester End Examination Individual Passing in External and Internal examination
6.	Standard of Passing		40%
7.	Credit Structure Sem I &II	**A**	
	Sem III & IV	**B**	
	Sem V & VI	**C**	
8.	Semester	A	SEM I & II
		B	SEM III & IV
		C	**SEM V & VI**
9.	Program Academic Level	A	4.5
		B	5.0
		C	**5.5**
10	Pattern	**Semester**	
11	Status	**New**	
12	To be implemented from Academic Year Progressively	**From Academic Year: 2025-26**	

Committee for Creation of Syllabus

Sign of the BOS Chairman	**Sign of BOS**	**Sign of**
Mrs. A.Y. Godkar		
Information Technology		

Proposed Third Year Credit Structure as per NEP 2020

Department of Information Technology

Proposed Structure for Major /Elective/ Minor/VSC/FP/OJT

Level 5.5					
Semester	**SUBJECT CODE**	**SUBJECT NAME**	**TH/ PRACT**	**CATEGORY**	**CREDIT**
V (Level 5.5)	**S301ITT**	Software Project Management and Testing	TH	Major	10
	S302ITT	Artificial Intelligence	TH		
	S303ITP	Advanced Web Programming and Artificial Intelligence Practical	Pract		
	S304AITT	Linux Administration	TH	Elective (any one)	2
	S304BITT	Security In Computing			
	S305AITP	Linux Administration Practical	Pract	Elective (any one)	2
	S305BITP	Security In Computing			
	S306ITT	Big Data	TH	Minor	2
	S307ITP	Big Data Practical	Pract		2
	ITVS04P	Intelligent Robotics and IoT Systems	Pract	VSC	2
	ITFP02P	FP (Field Project)	Pract	FP	2
				Total	**22**
VI	**S308ITT**	Advanced AI	TH	Major	10
	S309ITT	Cyber Law	TH		
	S3010ITP	Advanced AI and Advanced Mobile Programming	Pract		
	S3011AITT	Advanced Java Technology	TH	Elective (any one)	2
	S3011BITT	Linux Engineering			

(Level 5.5)	**S3012AITP**	Advanced Java Technology Practical	Pract	Elective (any one)	2
	S3012BITP	Linux Engineering Practical			
	S3013ITP	Data Analytics & Visualization	Pract	Minor	2
	S3014ITP	Applied Cyber Security	Pract		2
	ITOJT01P	OJT	Pract	OJT	4
				Total	**22**

SEMESTER V

B. Sc (Information Technology)	Semester – V
Course Name: Software Project Management and Testing (Major)	Course Code: S301ITT
Credits	4

Course Objective:

- Understanding the need for Software Project Management.
- Understanding the basic steps of project evaluation, planning.
- Understanding the basic steps of activity planning, risk management.
- Understanding the basic steps of controlling cost, managing contracts, managing people.
- Understanding how to work in a team, maintaining quality and successfully closing the project.

Unit	Details	Lectures
I	**Introduction to Software Project Management:** Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. **An Overview of Project Planning:** Introduction to Step Wise Project Planning	15
II	**Selection of an Appropriate Project Approach: I**ntroduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model. Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation **Activity Planning:** Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.	15

III	**Software Quality**: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models **Fundamentals of testing:** Introduction, Necessity of testing, What is testing? Fundamental test process, Testing During Development Life Cycle, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing	**15**
IV	**Unit Testing:** Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, **Equivalence Class Testing:** Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. **Decision Table–Based Testing:** Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, **Path Testing:** Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, **Data Flow Testing:** Define/Use Testing, Slice-Based Testing, Program Slicing Tools. **Software Verification and Validation:** Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities, V-test Model:	**15**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	1. Software Project Management.	Bob Hughes, Mike Cotterell, Rajib Mal	TMH	6th	2018
2.	Project Management and Tools & Technologies – An overview	Shailesh Mehta	SPD	1st	2017
3.	Software Testing: Principles, Techniques and Tools	M. G. Limaye	TMH		2017

4.	Software Testing Tools	Dr.K. V. K. K. Prasad.	Dreamtech Press		
5.	Software Testing: A Craftsman's Approach	Paul C. Jorgenson	CRC Press	4 th	2017

Course Outcome:

After completing the course, the learner will be able to:

CO1: Describe the basic concepts of software project management with its life cycle

CO2: Apply project estimation and evaluation techniques to real world problem

CO3: Apply Key project management system techniques like PERT, CRM

CO4: Identify project risk, monitor and track project deadlines

CO5: Work in teams to evaluate the different modes of communication among people.

B. Sc (Information Technology)	Semester – V
Course Name: Artificial Intelligence (Major)	Course Code: S302ITT
Credits	4

Course Objectives:

• To understand the fundamental concepts and history of Artificial Intelligence, including the current state of the field and its foundational principles.

• To develop proficiency in problem-solving techniques using various search algorithms, both uninformed and informed, and apply heuristic functions effectively.

• To gain knowledge and skills in adversarial search, including strategies for games, optimal decision-making, and dealing with uncertainty in partially observable environments.

• To master logical reasoning and inference methods, including propositional and first-order logic, and apply them to knowledge representation and problem-solving tasks.

• To explore advanced topics such as planning algorithms, including classical planning and multi-agent planning, as well as generative AI techniques and their applications.

Unit	Details	Lectures
I	**Introduction:** What is Artificial Intelligence? Foundations of AI, History, the state of art AI today. **Intelligent Agents:** Agents and Environment, Good Behaviour, Nature of Environment, Structure of Agents. **Solving Problems by Searching:** Problem Solving Agents, Searching for Solutions, Heuristic Functions. **Beyond Classical Search:** Local Search Algorithms, Searching with NonDeterministic Action, Searching with Partial Observations, Online Search Agents and Unknown Environments.	15
II	**Adversarial Search**: Games, Optimal Decisions in Games, Alpha-Beta Pruning, Stochastic Games, Partially Observable Games **Uninformed Search:**Breadth First Search, Uniform Cost Search, Depth First Search, Depth Limited Search,IDDFS, Bidirectional Search **Informed Search Strategies:** A* Search,Greedy Search, Graph Search,Hill Climbing, Best First Search	15
III	**First Order Logic:** Need For First Order Logic, Difference between Propositional and First Order Logic, Knowledge Engineering in First Order Logic. **Inference in First Order Logic:** Unification and Lifting, Forward and Backward Chaining, Resolution. **Fuzzy Logic:** Crisp sets , Application of fuzzy logic.	15
IV	**Planning**: Definition of Classical Planning, Algorithms for Planning as State 1 Space Search, Planning Graphs, Other Classical Planning Approaches, **Generative AI:** What is Generative AI? Types of Generative AI	15

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Artificial Intelligence: A Modern Approach	Stuart Russel and Peter Norvig	Pearson	Third	2015
2.	Artificial Intelligence: A Rational Approach	Rahul Deva	Shroff Publisher	First	2018
3.	Artificial Intelligence & Generative AI for Beginners: The Complete Guide	David M. Patel	GD Publishing	First	2023

Course Outcomes: After completing the course, the learner will be able to:

CO1: Articulate the historical development and current trends in Artificial Intelligence, demonstrating a comprehensive understanding of its foundations and principles.
CO2: Demonstrate proficiency in implementing and analyzing various search algorithms, utilizing both uninformed and informed strategies to solve complex problems efficiently.
CO3: Apply adversarial search techniques to decision-making in competitive environments, including games, and effectively manage uncertainty and partial observability.
CO4: Demonstrate competency in logical reasoning and inference, utilizing propositional and first-order logic to represent and solve real-world problems in AI applications.
CO5: Gain practical experience in planning algorithms and generative AI techniques, enabling them to design and implement AI systems capable of planning actions and generating novel content autonomously.

B. Sc (Information Technology)	Semester – V
Course Name: Advanced web Programming (Major)	Course Code: S303ITP
Credits	1

Course Objectives:

1. To develop the logical ability of the student.
2. Basic concepts to be cleared using suitable examples.
3. Different approach towards the problem.
4. To handle the errors and find suitable solutions.
5. Debugging the code.

Unit	Details	Lectures
I	1. Create an application to print on screen the output of adding, subtracting, multiplying and dividing two numbers entered by the user in C#	10
	2. Create a simple application to perform addition and subtraction using delegate.	
	3. Create a simple application to demonstrate the concepts boxing and unboxing.	
	4. Create a simple application to demonstrate use of the concepts of interfaces	
III	5.Create a simple web page with various server controls to demonstrate setting and use of their properties. Calendar control (Example: AutoPostBack)	10
	6. Create a registration form to demonstrate use of various Validation controls,Adrotator Control.User Controls	
	7.Create a web application to demonstrate various states of ASP.NET Pages using MASTER Page and Content Page.	
II	8.Create a web application for database Connectivity (insert,update,delete,select)	10
	9.Create a web application to demonstrate JS Bootstrap Button.	
	10. Create a web application to demonstrate use of various Ajax controls.	
	11. Create a web application to demonstrate Installation and use of NuGet package	

Web reference:

NuGet package :- https://learn.microsoft.com/en-us/nuget/quickstart/install-and-use-a-package-in-visual-studio

Course Outcome: After completing the course, the learner will be able to:
CO1: Learner will explore the foundations of .NET Development, .NET Ecosystem, C# and Fundamental Concepts
CO2: Comprehensive Understanding and Practical Application using controls.
CO3: ASP.NET Web Development Essentials: Tracing, Debugging, and State Management Techniques
CO4: Mastering Data Access in ASP.NET: ADO.NET Essentials and Azure Integration
CO5: Securing ASP.NET Applications: Authentication, Authorization, and Advanced Techniques with Ajax and Bootstrap

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Murach's ASP.NET 4.6 Web Programming in C#2015	Mary Delamater and Anne Bohem	SPD	Sixth	2016
2.	Ajax: A Beginner's Guide	Steven Holzner	paperback		2017
3.	Introducing Bootstrap 4	By Jorg Krause	Apres		2016

B. Sc (Information Technology)	Semester – V
Course Name: Artificial Intelligence Practical	Course Code: S303ITP
Credits	1

Unit	Practical No.	Details	Lectures
I	1	Write a program to Implement Depth first search algorithm.	10
	2	Write a program to Implement Breadth first search algorithm.	
	3	Simulate 4-Queen / N-Queen problem	
	4	Solve tower of Hanoi problem.	
	5	Write a program to Implement alpha beta search.	
II	6	Write a program to Implement hill climbing problem.	10
	7	Write a program to Implement A* algorithm.	
	8	Solve water jug problem.	
	9	Simulate tic – tac – toe game using min-max algorithm.	
	10	Shuffle deck of cards	
III	11	Design an application to simulate number puzzle problem.	10
	12	Derive the expressions based on Associative Law.	
	13	Derive the expressions based on Distributive Law.	
	14	Write a program which contains three predicates: male, female, parent. Make rules for following family relations: father, mother, grandfather, grandmother, brother, sister, uncle, aunt, nephew and niece, cousin. Question: i. Draw Family Tree. ii. Define: Clauses, Facts, Predicates and Rules with conjunction and disjunction	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Artificial Intelligence: A Rational Approach	Rahul Deva	Shroff Publisher	First	2018

2.	Artificial Intelligence & Generative AI for Beginners: The Complete Guide	David M. Patel	GD Publishing	First	2023

B. Sc (Information Technology)	Semester – V
Course Name: Linux Administration (Elective -I)	Course Code: S304AITT
Credits	2

Course Objectives:

1. Master Linux System Administration Basics
2. Configure and Secure System Access
3. Manage Storage and Networking Effectively
4. Automate System Tasks and Manage Containers
5. Troubleshoot and Maintain System Integrity

Unit	Details	Lectures
I	**Linux Basics, User Management, and System Security** 1. Understand and Use Essential Tools 2. Manage Users and Groups 3. Manage Security	10
II	**System Configuration, Storage, and Network Management** 1. Operate Running Systems 2. Configure Local Storage and File Systems 3. Manage Networking	10
III	**System Administration Automation, Containers, and Troubleshooting** 1. Automate System Administration Tasks **2.** Manage Containers and Images **3.** Perform Basic System Management Tasks **4.** Handle System Startup and Services	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Red Hat Enterprise Linux6 Administration	Sander van Vugt	Sybex	First	2013
2.	Red Hat Enterprise Linux 6 Deployment Guide	Red Hat	Red Hat Content Services	First	2021
3.	RedHat Certified System Administrator	William Maning	Emero Publishing	Second	2012

Course Outcomes:

Learners will be

1. Proficient in Linux System Administration
2. Able to Secure and Manage System Access
3. Effectively Manage Storage and Network Services
4. Competent in Automation and Container Management
5. Able to Troubleshoot and Maintain System Stability

B. Sc (Information Technology)	Semester – V
Course Name: Security in Computing	Course Code: S304BITT
Credits	2

Unit	Details	Lecture
I	**Information Security Overview:** The Importance of Information Protection, The Evolution of Information Security **Risk Analysis:** Threat Definition, Types of Attacks, Risk Analysis, Secure Design Principles**:** The CIA Triad and Other Models, Defense Models, Zones of Trust **Network Device Security:** Switch and Router Basics, Network Hardening	10
II	**Authentication and Authorization:** Authentication, Authorization **Encryption:** A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure **Storage Security**: Storage Security Evolution, Modern Storage Security, Risk Remediation **Database Security:** General Database Security Concepts, Understanding Database Security Layers, , Database Backup and Recovery	10
III	**Intrusion Detection and Prevention Systems:** IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). Voice over IP (VoIP) and PBX Security: **Virtual Machines and Cloud Computing:** Virtual Machines, Cloud Computing. **Securing Assets:** Locks and Entry Controls, Physical Intrusion Detection	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The Complete Reference: Information Security	Mark RhodesOusley	McGrawHill	Second	2013
2.	Josiah Dykstra	Josiah Dykstra	O'Reilly	Fifth	2017

3.	Principles of Computer Security: CompTIA Security+ and beyond	W Arthur Conklin, Greg White	McGraw Hill	Second	2010

Course Outcome: After completing the course, the learner will be able to: CO1: Understanding the importance of information protection.
CO2: Comprehending the evolution of information security.
CO3: Utilize established methodologies for implementing and managing security
CO4: Analysing Intrusion Detection and Prevention Systems, Voice over IP(VoIP) and PBX security
CO5: Understanding the security considerations for virtual machines and security aspects of cloud computing

B. Sc (Information Technology)	Semester – V
Course Name: Linux Administration Practical (ELECTIVE -I P)	Course Code: S305AITP
Credits	2

Course Objectives:

1. Master Linux System Administration Basics
2. Configure and Secure System Access
3. Manage Storage and Networking Effectively
4. Automate System Tasks and Manage Containers
5. Troubleshoot and Maintain System Integrity

Unit	Details	Lecture
I	0. Installation of RHEL7.x	10
	1. File and Directory Management.	
	2. Text File Editing Using vim	
	3. User and Group Management	
	4. Configure and manage sudo	
	5. Configure SELinux and Firewall Rules	
II	6. Process and Service Management	10
	7. Disk Partitioning and LVM Configuration	
	8. File System Management and Mounting	
	9. Configure and Test Network Interfaces	
	10. Configure autofs and NFS for File Sharing	
III	11. Automate Tasks with cron and at	10
	12. Create and Manage Containers Using podman.	
	13. Backup and Restore System Configuration	
	14. Configure and Secure SSH for Remote Administration	
	15. Troubleshoot System Boot Issues	

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Red Hat Enterprise Linux6 Administration	Sander van Vugt	Sybex	First	2013
2.	Red Hat Enterprise Linux 6 Deployment Guide	Red Hat	Red Hat Content Services	First	2021
3.	RedHat certified System Administrator	William Maning	Emero Publishing	Second	2012

B. Sc (Information Technology)	Semester – V
Course Name: Security in Computing Practical (ELECTIVE II-P)	**Course Code: S305BITP**
Credits	**2**

Unit	Details	Lecture
I	Configure Routers: ● OSPF MD5 authentication ● NTP ● to log messages to the syslog server.	**10**
	Configure AAA Authentication ● Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA ● Verify local AAA authentication from the Router console and the PC-A client	
	Configuring Extended ACLs ● Configure, Apply and Verify an Extended Numbered ACL	
	Configure IP ACLs to Mitigate Attacks ● Verify connectivity among devices before firewall configuration. ● Use ACLs to ensure remote access to the routers is available only from management station PC-C. ● Configure ACLs on to mitigate attacks	
	Configure IPV6 ACLs	
II	Configuring a Zone-Based Policy Firewall	**10**
	Configure IOS Intrusion Prevention System (IPS) Using the CLI ● Enable IOS IPS. ● Modify an IPS signature.	
	Layer 2 Security ● Assign the Central switch as the root bridge. ● Secure spanning-tree parameters to prevent STP manipulation attacks. ● Enable port security to prevent CAM table overflow attacks.	
	Layer 2 VLAN Security	
	Configure and Verify a Site-to-Site IPsec VPN Using CLI	
III	Configuring ASA Basic Settings and Firewall Using CLI ● Configure basic ASA settings and interface security levels using CLI	**10**

	● Configure routing, address translation, and inspection policy using CLI	
	Configure DHCP	
	Configure a DMZ, Static NAT, and ACLs	
	Configure AAA, and SSH	
	Configure Static NAT, and ACLs	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Essential Cybersecurity Science	Josiah Dykstra	O'Reilly	Fifth	2017
2.	Principles of Computer Security: CompTIA Security+	W Arthur Conklin and Beyond, Greg White	McGraw Hill	Second	2010
3.	The Complete Reference: Information Security	Mark RhodesOusley	McGrawHill	2 nd	2013

B. Sc (Information Technology)	Semester – V
Course Name: Big Data (Minor)	Course Code:S306ITT
Credits	2

Course Objectives:

1. To provide an overview of an exciting growing field of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
4. To enable students to have skills that will help them to solve complex real-world problems in decision support.

Unit	Details	Lecture
I	**Big Data:** Getting Started, Big Data, Facts About Big Data, Big Data Sources, Three Vs of Big Data, Volume, Variety, Velocity, Usage of Big Data, Visibility, Discover and Analyze Information, Segmentation and Customizations, Aiding Decision Making, Innovation, Big Data Challenges, Policies and Procedures, Access to Data, Technology and Techniques, Legacy Systems and Big Data, Structure of Big Data, Data Storage, Data Processing, Big Data Technologies	10
II	**NoSQL:** SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer's Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases Introducing MongoDB: History, MongoDB Design Philosophy, Speed, Scalability, and Agility, Non-Relational Approach, JSON-Based Document Store, Performance vs. Features, Running the Database Anywhere, SQL Comparison	10
III	**jQuery**: Introduction, Traversing the DOM, DOM Manipulation with jQuery, Events, Ajax with jQuery, jQuery Plug-ins, jQuery Image Slider **JSON**: Introduction, JSON Grammar, JSON Values, JSON Tokens, Syntax, JSON vs XML, Data Types, Objects, Arrays, Creating JSON, JSON Object, Parsing JSON, Persisting JSON, Data Interchange, JSON PHP, JSON HTML, JSONP	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Big Data and Analytics	Subhashini chillapaa	wiley	First	

2.	Beginning jQuery	Jack Franklin Russ Ferguson	Apress	Second	2017
3.	Next Generation Databases	Guy Harrison	Apress	First	2015
4.	Beginning JSON	Ben Smith	Apress		
5.	Mastering MongoDB	Marko Aleksendric,	Packt	first	2015

Course Outcome:

After completing the course, the learner will be able to:

CO1: Understand and articulate the foundational concepts and practical applications of Big Data, and compare and contrast SQL and NoSQL databases.

CO2: Design and implement effective MongoDB data models utilizing JSON, BSON, and various schema strategies; efficiently perform data operations using the MongoDB shell.

CO3: Understand and utilize MongoDB's storage engine, journaling, and GridFS file system; effectively design and implement MongoDB use cases.

CO4: Evaluate the benefits and implications of transitioning from traditional disk storage to SSD and in-memory databases, proficiently use technologies like TimesTen, Redis, etc., and effectively utilize jQuery for DOM manipulation.

CO5: Understanding of JSON, including its grammar, syntax, and data types, and be able to create, parse, and persist JSON objects and arrays. They will also learn to compare JSON with XML for data interchange and effectively use JSON in various web development contexts

B. Sc (Information Technology)	Semester – V
Course Name: Big Data Practical (Minor)	Course Code: S307ITP
Credits	2

COURSE OBJECTIVES: The objectives of this course are,

1. To implement programs for processing big data.
2. To realize storage of big data using MongoDB.
3. To analyze big data using machine learning techniques such as Decision tree classification and clustering.

Unit	Details	Lecture
I	1 Install, configure and run python, numPy and Pandas.	20
	2. Install, configure and run Hadoop and HDFS.	
	3. Visualize data using basic plotting techniques in Python.	
II	MongoDB	20
	4. Install, configure and run MongoDB	
	5. Data models and normalised data Model.	
	6. Create, Drop Database	
	7. Create Drop Collection.	
	8. Implement NoSQL Database Operations: CRUD operations, Arrays implement Aggregation, replication, Sharding.	
III	9.Implement a program that processes a JQuery.js	20
	10. Create Jason structure to store and retrieve product in catalog using (add, retrieve, update and delete)	

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Big Data and Analytics	Subhashini chillapaa	wiley	First	
2.	Data Analytics with Hadoop An Introduction for Data Scientists	Benjamin Bengfort and Jenny Kim	Benjamin Bengfort and Jenny Kim	Second	2016
	Big Data and Hadoop	V.K Jain	Khanna Publishing	First	2016

References:

1. **https://www.tutorialspoint.com/mongodb/mongodb_deployment.htm**

B. Sc (Information Technology)	Semester – V
Course Name: Intelligent Robotics and IoT Systems	Course Code:ITVS04P
Credits	2

Course Objectives:

1. Introduce IoT Concepts and Raspberry Pi Basics
2. Develop Skills in Controlling Hardware Using Python and Node-RED
3. Explore Communication Protocols and Web Technologies in IoT
4. Implement Real-time Data Monitoring and Control Systems
5. Enable Practical Application of IoT Concepts in Real-world Scenarios

Unit	Pract No.	Details	Lecture
I	1.	Starting Raspbian OS, Familiarizing with Raspberry Pi Components and interface	15
	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.	
II	6	Interfacing Raspberry Pi with RFID.	15
	7	Run the node red editor and run simple programs and trigger gpios. Use basic nodes such as inject, debug, gpio	
	8	Setup a physical button switch and trigger a led in node red and python with Debounce.	
	9	Trigger a set of led Gpios on the pi via a Python Flask web server.	
	10	Setup a Mosquitto MQTT server and client and write a Python script to communicate data between Pi's.	
III	11	**Students need to design any one project from below list**	30
		1. Home Automation System Using Raspberry Pi and Node-RED 2. Smart Attendance System Using RFID and Raspberry Pi 3. IoT-based Environmental Monitoring System with MQTT	

		4. Raspberry Pi-Based Oscilloscope with Real-time Data Visualization 5. Smart Security System Using Telegram and Raspberry Pi 6. Automated Plant Watering System Using Node-RED and MQTT 7. Gesture-Controlled LED System Using Raspberry Pi and Flask 8. IoT-based Home Energy Monitoring System Using PZEM-004T and Raspberry Pi 9. Smart Door Lock System Using RFID and Telegram Notifications 10. IoT-based Smart Parking System Using Ultrasonic Sensors and Flask 11. Light Seeking Robot 12. Voice Controlled Robot (Using Arduino and Google Assistant) 13. Line Follower Robot 14. Obstacle Avoidance Robot 15. Bluetooth Controlled Robot 16. Edge Avoiding Robot 17. Gesture Controlled Robot 18. Maze Solving Robot 19. Self-Balancing Robot 20. Emotion Detecting Robot	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	WILEY	First	2014
2.	Programming the Raspberry Pi	by Simon Monk	McGraw Hill	Third	2021
3.	Official Raspberry Pi Beginner's Guide	Gareth Halfacre	Raspberry Pi Press	First	2018

B. Sc (Information Technology)	**Semester – V**
Course Name: Field Project	**Course Code: ITFP02P**
Credits	**2**
Refer Circular No. AAMS_UGS/1CC/2024-25/213 on Dated 18Jan.2025	

SEMESTER VI

B. Sc (Information Technology)	Semester – VI
Course Name: Advanced Artificial Intelligence (Major)	Course Code: S308ITT
Credits	4

Course Objectives:

- The course is designed to make the participants capable of solving industry standard problems in artificial intelligence. After completing the course, the participants will be capable of doing the following.
- They will be able to formulate the right AI problems that can be solved with the raw data available.
- They will be able to apply various machine learning algorithms on structured data to develop machine learning models and compare them to obtain the most suitable model and by using suitable metrics.
- They will be able to develop suitable machine learning models using unstructured data using various machine learning algorithms including deep learning, natural language processing methods, computer vision and reinforcement learning.

Unit	Details	Lecture
I	**1.1 Introduction to AI and Programming Tools:** Python Basics Data Types, Conditional Statements, Looping, Control Statements, String, List and Dictionary Manipulations, Python Functions, Modules and Packages, Object Oriented Programming in Python, Regular Expressions, Exception Handling, Popular python packages like pandas for data handling **1.2 Introduction to Database Management System & SQL**, Database Interaction in Python. **1.3 Data Analysis & visualization** – using numpy, matplotlib, scipy **1.4 R Programming: - Basics -** Vectors, Factors, Lists, Matrices, Arrays, Data Frames, Reading data. 1.5 Data visualization - barplot, pie, scatterplot, histogram, scatter matrix	15
II	**Machine Learning:** Structured and unstructured data handling, Data Preprocessing, Supervised and Unsupervised Learning,Classification, Regression & Clustering,Linear Algebra, Machine Learning Algorithms, Ensemble Methods - Random Forest, Boosting and Optimization, etc., Model Evaluation Metrics	15
III	**Introduction Deep Learning and Neural Networks** Deep Learning Overview, Components of a Neural Network, Types of Neural Networks, Training Neural Networks:	15
IV	**Reinforcement Learning (RL):**-Reinforcement Learning Overview , Key Concepts in RL, Exploration vs. Exploitation, RL Algorithms **AI Applications in Various Domains** , AI in Healthcare, AI in Finance, AI in Robotics , AI in Other Domains:	15

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Machine Learning an algorithmic Perspective	by Stephen Marshland	CRC Press		2014
2.	Programming in Python	Mark Summerfield	Pearson Education	2nd	2009
3.	Artificial Intelligence-Reshaping Life and Business	Prabhath Kumar	BPB Publications		
4.	R for everyone	Jared P Lander	Pearson India	2nd	

Course Outcome:

After completing the course, the learner will be able to:

CO1: Articulate the historical development and current trends in Artificial Intelligence, demonstrating a comprehensive understanding of its foundations and principles.

CO2: Demonstrate proficiency in implementing and analyzing various search algorithms, utilizing both uninformed and informed strategies to solve complex problems efficiently.

CO3: Apply adversarial search techniques to decision-making in competitive environments, including games, and effectively manage uncertainty and partial observability.

CO4: Demonstrate competency in logical reasoning and inference, utilizing propositional and first-order logic to represent and solve real-world problems in AI applications.

CO5: Gain practical experience in planning algorithms and generative AI techniques, enabling them to design and implement AI systems capable of planning actions and generating novel content autonomously.

B. Sc (Information Technology)	Semester – VI
Course Name: Cyber Law (Major)	Course Code:S309ITT
Credits	4

Course Objectives:

- To understand the legal framework for arrests without warrant, penalties, adjudication, and appeals in cybercrime cases under the IT Act, 2000.
- To explore the formation, validity, and jurisdictional issues of contracts in the digital and cyber world.
- To examine legal strategies and protections against cyber-squatting and copyright infringement in the digital realm.
- To analyze the challenges of e-commerce taxation and understand the role of digital signatures, certifying authorities, and e-governance in the digital economy.
- To compare the Indian Evidence Act of 1872 with the IT Act of 2000 and explore protections for cyber consumers in India.

Unit	Details	Lecture
I	Power of Arrest Without Warrant Under the IT Act, 2000: A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for "About to Commit" an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment!	15
II	Contracts in the Infotech World: Contracts in the Infotech World, ClickWrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts. Jurisdiction in the Cyber World: Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act,2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on 12 Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America	15
III	E-Commerce Taxation: Real Problems in the Virtual World: A Tug of War on the Concept of „Permanent Establishment", Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over NonResidents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act,1961 and the	15

	Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance. Digital Signature, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!	
IV	The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934. Protection of Cyber Consumers in India: Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000	**15**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	Vivek Sood	TMH Education	First	2001
2.	Cybersecurity Law	Jeff Kossef	Wiley	First	2017
3.	Cyber Law Pavan Duggal	Pawan Duggal	Universal	Thirst	2023
4.	Cyber Crimes & Law	Santosh Kumar	Whiteman's	First	2024
5.	Information Technology	Krishna Pal Malik Allahabad		Second	2023

Course Outcome:

After completing the course, the learner will be able to:

CO1: Gain a detailed understanding of the legal procedures and enforcement mechanisms for cybercrimes, including arrest without warrant, penalties, adjudication, and appeals under the IT Act, 2000.

CO2: understand the legal principles governing digital contracts and jurisdictional challenges in the cyber world.

CO3: Equipped with knowledge of legal remedies and strategies to combat cyber squatting and protect copyrights in the digital world.

CO5: Understand the complexities of e-commerce taxation and the significance of digital signatures, certifying authorities, and e-governance in modern digital transactions.

CO5: Comprehend the interplay between the Indian Evidence Act of 1872 and the Information Technology Act of 2000, and gain insights into the legal safeguards for cyber consumers in India

B. Sc (Information Technology)	Semester – VI
Course Name: Advanced Artificial Intelligence (Major)	Course Code: S3010ITP
Credits	1

Unit	Practical No.	Details	Lectures
I	1	**Introduction to Python for Data Science** a) Install and configure Python and Jupyter Notebook. b) Explore basic Python programming concepts. c)Utilize libraries such as NumPy, Pandas, and Matplotlib for data manipulation and visualization.	10
	2	**. Exploratory Data Analysis (EDA)** a) Load datasets using Pandas:Perform data cleaning: handle missing values, detect and remove outliers.	
	3	**Linear Regression**:Implement simple and multiple linear regression models.	
	4	**Logistic Regression:**Apply logistic regression for binary classification tasks.	
II	5	**Support Vector Machines (SVM):** Apply SVM for classification tasks.	10
	6	**Decision Trees and Random Forests:**Construct decision tree classifiers and regressors.	

	7	**K-Nearest Neighbors (KNN)**: Implement KNN for classification and regression.	
	8	**Naive Bayes Classifier:**Apply Naive Bayes for text classification tasks.	
III	9	**K-Means Clustering:**Implement K-Means for unsupervised learning tasks. **Principal Component Analysis (PCA):** Apply PCA for dimensionality reduction.	**10**

B. Sc (Information Technology)	Semester – VI
Course Name: Advanced Mobile Programming Practical	Course Code:S3010ITP
Credits	1

Unit	Practical No.	Details	Lectures
I	1	Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals: Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple "Hello World" program.	15
	2	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image)	
	3	Programs related to different Layouts Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View.	
	4	Programming Activities and fragments Activity Life Cycle, Activity methods, Multiple Activities,	
II	5	Programs on Intents, Events, Listeners and Adapters The Android Intent Class, Using Events and Event Listeners	15
	6	Programming UI elements AppBar, Fragments, UI Components	
	7	Programming menus, dialog, dialog fragments	
	8	Programs on Services, notification and	
	9	Programs on broadcast receivers	
III	10	Programming Media API and Telephone API	15
	11	Develop Simple Android App (Using Intent, fragment , menu)	
	12	Database Programming with SQLite	
	13	Develop Android App with Database	

B. Sc (Information Technology)	Semester – VI
Course Name: Linux Engineering	Course Code: S3011AITT
Credits	2

Unit	Details	Lecture
I	**Remote Access, Network Services, and File Servers** 1. TigerVNC and VNC Servers 2. DHCP Servers 3. DNS Servers 4. Web and Mail Servers 5. File Servers	10
II	**System Monitoring, Automation, and Security** 1. System Monitoring and Performance Tuning 2. Managing Log Files with rsyslog 3. Automating System Tasks 4. Securing the Server with iptables	10
III	Cryptography, Bash Scripting, and Boot Configuration 1. Cryptographic Services and SSL Configuration 2. Introduction to Bash Shell Scripting 3. Configuring Boot with GRUB	10

Course Outcomes:

Learners will be

1. Proficient in Linux System Administration
2. Able to Secure and Manage System Access
3. Effectively Manage Storage and Network Services
4. Competent in Automation and Container Management
5. Able to Troubleshoot and Maintain System Stable

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Red Hat Enterprise Linux6 Administration	Sander van Vugt	Sybex	First	2013
2.	Red Hat Enterprise Linux 6 Deployment Guide	Red Hat	Red Hat Content Services	First	2021
3.	RedHat Certified System Administrator	William Maning	Emero Publishing	Second	2012

B. Sc (Information Technology)	Semester – VI
Course Name: Advanced Java Technology	Course Code: S3011BITT
Credits	2

Course Objectives:

•To understand the concept of and develop applications using servlets and database connectivity.

• To develop applications that can handle cookies, sessions and file operations.

• To understand the concept of and design applications using Java server pages.

• To understand the concept of and design applications using Enterprise Java Beans.

• To understand the concepts of persistence, Hibernate and develop JPA applications, Hibernate applications.

Unit	Details	Lecture
I	**Understanding Java EE:** What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Glassfish server Java EE Architecture, **Server and Containers:** Types of System Architecture **Introduction to Java Servlets**: The Need for Dynamic Content **Servlet API and Lifecycle:** Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, **Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example. **Cookies , Session , Working with Files**	10
II	**Introduction To Java Server Pages**: Life Cycle of a JSP Page **Action Elements**: Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Java bean. **Implicit Objects, Scope and El Expressions**: Implicit Objects, Character Quoting Conventions, Unified Expression Language [UnifiedEl], Expression Language. **Java Server Pages Standard Tag Libraries** **Introduction To Enterprise Javabeans** **Interceptors:** Request and Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application.	10
III	**Java Naming and Directory Interface** **Persistence, Object/Relational Mapping And JPA** **Introduction to Java Persistence API:** The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications. **Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works? **Writing Hibernate Application**	10

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Java EE 7 For Beginners	Sharanam Shah, Vaishali Shah	SPD	First	2017
2.	Java EE 8 Cookbook	Elder Moraes	Packt	First	2018
3.	Java EE 8 Application Development	David R. Heffelfinger	Packt	First	2017

Course Outcome:

After completing the course, the learner will be able to:

After completing the course, the learner will be able to:
CO1: Proficiently understand and apply servlets and database connectivity concepts to develop dynamic web applications.
CO2: Demonstrate the ability to develop applications capable of managing cookies, sessions, and performing file operations effectively.
CO3: Proficient in understanding and designing applications using Java Server Pages (JSP), enabling dynamic and interactive web content creation.
CO4: Adept at comprehending and designing applications utilizing Enterprise Java Beans (EJB), facilitating the development of scalable and distributed enterprise-level applications.
CO5: Possess a thorough understanding of persistence concepts, Hibernate framework, and the ability to develop Java Persistence API (JPA) and Hibernate applications proficiently.

B. Sc (Information Technology)	Semester – VI
Course Name: Linux Engineering Practical	Course Code:S3012AITP
Credits	2

Unit	Practical No.	Details	Lectures
I	1	Configuring and Using TigerVNC for Remote Access	10
	2	Configuring a DHCPv4 Server and Client	
	3	Configuring a DNS Server with BIND	
	4	Installing and Configuring Apache HTTP Server	
	5	Configuring Samba and FTP for File Sharing	
II	6	Monitoring System Resources and Performance	10
	7	Configuring and Managing rsyslog for Logging	
	8	Automating Tasks Using cron and anacron	
	9	Configuring NET-SNMP for Network Monitoring	
	10	Setting Up Firewall Rules Using iptables	
III	11	Configuring SSL and Managing Certificates with OpenSSL	10

	12	Using GPG to Encrypt and Sign Files	
	13	Writing Basic Bash Shell Scripts	
	14	Automating System Tasks with Bash Scripting	
	15	Configuring Boot Options with GRUB	

B. Sc (Information Technology)	Semester – VI
Course Name: Advanced Java Technology Practical	Course Code: S3012BITP
Credits	2

Unit	Practical No.	Details	Lectures
I	1	Create a simple application using servlet.	10
	2	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	
	3	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.	
	4	Create a Servlet application to upload and download a file.	
	5	Create a JSP application to demonstrate the use of JSTL	
II	6	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.	10
	7	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.(use update query)	
	8	Develop a Application Using EJB.	
	9	Develop using EJB [Stateful Session Bean].	
	10	Create simple Servlet application to demonstrate Non-Blocking Read Operation.	
III	11	Develop a simple Application Using JPA.	10
	12	Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.	
	13	Develop an application to demonstrate Hibernate One-To -One Mapping Using Annotation	

	14	Develop Hibernate application to enter and retrieve course details with ORM Mapping	
	15	Develop a five page web application site using any two or three Java EE Technologies.	

B. Sc (Information Technology)	Semester – VI
Course Name: Data Analytics & Visualization Practical	Course Code: S3013ITP
Credits	2

Unit	Practical No.	Details	Lectures
I	1	Perform the analysis for the following: a.Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.	10
	2	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data. Use Excel.	
	3	Perform the data classification using classification algorithm using R/Python	
	4	Perform the data clustering using clustering algorithm using R/Python.	10
	5	Perform the Linear regression on the given data warehouse data using R/Python.	
	6	Perform the logistic regression on the given data warehouse data using R/Python.	
	7	Write a Python program to read data from a CSV file, perform simple data analysis, and generate basic insights. (Use Pandas is a Python library)	10
	8	Perform data visualization using Python on any sales data. b. Perform data visualization using PowerBI on any sales data	
	9	Create the Data staging area for the selected database using SQL.	
		Tableau Practical List :	
	10	Data Connectivity and Import:Connect to various data sources like Excel, CSV, SQL Server, and cloud-based platforms.	
	11	Basic Chart Creation:Create different chart types (bar, pie, line, scatter, map) using basic data fields.	
	12	Data Analysis and Calculations: Create calculated fields using calculations. Apply filters and parameters to drill down into data. Use table calculations for dynamic analysis.	

	14	Dashboard and Report Design:Design interactive dashboards with multiple visualizations.	

B. Sc (Information Technology)	Semester – VI
Course Name: Applied Cyber Security Practical	Course Code: S3014ITP
Credits	2

Unit	Practical No.	Details	Lectures
I	1	**Information Gathering/ Footprinting + Scanning + Enumeration** **a.** FOCA tool + Recon-ng + Metasploit **b.** Nmap + Advanced IP Scanner + CurrPorts + Network View + Port Droid Tool **c.** SuperScan + Hyena	**10**
	2.	**System Hacking + Steganography + Covering Tracks** **a.** Ophcrack + PWDump + winrtgen **b.** NTFS Stream manipulation + QuickStego **c.** Clearing Logs + Clearing Audit Policies	
	3.	**Sniffing + Social Engineering + Denial of Service** **a.** Wireshark + Omnipeek + Cain and Abel **b.** Social Engineering Toolkit (kali linux) **c.** HOIC + LOIC + Metasploit	
	4.	**Session Hijacking + SQL Injection + Cryptography** **a.** Using BurpSuite to modify the traffic **b.** SQL injection using bwapp **c.** Hashcalc + Advanced Encryption Package + Cryptool	
II	5.	**Wireless Hacking**	**10**

		a. Aircrack-ng + wifite	
	6.	**Vulnerability Assessment** **a.** OWASP Zed Proxy **b.** openVAS	
	7.	**Malware Analysis** **a.** Perform Static Analysis **b.** Perform Dynamic Analysis	
III	8.	**Security Operation Centre** **a.** Encrypting and Decrypting Data using OpenSSL **b.** Examining Telnet and SSH in wireshark **c.** Exploring DNS Traffic	**10**
	9.	**Cyber Forensics - I** **a.** Creating a Forensic Image using FTK Imager **b.** Viewing content of Forensic Image using Access Data FTK Imager Tool	
	10.	**Cyber Forensics - II** **a.** Email Forensics **b.** Web Browser Forensics **c.** Using Sysinternals tools for Network Tracking and Process Monitoring	

B. Sc (Information Technology)	**Semester – VI**
Course Name: OJT	**Course Code: ITOJT01P**
Credits	**2**

Note:- Refer Appendix -I

Appendix-I

(Proforma for the certificate for internship in official letter head)

This is to certify that Mr. /Ms. …… of .....College/Institution worked as an intern as part of his/her M.Sc. course in Computer Science of University of Mumbai. The particulars of internship are given below:

Internship starting date: _____

Internship ending date: _____

Actual number of days worked: _____

Tentative number of hours worked: _____ Hours

Broad area of work:

_____

A small description of work done by the intern during the period:

_____

_____

_____

_____

Signature: _____

Name:

Designation:

Contact details:

Email:

(Seal of the organization)

Appendix-II

(Proforma for the Evaluation of the intern by the industry mentor /to whom the intern was reporting in the organization)

Professional Evaluation of intern

Name of intern: _____

College/institution: _____

[Note: Give a score in the 1 to 5 scale by putting √ in the respective cells]

No	Particular	Excellent	Very Good	Good	Moderate	Satisfactory
1	Attendance & Punctuality					
2	Ability to work in a team					
3	Written and oral communication skills					
4	Problem solving skills					
5	Ability to grasp new concepts					
6	Technical skill in terms of technology, programming etc					
7	Ability to complete the task					
8	Quality of overall work done					

Comments:

_____

Signature: _____

Name:

Designation:

Contact details:

Email:

(Seal of the organization)

1. OVERVIEW OF THE ORGANIZATION

1.1 Introduction

- Brief introduction to the organization (name, location, industry type).
- Year of establishment and core business activities.
- Vision and mission of the organization.

1.2 Organizational Structure

- A brief overview of the departments/cells of the organization.
- The hierarchy and reporting structure of the intern's section.

2. ACTIVITIES

2.1 Section/Department Overview

- Name of the section/cell where the intern worked.
- Key responsibilities and operations of the section.
- Importance of the section in the overall functioning of the organization.

2.2 Activities Performed

- List of daily/weekly activities undertaken by the intern.
- Description of how these activities contribute to the organization.

3. WORK ALLOTMENT DETAILS

3.1 Work Assigned

- Tasks and responsibilities assigned to the intern.
- Objectives of the assigned work.

3.2 Work Performed

- Detailed description of tasks completed during the internship.
- Challenges faced and how they were tackled.
- Tools, software, or methodologies used to complete tasks.

3.3 Learning Outcomes from Work

- Technical and practical skills acquired.
- Knowledge about industry practices and standards.

4. SELF-ASSESSMENT

4.1 Technical Learning

- List of technical skills gained.
- Understanding of industry-related tools, software, and workflows.
- Improvements in problem-solving abilities.

4.2 Interpersonal & Professional Skills

- Communication and teamwork skills developed.
- Adaptability, time management, and decision-making improvements.
- Professionalism and workplace ethics learned.

4.3 Overall Experience & Future Application

- Summary of key takeaways from the OJT experience.
- How the internship aligns with future career goals.
- Areas for self-improvement and further learning.

5. CONCLUSION

- Final thoughts on the internship experience.
- Gratitude towards mentors and the organization.
- How this experience will contribute to future endeavours.

Evaluation pattern:

Examination Pattern for MAJOR & MINOR Subject

A) Internal Assessment: 40 Marks (4 CREDIT)

(Note: Only those certification/courses suggested by the department shall be deemed valid, Student cannot do any certification on their own)

Sr No.	Particulars	Marks
1	Mid-Term Class Test	30
2	a. SWAYAM (Advanced Course) of minimum 20 hours and certification exam completed or b. NPTEL (Advanced Course) of minimum 20 hours and certification exam completed c. Certification marks of one completed exam shall be awarded to one course only.	10

B) External Examination for Theory Courses – 60 Marks (4 CREDIT)

- ➢ Duration: 2 Hours
- ➢ All questions shall be compulsory with internal choice within the questions.
- ➢ Each Question may be subdivided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

Theory question paper pattern:

All questions are compulsory.			
Question	Based on	Options	Marks
Q.1	Unit - I	Any 3 out of 6	15
Q.2	Unit - II	Any 3 out of 6	15
Q.3	Unit - III	Any 3 out of 6	15
Q.4	Unit -IV	Any 3 out of 6	15

C) Semester End Practical Examination (50 marks) :(2 Credit)

- ➢ Major subject carries 50 Marks
- ➢ Duration: 2 Hours for practical course.
- ➢ Certified Journal is compulsory for appearing at the time of Practical Exam

D) Internal Assessment: 20 Marks (2 CREDIT)

Sr No.	Particulars	Marks
1	**Mid-Term Class Test**	**20**

E) External Examination for Theory Courses – 30 Marks (2 CREDIT)

- ➢ Duration: 1 Hours
- ➢ All questions shall be compulsory with internal choice within the questions.
- ➢ Each Question may be subdivided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

Theory question paper pattern:

All questions are compulsory.			
Question	Based on	Options	Marks
Q.1	Unit - I	Any 2 out of 4	10
Q.2	Unit - II	Any 2 out of 4	10
Q.3	Unit - III	Any 2 out of 4	10