RCOEM

Shri Ramdeobaba College of Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR – 440013

An Autonomous College affiliated to Rashtrasant Tukdoji Maharaj Nagpur University,
Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME

2022-2023

B. TECH. (INFORMATION TECHNOLOGY)

Teaching Scheme for B.Tech. Information Technology

SEMESTER -I											
								Maximum Marks			ESE Duration (Hrs)
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Continuous Evaluation	End Sem Exam	Total	
				L	T	P					
01	BSC	PHT159	Introduction to Quantum Computing	3	1	0	4	40	60	100	03
02	BSC	PHP159	Introduction to Quantum Computing Lab	0	0	2	1	25	25	50	-
03	BSC	MAT153	Mathematics-I	3	0	0	3	40	60	100	03
04	BSC	MAP153	Mathematics-I Lab	0	0	2	1	25	25	50	-
05	ESC	ITT151	Fundamentals of Programming	3	0	0	3	40	60	100	03
06	ESC	ITP151	Fundamentals of Programming Lab	0	0	2	1	25	25	50	-
07	ESC	ITT152	Digital Circuits	2	1	0	3	40	60	100	03
08	ESC	ITP152	Digital Circuits Lab	0	0	2	1	25	25	50	-
09	MC	HUT152	Constitution of India	2	0	0	0	-	-	-	-
10	MC	PEP151	Yoga/Sports	0	0	2	0	-	-	-	-
TOTAL				**13**	**02**	**10**	**17**				
				25 Hrs.							

SEMESTER –II											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	ESC	ITT153	Object Oriented Programming	3	1	0	4	40	60	100	03
02	ESC	ITP153	Object Oriented Programming Lab	0	0	2	1	25	25	50	-
03	PCC	ITT154	Data Structures	2	1	0	3	40	60	100	03
04	PCC	ITP154	Data Structures Lab	0	0	2	1	25	25	50	-
05	ESC	ITP155	IT Workshop Lab -I	0	0	4	2	25	25	50	-
06	BSC	CHT154	Chemistry	2	0	0	2	40	60	100	03
07	BSC	CHP154	Chemistry Lab	0	0	2	1	25	25	50	-
08	BSC	MAT154	Mathematics-II	3	1	0	4	40	60	100	03
09	HSSM	HUT151	English	2	0	0	2	40	60	100	03
10	HSSM	HUP151	English Lab	0	0	2	1	25	25	50	-
11	ESC	IDT151	Creativity, Innovation & Design Thinking	1	0	0	1				
TOTAL				**13**	**03**	**12**	**22**				
				28 Hrs.							

SEMESTER -III											
Sr. No.	**Category**	**Course Code**	**Course Name**	**Hours/week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
01	PCC	ITT261	Computer Organization and Architecture	3	0	0	3	40	60	100	03
02	PCC	ITT262	Advanced Data Structures	2	1	0	3	40	60	100	03
03	PCC	ITP262	Advanced Data Structures Lab	0	0	2	1	25	25	50	-
04	PCC	ITT263	IT Infrastructure Services	2	0	0	2	40	60	100	03
05	PCC	ITP263	IT Infrastructure Services Lab	0	0	2	1	25	25	50	-
06	ESC	ITT264	Cyber Laws and Ethics	2	0	0	2	40	60	100	03
07	PCC	ITT265	Computer Graphics	2	1	0	3	40	60	100	03
08	PCC	ITP265	Computer Graphics Lab	0	0	2	1	25	25	50	-
09	BSC	MAT252	Linear Algebra & Statistics	3	0	0	3	40	60	100	03
10	HSSM	HUT254	Technical Communication	3	0	0	3	40	60	100	03
11	MC	CHT251	Environmental Science	2	0	0	0	-	-	-	-
TOTAL				**19**	**02**	**06**	**22**				
				27 Hrs.							

SEMESTER – IV											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT266	Formal Languages and Automata Theory	2	1	0	3	40	60	100	03
02	PCC	ITT267	Software Engineering	3	0	0	3	40	60	100	03
03	PCC	ITP267	Software Engineering Lab	0	0	2	1	25	25	50	-
04	PCC	ITT268	Design and Analysis of Algorithms	3	0	0	3	40	60	100	03
05	PCC	ITP268	Design and Analysis of Algorithms Lab	0	0	2	1	25	25	50	-
06	PCC	ITT269	Database Management System	3	0	0	3	40	60	100	03
07	PCC	ITP269	Database Management System Lab	0	0	2	1	25	25	50	-
08	OEC	ITT299	Open Elective – I	3	0	0	3	40	60	100	03
09	BSC	MAT281	Discrete Mathematics	3	0	0	3	40	60	100	03
10	MC	HUT252	Indian Traditional Knowledge	2	0	0	0	-	-	-	-
TOTAL				**19**	**01**	**06**	**21**				
				26 Hrs.							

Open Elective – I	
Course Code	**Course Name**
ITT299-05	Web Development

SEMESTER – V											
Sr. No.	**Category**	**Course Code**	**Course Name**	**Hours/week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
01	PCC	ITT371	Compiler Design	3	1	0	4	40	60	100	03
02	PCC	ITT372	Operating Systems	3	0	0	3	40	60	100	03
03	PCC	ITP372	Operating Systems Lab	0	0	2	1	25	25	50	-
04	PCC	ITT373	Computer Networks	3	0	0	3	40	60	100	03
05	PCC	ITP373	Computer Networks Lab	0	0	2	1	25	25	50	-
06	PCC	ITT374	Introduction to Machine Learning	2	1	0	3	40	60	100	03
07	PCC	ITP374	Introduction to Machine Learning Lab	0	0	2	1	25	25	50	-
08	OEC	ITT398	Open Elective– II	3	0	0	3	40	60	100	03
09	PROJC	ITP375	Project -I	0	0	4	2	50	50	100	
10	HSSM	HUT354	Managerial Economics	2	0	0	2	40	60	100	03
TOTAL				**16**	**02**	**10**	**23**				
				28 Hrs.							

Open Elective – II	
Course Code	**Course Name**
ITT398-05	Mobile Apps Development

SEMESTER -VI											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT376	Cryptography and Network Security	3	0	0	3	40	60	100	03
02	PCC	ITT377	Artificial Intelligence	2	1	0	3	40	60	100	03
03	PCC	ITP377	Artificial Intelligence Lab	0	0	2	1	25	25	50	-
04	PCC	ITT378	Cloud Computing	2	1	0	3	40	60	100	03
05	PCC	ITP378	Cloud Computing Lab	0	0	2	1	25	25	50	-
06	PEC	ITT379	Elective-I	3	0	0	3	40	60	100	03
07	OEC	ITT399	Open Elective– III	3	0	0	3	40	60	100	03
08	PCC	ITP380	IT Workshop Lab-II	0	0	4	2	25	25	50	-
09	HSSM	HUT358	Organizational Behavior	2	0	0	2	40	60	100	03
10	PROJC	ITP381	Project-II	0	0	6	3	75	75	150	-
TOTAL				**15**	**02**	**14**	**24**				
				31 Hrs.							

Elective-I	
Course Code	**Course Name**
ITT379-01	Customer Relationship Management
ITT379-02	Product and Project Management

Open Elective – III Organizational Behavior	
Course Code	**Course Name**
ITT399-05	Open-Source Technologies
IDT399-2	Massive Open Online Course(s) of Coursera - MOOC COURSERA

SEMESTER – VII											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT481	Software Architecture	3	0	0	3	40	60	100	03
02	PEC	ITT482	Elective-II	3	0	0	3	40	60	100	03
03	PEC	ITP482	Elective-II Lab	0	0	2	1	25	25	50	-
04	PEC	ITT483	Elective-III	3	0	0	3	40	60	100	03
05	PEC	ITP483	Elective-III Lab	0	0	2	1	25	25	50	-
06	OEC	ITT498	Open Elective-IV	3	0	0	3	40	60	100	03
07	PROJC	ITP484	Industry Internship Evaluation*	0	0	2	1	-	-	50	-
08	PROJC	ITP485	Project-III	0	0	8	4	75	75	150	-
TOTAL				**12**	**00**	**12**	**19**			**700**	
				24 Hrs.							

***6-8 weeks Internship must be completed before reaching VII Semester**

Elective-II		Elective-III	
Course Code	**Course Name**	**Course Code**	**Course Name**
ITT482-01	Frontend Technologies	ITT483-01	Backend Technologies and DevOps
ITT482-02	Internet of Things (IoT)	ITT483-02	Mobile Application Development

Open Elective – IV	
Code	**Course Name**
ITT498-05	Introduction to Cybersecurity

OR

SEMESTER – VII (06 Months Full Semester Internship)											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PEC	ITT482	Elective-II	3	0	0	3	40	60	100	03
02	PEC	ITT483	Elective-III	3	0	0	3	40	60	100	03
03	PROJC	ITP484	Industry Internship Evaluation*	0	0	2	1	50	-	50	-
04	PR	ITP485	Full Semester Internship	0	0	0	12	100	100	200	-
TOTAL				**06**	**0**	**02**	**19**				
				08 Hrs.							

OR

SEMESTER – VII (One-year Full Internship)											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PEC	ITT482	Elective-II	3	0	0	3	40	60	100	03
02	PEC	ITT483	Elective-III	3	0	0	3	40	60	100	03
04	PROJC	ITP484	Industry Internship Evaluation	0	0	2	1	-	-	-	-
05	PR	ITP485	Full Semester Internship	0	0	0	24	200	200	400	-
TOTAL				**06**	**0**	**02**	**31**			**600**	
				8 Hrs.							

SEMESTER – VIII											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PEC	IDT457/ ITT486	Elective-IV	3	0	0	3	40	60	100	03
02	PEC	ITT487	Elective-V	3	1	0	4	40	60	100	03
03	PEC	ITP487	Elective-V Lab	0	0	2	1	25	25	50	-
04	PEC	ITT488	Elective-VI	2	1	0	3	40	60	100	03
05	PEC	ITP488	Elective-VI Lab	0	0	2	1	25	25	50	-
			TOTAL	**08**	**02**	**04**					
				1 Hrs.			**12**			**400**	

OR

Sr. No.	Category	Course Code	Course Name	Hours/week	Credits	Maximum Marks			ESE Duration (Hrs.)
						Continuous Evaluation	End Sem Exam	Total	
01	PR	ITP460	Full Semester Internship		12	100	100	200	-

Elective-IV		Elective-V	
Course Code	**Course Name**	**Course Code**	**Course Name**
IDT457	Bioinformatics	ITT487-01	Image Processing
ITT486	Nature Inspired AI	ITT487-02	Data Warehouse and Mining

Elective-VI	
Code	**Course Name**
ITT488-01	Information Retrieval
ITT488-02	Digital Forensics

Scheme of Teaching & Examination of HONORS Specialization In Information Technology

Sr. No.	Semester	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	III	ITTH301	Introduction to Web3 Programming	3	-	-	3	40	60	100	03 Hrs.
02	IV	ITTH401	Development of Progressive Web Application	3	-	-	3	40	60	100	03 Hrs.
03	V	ITTH501	Cloud Native Apps Development	4	-	-	4	100	-	100	-
04	VI	ITTH601	Introduction to DevOps	4	-	-	4	100	-	100	-
05	VII	ITPH701	Project	-	-	08	4	50	50	100	-
			Total	**14**	**-**	**08**	**18**			**500**	

*** Note: In case any of the above motioned courses are offered by the parent department, another course will be offered in lieu of that course.**

The Scheme of Teaching & Examination of MINORS Specialization In Information Technology

Sr. No.	Semester	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	III	ITTM301	Web Designing	2	1	-	3	40	60	100	03 Hrs.
02	IV	ITTM401	Advanced Java Programming	2	1	-	3	40	60	100	03 Hrs.
03	V	ITTM501	Data Warehousing and Business Intelligence	3	1	-	4	40	60	100	03 Hrs.
04	VI	ITTM601	Introduction to Emerging Technologies	3	1	-	4	40	60	100	03 Hrs.
05	VII	ITPM701	Project			08	4	50	50	100	
				10	**04**	**08**	**18**			**500**	

***Note: In case any of the above-mentioned courses are offered by the parent department, another course will be offered in lieu of that course.**

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITT481				
Category	Program Core Course				
Course Title	Software Architecture				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VII

Course Outcomes:

At the end of the course, students will be able to

1. Understand the fundamental concepts, roles, and significance of software architecture
2. Apply different architectural styles and design patterns to develop suitable architectures
3. Apply architectural approaches such as microservices, cloud-native architecture, and DevOps principles
4. Design software architectures using standard modeling notations and architecture description languages
5. Evaluate software architecture using quality attributes and architecture evaluation methods

Unit I

Foundations of Software Architecture: Definition and significance of software architecture, The Architecture Business Cycle (ABC), Architectural structures and views, Architectural drivers: functional requirements, quality attributes, constraints, Stakeholders and their concerns, Architectural views and viewpoints, Architecture description languages (ADLs), Role and responsibilities of a software architect

Unit II

Architectural Styles and Patterns: Common architectural styles: layered, client-server, microservices, event-driven, service-oriented, pipe-and-filter, Design patterns: Model-View-Controller (MVC), Broker, Blackboard, Publish-Subscribe, Applying patterns to solve architectural problems, Case studies demonstrating the use of architectural patterns

Unit III

Architecture Design and Documentation: Architecture design processes and methodologies, Documenting architectures using UML and other notations, ISO/IEC/IEEE 42010 standard for architecture descriptions, Tools and best practices for effective documentation

Unit IV

Quality Attributes and Architecture Evaluation: Understanding quality attributes: performance, scalability, security, modifiability, availability, Tactics and strategies to achieve quality attributes, Architecture evaluation methods: ATAM (Architecture Tradeoff Analysis Method), CBAM (Cost Benefit Analysis Method), Risk assessment and mitigation in architectural decisions.

Unit V

Advanced Topics in Software Architecture: Microservices architecture: principles, benefits, challenges, Cloud-native architectures and deployment considerations, DevOps and continuous delivery in architectural context, Evolutionary architecture and managing change over time

Unit VI

Real-world case studies of software architecture in various domains, Emerging trends: serverless computing, edge computing, AI-driven architecture, Ethical considerations and sustainability in software architecture, Future directions and ongoing research in the field

Text Books:

1. Software Architecture in Practice, Len Bass, Paul Clements, Rick Kazman, Addison-Wesley
2. Fundamentals of Software Architecture: An Engineering Approach, Mark Richards, Neal Ford, O'Reilly Media

Reference Books:

1. Documenting Software Architectures: Views and Beyond, Paul Clements, Felix Bachmann, Len Bass, David Garlan et al., Addison-Wesley
2. Designing Software Architectures: A Practical Approach, Humberto Cervantes, Rick Kazman, Addison-Wesley

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITT482-01				
Category	Program Elective Course (Elective-II)				
Course Title	Frontend Technologies				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VII

Course Outcomes:

At the end of the course, students will be able to:

1. Create a basic website using HTML and Cascading Style Sheets.
2. Design a dynamic web page with validation using JavaScript objects
3. Apply different event handling mechanisms
4. Apply the advanced concepts of Angular

Syllabus:

Unit 1:
Web Development: Client-Side web development, UI Components, layouts, navigation, form validation, Business Logic, Database operations, Static and Dynamic web pages, programming languages, libraries, tools and frameworks required for developing interactive, dynamic web user interfaces and single-page applications.

Unit 2:
HTML5 : Web and Importance of HTML, anatomy of HTML elements, Nesting Elements, block and inline elements, attributes, HTML document, Hyperlinks, Tables, Multimedia elements and embedding technologies, Native web API's and semantic elements its importance and usage.

Unit 3:
CSS: Building Blocks of CSS, Box Model, Selectors, Values and Units, Styling various HTML elements(tables, text, media, images, overflowing content et), Organizing the CSS.

Unit 4:
JavaScript: DOM and Building blocks of JavaScript(Variables, Data Types, Basic Mathematical operators, Conditional Branching, Looping, Functions, Function Expressions), Variable types, Scopes and Closures, JavaScript Objects, Object References, properties, Asynchronous and functional programming.

Unit 5:
Angular: Angular Framework, Structure of Angular Application, and basic commands to setup angular application, Building blocks and concept of Angular (Components, Directives, Templates, Life Cycle Hooks, Services, Pipes, Dependency Injection, HTTP Client, Modules, Lazy Loading).

Unit 6:
Package Managers: npm, yarn, Module Bundlers: Webpack, Vite, Parcel (Intro only), Code Splitting and Lazy Loading, Linting and Formatting Tools (ESLint, Prettier), Deployment of Frontend Applications (Netlify, Vercel, GitHub Pages)

TextBooks:

1. HTML and CSS: Design and Build Websites, by Jon Duckett
2. Learning Web Design: A beginners guide to HTML, CSS, Javascript, and Web Graphics, By Jennifer Niederst Robbins

Reference Book:

1. Ducket J. JavaScript and JQuery: Interactive FrontEnd Web Development, Wiley 2014

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITP482-01				
Category	Program Elective Course (Elective-II)				
Course Title	Frontend Technologies Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VII

Course Outcomes

On successful completion of the course, the student will be able to:

1. To create a basic website using HTML and Cascading Style Sheets
2. Design and Implement Dynamic Webpages
3. Apply Advanced Concepts of Angular

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITT482-02				
Category	Program Elective Course(Elective-II)				
Course Title	Internet of Things				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VII

Course Outcomes

At the end of the course, the students will be able to:

1. Understand the fundamental concepts and real-world benefits of the IoT
2. Identify key IoT components essential for designing IoT applications
3. Analyse various communication protocols used in IoT frameworks
4. Demonstrate an understanding of IoT constraints and emerging advancements in the field
5. Develop IoT applications for different domains using hardware and software platforms

Syllabus:

Unit-I

Introduction to Internet of Things: IoT basics, Connected devices evolution, Introduction to Communication mechanisms in IoT, Challenges with IoT, Applications of IoT. IoT Reference Architecture - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Unit-II

IoT hardware platforms: Sensors, Actuators, Smart objects, Controller platform: Arduino, Raspberry-Pi, Implementation of simple IoT system.

Unit-III

IoT access technologies**:** Physical layer protocols used in IoT communication. IPv6, HTTP based protocols-CoAP and MQTT, Specific aspects of protocols covering IoT communication.

Unit-IV

Sensor networks and M2M Architecture: High level M2M requirements, M2M services architecture, ZigBee network and its architecture, 6LoWPAN related standards.

Unit-V

Real-World Design and Constraints: Technical Design constraints, Data representation, analysis and visualization, Interaction and remote control, Standard Communication protocols, Concepts of Sensor cloud, Edge Computing, Fog computing.

Unit-VI

Case studies of IoT systems: Smart City, Smart Home, Agriculture, Transportation, Smart Manufacturing, Healthcare.

Text Books:

1. A. Bahga, V. Madisetti; Internet of Things: A Hands-on Approach, 1st Edition, Orient Blackswan Private Limited - New Delhi., 2015.

Reference Books:

1. Peter Waher , Learning Internet of Things , Packt Publishing .
2. Olivier Hersent; David Boswarthick; Omar Elloumi , The Internet of Things: Key Applications and Protocol , John Wiley & Sons.
3. Y. Kanetkar, S. Korde; 21 Internet of Things (IOT) Experiments: Learn IoT, the programmer's way, 1st Edition, BPB Publications, 2018.

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITP482-02				
Category	Professional Core Course				
Course Title	Internet of Things Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	

Course Outcomes

On successful completion of the course, the student will be able to:

1. Identify IoT hardware components, including sensors, actuators, and communication modules.
2. Interface sensors and actuators with controllers to build functional IoT systems.
3. Develop IoT applications for real-time applications.
4. Analyse IoT systems with regard to performance, energy efficiency, scalability, and data security

Experiments would be based on the following:

1. Introduction to IoT, IDE platforms and Development Boards
2. Sensor Interfacing
3. Actuator Interfacing
4. Display devices interfacing
5. Data Communication and Protocols
6. IoT with Cloud Platforms
7. Security and Power Optimization
8. IoT Project Integration (Smart Home Automation, Smart Agriculture System, Health Monitoring System, Smart Parking or Gas Leakage Detection System etc)

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITT483-01				
Category	Program Elective Course (Elective-II)				
Course Title	Backend Technologies and DevOps				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VII

Course Outcomes

On successful completion of the course, the student will be able to:

1. Design and implement backend services with RESTful APIs.
2. Use relational and non-relational databases in web applications.
3. Apply DevOps tools for version control, CI/CD, and automation.
4. Containerize applications using Docker and orchestrate them with Kubernetes.
5. Deploy and manage backend applications on cloud platforms using Infrastructure as Code.

Syllabus:

Unit 1: Backend Development Fundamentals

- Client-Server Model and Architecture
- RESTful APIs: Principles and Design
- HTTP Methods and Status Codes
- Introduction to Backend Languages: Node.js, Python (Flask), Java (Spring Boot)
- Building a Simple REST API with Express.js / Flask / Spring Boot
- Lab: Create a simple CRUD REST API
- Tools: Postman, Swagger

Unit 2: Database Integration and Security

- Relational Databases: MySQL / PostgreSQL
- NoSQL Databases: MongoDB
- ORMs: Sequelize, Mongoose, Hibernate
- Authentication and Authorization: Sessions, JWT, OAuth2
- Security Best Practices: SQL Injection, XSS, CSRF, HTTPS, CORS
- Lab: Connect API to a database, implement JWT-based login
- Tools: pgAdmin, MongoDB Compass

Unit 3: DevOps Essentials

- Introduction to DevOps, Agile vs DevOps
- Version Control with Git and GitHub/GitLab
- CI/CD Concepts and Tools: Jenkins, GitHub Actions, GitLab CI
- Writing Build and Deployment Scripts
- Lab: Set up CI pipeline for automated testing and deployment

- Tools: Git, Jenkins, GitHub Actions

Unit 4: Containerization and Orchestration

- Docker Basics: Images, Containers, Dockerfiles
- Docker Compose: Multi-Container Applications
- Kubernetes Overview: Pods, Deployments, Services
- Helm Charts (Optional Introduction)
- Lab: Dockerize a backend app and deploy using Kubernetes
- Tools: Docker, Minikube, Kubernetes Dashboard

Unit 5: Infrastructure as Code and Cloud Deployment

- Introduction to Cloud Platforms: AWS / Azure / GCP
- Infrastructure as Code: Terraform / Ansible
- Deploying Applications on Cloud
- Monitoring and Logging: Prometheus, Grafana, ELK Stack
- Load Balancing and Auto Scaling
- Lab: Deploy an application on AWS using Terraform
- Tools: AWS EC2, S3, Terraform, Grafana

Textbooks:

1. Node.js Design Patterns by Mario Casciaro, Third Edition (2020), Packt Publishing.
2. Flask Web Development by Miguel Grinberg, Second Edition (2018), O'Reilly Media
3. Spring Boot in Action by Craig Walls, First Edition (2015), Manning Publications
4. The DevOps Handbook by Gene Kim et al., Second Edition (2021), IT Revolution Press
5. Docker Deep Dive by Nigel Poulton

Reference Books:

1. Designing Data-Intensive Applications by Martin Kleppmann, First Edition (2017), O'Reilly Media
2. Clean Code by Robert C. Martin, First Edition (2008), Prentice Hall
3. Infrastructure as Code by Kief Morris, Third Edition (2025), O'Reilly Media
4. Official Documentation: Docker, Kubernetes, Terraform, GitHub Actions, AWS,

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITP483-01				
Category	PEC (Elective-III)				
Course Title	Backend Technologies and DevOps Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VII

Course Outcomes

On successful completion of the course, the student will be able to:

1. Set up backend development environments and tools.
2. Create and test backend applications with APIs.
3. Integrate backend apps with SQL/NoSQL databases.
4. Use Git, Docker, and CI/CD tools for deployment and automation.
5. Deploy and monitor applications using Kubernetes and cloud services.

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITT483-2				
Category	Program Elective Course (Elective-III)				
Course Title	Mobile Application Development				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VII

Course Outcomes

At the end of the course, students will be able to

1. Understand the different aspects of Mobile app development
2. Design mobile apps using Android as development platform
3. Apply the concepts of hardware, software co-design in building mobile applications
4. Perform testing signing, packaging and distribution of mobile apps

Syllabus:

Unit I

Getting started with Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development.

Unit II

Building blocks of mobile apps: App user interface designing –mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity-state and life cycle, interaction amongst activities. App functionality beyond user interface – Threads, Async task, Services – States and life cycle, Notification, Broadcast receivers, Telephony and SMS APIs.

Unit III

Native data handling: On device file I/O, shared preferences, Mobile databases such as SQLite, and enterprise data access (via Internet /Internet)

Unit IV

Sprucing up mobile apps: Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness and native hardware access (sensors such as accelerometer and gyroscope)

Unit V

Testing of Mobile App: Different levels of testing, different types of testing, Static Testing types, Dynamic Testing types, Debugging mobile apps , Test automation of mobile apps, JUnit for Android.

Unit VI

Publishing Mobile Apps: Robotium, Monkey Talk ,Taking apps to market, Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Localization, Prework for publishing app

Text Books

1. Mobile Apps Development : Anubhav Pradhan , Anil V. Deshpande, 1st Edition, Wiley India
2. Android Application Development all in one for Dummies - Barry Burd, 1st Edition, John Wiley & Sons.
3. Foundations of Software Testing: Dorothy Graham, Erik van Veenendaal, Isabel Evans,Rex Black, 2nd Revised Edition, Cengage Learning

Reference Books

1. Teach Yourself Android Application Development 24 Hours- Lauren Darcy, 1st Edition, Pearson.

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITP483-02				
Category	Program Elective Course (Elective-III)				
Course Title	Mobile Application Development Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VII

Course Outcomes

At the end of the course, students will be able to

1. Set Up and Navigate the Android Development Environment
2. Design User Interfaces and Android Application Logic
3. Integrate Data Storage and Networking
4. Test, Debug, and Deploy Android Apps

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITT498-05				
Category	OEC (Open Elective-IV)				
Course Title	Introduction to cybersecurity				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VII

Course Outcomes:

After the successful completion of the course, students shall be able to –

1. Identify scope of modern-day cybersecurity needs.
2. Assign appropriate security controls for specific requirements.
3. Implement and maintain cybersecurity in organizations from legal and ethical perspectives.

Syllabus:

Unit I:
Introduction to Computer Networks, Need for Cybersecurity, History & Impact of the Internet, Introduction to Cybercrime, Reasons for Committing Cybercrimes

Unit II:
Cyber-offenses Planning by Criminals, Introduction to Cyber Security, CNSS Security Model, Types of Network Attacks, Application Security

Unit III:
Identity and Access Management, Mobile Security, Infrastructure Security, Defense-in-Depth, Authentication, Data Loss Prevention (DLP), Data Backup, Fighting Cyber Attacks

Unit IV:
Legal, Ethical, and Professional Issues in Information Security, Physical Security, Implementing Information Security, IS Project Management, Information Security Maintenance, Security Management Models

Unit V:
Balancing Information Security & Access, Security Professionals, IS Governance, Overview of Risk Management

Textbooks:

1. Introduction to Cyber Security: Guide to the World of Cyber Security by Anand Shinde. Notion Press.
2. Principles of Information Security, Sixth Edition by Michael E. Whitman & Herbert J. Mattord. Cengage Publishing.

Syllabus for B. Tech. VII Semester
Department of Information Technology

Course Code	ITP485				
Category	PROJC				
Course Title	Project-III				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	8	4	VII

Course Outcomes

Upon completion of the course, students would be able to

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation, and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Communicate with engineers and the community at large in written and oral forms.
5. Demonstrate the knowledge, skills, and attitudes of a professional engineer.
6. Learn to work as a team for the timely completion of project work.

Syllabus for B. Tech. VIII Semester
Department of Information Technology

Course Code	IDT457				
Category	Program Elective Course (Elective-IV)				
Course Title	Bioinformatics				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VIII

Course Outcomes

On successful completion of the course, student will be able to:

1. Apply knowledge of bioinformatics in a practical project
2. Develop the ability for critical assessment of scientific research publications in bioinformatics
3. Build an understanding of the research process in general, such as research methods, scientific writing, and research ethics
4. Evaluate the main databases at the NCBI and EBI resources
5. Compare the databases, tools, and repositories, and be able to use each one to extract specific information
6. Demonstrate the selected tools at NCBI and EBI to run simple analyses on genomic sequences

Syllabus:

Unit I: Overview of Bioinformatics
Scope and applications of bioinformatics, Alignment of pairs of sequences; Introduction, Definition of sequence alignment, Methods Dot matrix sequence comparison.

Unit II: Pairwise Sequence Alignment and Database Similarity Search
Dynamic programming algorithm, Needleman-Wunsch, Smith-Waterman, Gap penalty, Assessing the significance of an alignment-Database searching for similar sequences, FASTA, BLAST, Other methods of comparing databases of sequences and patterns.

Unit III: Scoring Matrices
Similarity searches, PAM and BlOSUM matrix, Dayhoff mutation matrix, construction of PAM and BLOSUM matrix; Differences between PAM & BLOSUM.

Unit IV: Multiple Sequence Alignment
Dynamic programming, Progressive methods, Iterative methods, MSA using CLUSTALW, PILEUP and CLUSTALX, Purpose and applications of multiple sequence alignment.

Unit V: Phylogenetic Analysis
Fundamental elements of phylogenetic models, Tree interpretation, Paralogs and Orthologs, Phylogenetic data Analysis, Alignment, Extraction of a Phylogenetic Data Set , Determining

the Substitution Model, Tree-Building Methods - Distance, Parsimony, and Maximum Likelihood, Tree Evaluation - Phylogenetics software.

Unit VI: Artificial Neural Network and Hidden Markov Model
Basics of artificial neural network, Applications of neural network for nucleotide and protein sequence prediction; Hidden Markov model Introduction, Applications of HMMs – General aspects, Nucleotide and Protein applications.

Text Books:

1. Bioinformatics, by Andreas D Baxevanis, Gary D Bader, David S Wishart, 4th Edition, 2020, Wiley, USA
2. Introduction to Bioinformatics, by Arthur Lesk, 5th Edition, 2019, Oxford University Press, UK

Reference Books:

1. Bioinformatics: Methods and Applications, by Dev Bukhsh Singh, Rajesh Kumar Pathak, 1st Edition, 2021, Oxford, UK.
2. Bioinformatics, by Curran B G, Walker R J, 2017, CSB Publishers (P) Ltd., India.

Syllabus for B. Tech. VIII Semester
Department of Information Technology

Course Code	ITT486				
Category	Program Elective Course (Elective-IV)				
Course Title	Nature Inspired AI				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VIII

Course Outcomes:
On successful completion of the course, students will be able to:

1. Explain the principles behind nature-inspired computing.
2. Develop and test algorithms like GA, PSO, ACO, and AIS
3. Analyze algorithm efficiency and appropriateness.
4. Evaluate nature-inspired approaches for real-world problems.
5. Design hybrid and adaptive AI models using bio-inspired techniques.

Syllabus:

Unit I Foundations of Natural Computation
Nature as a source of inspiration in AI, Problem-solving in natural systems, Introduction to heuristic and metaheuristic algorithms, Basics of optimization.

Unit II Genetic and Evolutionary Algorithms
Biological evolution and Darwinian principles, Genetic Algorithms (GA): Encoding, selection, crossover, mutation, Elitism, convergence, and diversity, Real-world applications.

Unit III Swarm Intelligence Techniques
Self-organization in nature, Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Case studies: routing, scheduling, clustering.

Unit IV Artificial Immune Systems and Bio-inspired Defense
Immunological principles, Negative selection and clonal selection, Intrusion detection using AIS, Network and anomaly detection applications.

Unit V Contemporary Nature-Inspired Methods
Bee Colony Optimization, Firefly Algorithm, Harmony Search, Bat Algorithm, Comparative analysis of techniques.

Unit VI Integrating Nature-Inspired AI in Applications
Hybrid and ensemble models, Case studies: Cloud computing, IoT, Robotics, ML, Trends: Deep Neuroevolution, Reinforcement Learning with heuristics.

Text Books

1. Xin-She Yang, Nature-Inspired Optimization Algorithms, Elsevier, 2014
2. A. E. Eiben and J. E. Smith, Introduction to Evolutionary Computing, 2nd Edition, Springer, 2015
3. Andries P. Engelbrecht, Computational Intelligence: An Introduction, 2nd Edition, Wiley, 2007

Reference Books

1. Kennedy, J. and Eberhart, R., Swarm Intelligence, Morgan Kaufmann, 2001
2. Dipankar Dasgupta, Artificial Immune Systems and Their Applications, Springer, 1999
3. Sivanandam, S. N., and Deepa, S. N., Introduction to Genetic Algorithms, Springer, 2008

Syllabus for B. Tech. VIII Semester
Department of Information Technology

Course Code	ITT487-01				
Category	Program Elective Course (Elective V)				
Course Title	Image Processing				
Scheme& Credits	L	T	P	Credits	Semester
	3	1	0	4	VIII

Course Outcomes

On successful completion of the course student will be able to:

1. Exhibit an understanding of the fundamentals of Image processing techniques.
2. Apply different image enhancement techniques.
3. Understand the concept of different transformations in time and frequency domains and apply it for image processing.
4. Describe the utility of image compression and its issues, and analyze the performance of each of the techniques concerning space.
5. Understand the basics of Image segmentation and apply it to gray and color images.
6. Analyze the use of color image processing and understand the concept of image representation and Descriptors.

Unit I:
Introduction to Image Processing: Fundamental Steps in Image Processing, Image representation, Components of digital image processing systems, Sampling and Quantization, Relationship between pixels – neighborhoods, adjacency connectivity, regions, boundaries, and distance measures.

Unit II:
Image Enhancement in the Spatial Domain: Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Histogram Processing, Local Enhancement, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Unit III :
Image Transforms: Introduction to the Fourier Transform, Discrete Fourier Transformation, Fast Fourier Transformation, Fourier Properties, 2DFT, inverse Fourier transform, Image Enhancement in frequency domain

Unit IV:
Image Compression: Coding Redundancy, Interpixel redundancy, fidelity criteria, Image compression models, Error-free compression, Variable length coding, Bit-plane coding, Lossless predictive coding, Lossy compression, Image compression standards JPEG and MPEG.

Unit V:

Image Segmentation: Image segmentation fundamentals, Point , Line and edge detection, Edge linking and Boundary Detection, Thresholding techniques, Region Based Segmentation.

Unit VI :

Color Image Processing and Representation: Color Image Processing Fundamentals, Color Models, Chain Code Representation, Boundary & Regional Descriptor.

Text Books:

1. Digital Image Processing : Rafael Gonzalez and Richard Woods, 3Ed., Pearson Pub.

Reference Books:

1. Fundamentals of Digital Image Processing : A.K.Jain, Prentice Hall.
2. Image Processing Principles & Applications: Tinku Acharya & Ajoy K. Ray, Willey

Syllabus for B. Tech. VIII Semester
Department of Information Technology

Course Code	ITP487-01				
Category	Program Elective Course (Elective V)				
Course Title	Image Processing Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VIII

Course Outcome :

On successful completion of the course, the student will be able to:

1. Understand and implement fundamental image processing operations such as image enhancement, filtering, and transformation.
2. Apply spatial and frequency domain techniques to process and analyze digital images.
3. Develop and evaluate algorithms for edge detection, image segmentation, and morphological operations.
4. Utilize image processing tools and libraries (e.g., MATLAB, OpenCV) to design and simulate image-based applications.
5. Analyze the performance of image processing techniques for real-world applications such as object recognition and image compression.

Syllabus for B. Tech. VIII Semester
Department of Information Technology

Course Code	ITT487-02				
Category	Program Elective Course (Elective V)				
Course Title	Data Warehousing and Mining				
Scheme& Credits	L	T	P	Credits	Semester
	3	1	0	4	VIII

Course Outcomes:

At the end of the course students will be able to

1. Understand the need for Data Warehouse and Business Intelligence
2. Understand Architecture of a data warehouse and methods for data gathering and data pre- processing using OLAP tools.
3. Apply knowledge of different data mining models and techniques.
4. Differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence.
5. Demonstrate understanding of technology and processes associated with Business Intelligence framework.

Syllabus:

Unit I
Foundation: Introduction to DATA Warehousing. Client/Server Computing model & Data Warehousing. Parallel processors & Cluster Systems. Distributed DBMS implementations. Client/Server RDBMS Solutions. Data Warehousing: Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehousing to a Multiprocessor Architecture.

Unit II
DBMS Schemas for Decision Support. Data Extraction, Cleanup and Transformation Tools. Metadata. Business Analysis: Reporting & Query Tools & Applications. On line Analytical Processing (OLAP).

Unit III
BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit IV
Concepts of Data Integration Need and Advantages of Using Data Integration, Introduction to Common Data Integration Approaches, Introduction to ETL, Introduction to Data Quality, Data Profiling Concepts and Applications.

Unit V
Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling Vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star

and Snowflake Schema, Introduction to Business Metrics and KPIS, Creating Cubes Using SSAS, Introduction to Enterprise Reporting, Concepts of Dashboards, Balanced Scorecards, and Overall Architecture.

Unit VI

Association rules mining, Mining Association Rules from Single Level, Multilevel Transaction Databases, Classification and Prediction, Decision Tree Induction, Bayesian Classification, K-Nearest Neighbor Classification, Cluster Analysis, Types of Data in Clustering, Categorization of Clustering Methods.

Text Books:

1. Data Warehousing, Data Mining & OLAP: Berson, 2nd Edition, TMH.
2. Data Mining: Concepts and Techniques : Jiawei Han and Micheline Kamber, 2nd edition Morgan Kaufmann Publishers, 2006.
3. Fundamentals of Business Analytics: R N Prasad, Seema Acharya, 1st Edition Wiley India.

Reference Books:

1. Data Warehousing System: Mallach, TMH.
2. Data Mining and Knowledge Discovery Technologies (Advances in Data Warehousing and Mining : David Taniar , IGI Publication
3. Business Intelligence: David Loshin, 2nd Edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd.
4. Business intelligence for the enterprise: Mike Biere.

Syllabus for B. Tech. VIII Semester
Department of Information Technology

Course Code	ITP487-02				
Category	Program Elective Course (Elective V)				
Course Title	Data Warehousing and Mining Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VIII

Course Outcomes:

At the end of the course, students will be able to

1. Understand and Set Up Data Warehousing Environments
2. Perform Data Integration and Transformation Tasks
3. Implement and Query OLAP Cubes and Data Models
4. Develop and Use Business Intelligence Dashboards and Reports
5. Apply Advanced Analytical Techniques and Predictive Analytics

Syllabus for B. Tech. VIII Semester

Department of Information Technology

Course Code	ITT488-01				
Category	Program Elective Course (Elective-VI)				
Course Title	Information Retrieval				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	VIII

Course Outcomes

On successful completion of the course, the student will be able to:

1. Exhibit the use of IR and DBMS.
2. Realize the data structures like Inverted Indices used in Information retrieval systems.
3. Apply the concept of ranking models and evaluation techniques to IR problems.
4. Demonstrate the use of the probabilistic model to IR systems.
5. Apply the concept of link analysis to web-based systems.
6. Exhibit the use of clustering in designing IR systems.

Unit - I

Introduction to Information Retrieval: Introduction to Information Retrieval, Comparison of Database Management System and IR system, Components of IR system.

Unit - II

Boolean Model: Inverted Index and the terms vocabulary and postings lists, Data structures used inInformation retrieval, Dictionaries and tolerant retrieval, Introduction to index-construction and index-compression.

Unit - III

Ranking Model: Scoring, term weighting and the vector space model, Cosine similarity measures, tf-idf model, Computing scores in a complete search system, Evaluation in information retrieval.

Unit - IV

Probabilistic Model: Review of basic probability theory, the probability ranking principle, the binaryindependence model, BM25 ranking function.

Unit - V

Web Search: Introduction to Web search basics, Web crawling and indexes, Link analysis, Page rankcomputation, Concept of Hub and Authority.

Unit - VI

Clustering: Clustering in Information Retrieval, Flat clustering, and Hierarchical clustering. Matrixdecomposition and Latent semantic Indexing. Introduction to Language Modelling.

Text Books

1.An Introduction to Information Retrieval: Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, 1st Edition, Cambridge University Press

Reference Book:

1. Information Retrieval: Implementing and evaluating search engines: Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, 1st Edition, MIT Press.
2. Modern Information Retrieval : Ricardo Yates, Berthier Ribeiro-Neto, Addison Wesley

Syllabus for B. Tech. VIII Semester

Department of Information Technology

Course Code	ITP488-01				
Category	Program Elective Course (Elective-VI)				
Course Title	Information Retrieval Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VIII

Course Outcomes

On successful completion of the course, the student will be able to:

1. Implement the Intersection Algorithm for Inverted Index processing.
2. Apply fast retrieval methods for the Inverted Index.
3. Implement vocabulary-tolerant processing of the Inverted Index.
4. Apply clustering techniques to IR text documents.
5. Apply SVD or LSI on text documents.

Syllabus for B. Tech. VIII Semester

Department of Information Technology

Course Code	ITT488-02				
Category	Program Elective Course (Elective-VI)				
Course Title	Digital Forensics				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	VIII

Course Outcome

On successful completion of the course, the student will be able to:

1. Understand the fundamentals of computer forensics, types of computer crimes, and legal considerations related to digital evidence.
2. Identify the steps involved in high-tech investigations and the tools used in computing investigations.
3. Recognize appropriate data acquisition methods and tools for collecting and validating digital evidence
4. Understand proper procedures for processing digital crime scenes, securing and preserving electronic evidence.
5. Learn current forensic tools and techniques for investigating email-related crimes and data-hiding practices.

Unit -I: Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

Unit- II: Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery workstation and software, conducting and investigations.

Unit-III: Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Unit-IV: Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

Unit-V: Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Textbooks:

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

Reference Books:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

Syllabus for B. Tech. VIII Semester

Department of Information Technology

Course Code	ITP488-02				
Category	Program Elective Course(Elective-VI)				
Course Title	Digital Forensics Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VIII

Course Outcomes

On successful completion of the course, the student will be able to:

1. Demonstrate understanding of digital forensic principles and the role of digital evidence in investigations.
2. Apply appropriate forensic tools and techniques to acquire, preserve, and analyze digital evidence from computers and mobile devices.
3. Perform file system analysis, data recovery, and registry examination for forensic purposes.
4. Investigate cybercrimes involving network intrusions, email threats, and internet artifacts using forensic tools.
5. Document and present forensic findings in a legally acceptable format, adhering to ethical and professional standards.