RCOEM

Shri Ramdeobaba College of Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR – 440013

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

PROGRAMME SCHEME

2023-2024

B. TECH. (INFORMATION TECHNOLOGY)

(NEP)

Teaching Scheme for B.Tech. Information Technology

Semester - I											
Sr. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Continuous Evaluation**	**End Sem Exam**	**Total**	**ESE Duration**
1	BSC	PHT 1006	Introduction to Quantum Computing	2	1	0	3	50	50	100	03 Hrs
2	BSC	PHP 1006	Introduction to Quantum Computing Lab	0	0	2	1	50	-	50	-
3	BSC	MAT1002	Calculus	3	0	0	3	50	50	100	03 Hrs
4	BSC	MAP1002	Computational Mathematics Lab	0	0	2	1	50	-	50	-
5	ESC	ITT1001	Fundamentals of Programming	2	1	0	3	50	50	100	03 Hrs
6	ESC	ITP1001	Fundamentals of Programming Lab	0	0	2	1	50	-	50	-
7	ESC	ITT1002	Digital Circuits	2	1	0	3	50	50	100	03 Hrs
8	ESC	ITP1002	Digital Circuits Lab	0	0	2	1	50	-	50	
9	PCC	ITP1003	IT Workshop Lab	0	0	2	1	50	-	50	-
10	HSSM-AEC	HUT1002	English for Professional Communication	2	0	0	2	50	50	100	03 Hrs
11	HSSM-AEC	HUP1002	English for Professional Communication Lab	0	0	2	1	50	-	50	-
12	HSSM-VEC	HUT1004	Foundational course in Universal Human Value	1	0	0	1	50	-	50	-
13	CCA	PEP1002	Liberal/Performing Art	0	0	2	1	50	-	50	-
Total				**12**	**3**	**14**	**22**	**650**	**250**	**900**	

Semester - II											
Sr. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Continuous Evaluation**	**End Sem Exam**	**Total Marks**	**ESE Duration**
1	BSC	CHT2006	Chemistry of Smart Materials	2	0	0	2	50	50	100	02 Hrs
2	BSC	CHP2006	Chemistry of Smart Materials Lab	0	0	2	1	50	-	50	-
3	BSC	MAT2002	Discrete Mathematics	3	0	0	3	50	50	100	03 Hrs
4	ESC	ITT2001	Object Oriented Programming	3	0	0	3	50	50	100	03 Hrs
5	ESC	ITP2001	Object Oriented Programming Lab	0	0	2	1	50	-	50	---
6	PCC	ITT2002	Data Structures	2	1	0	3	50	50	100	03 Hrs
7	PCC	ITP2002	Data Structures Lab	0	0	2	1	50	-	50	
8	VSEC	ITT2003	Creativity, Innovation & Design Thinking	2	0	0	2	50	-	50	-
9	IKS	HUT2001	Foundational Literature of Indian Civilization	2	0	0	2	50	50	100	02 Hrs
10	CCA	PET2001	SPORTS-YOGA-RECRATION	1	0	0	1	50	-	50	-
11	CCA	PEP2001	SPORTS-YOGA-RECRATION LAB	0	0	2	1	50	-	50	-
	Total			**15**	**1**	**8**	**20**	**550**	**250**	**800**	

Exit option: Award of UG Certificate in Major with 42 credits and an additional 8 credits.			
Exit Courses			
1	**Introduction to Computer Hardware and Networking**	**Online/offline Certification Course**	**8**

Semester - III

Sr. No.	Category	Course Code	Course Title	L	T	P	Credits	Continuous Evaluation	End Sem Exam	Total	ESE Duration
1	PCC	ITT3001	Computer Organization and Architecture	3	0	0	3	50	50	100	03 Hrs
2	PCC	ITT3002	Design and Analysis of Algorithms	2	1	0	3	50	50	100	03 Hrs
3	PCC	ITP3002	Design and Analysis of Algorithms Lab.	0	0	2	1	50	-	50	-
4	VSEC	ITP3003	IT Infrastructure Services Lab.	0	1	2	2	50	-	50	-
5	MDM	MAT3002	Probability and Statistics	3	0	0	3	50	50	100	03 Hrs
6	OE	ITT2980	Open Elective -I	2	0	0	2	50	50	100	02 Hrs
7	HSSM-AEC	HUT3001	Business Communication	2	0	0	2	50	50	100	02 Hrs
8	HSSM-VEC	HUT3002	Environment Education	2	0	0	2	50	50	100	02 Hrs
9	CEP/FP	ITP3005	Field Project	0	0	4	2	25	25	50	-
	TOTAL			**14**	**2**	**8**	**20**	**425**	**325**	**750**	

Course Code	Open Elective-I
ITT2980-1	Web Development

Semester - IV

Sr. No.	Category	Course Code	Course Title	L	T	P	Credits	Continuous Evaluation	End Sem Exam	Total	ESE Duration
1	PCC	ITT4001	Formal Languages and Automata Theory	2	1	0	3	50	50	100	03 Hrs
2	PCC	ITT4002	Database Management System	2	1	0	3	50	50	100	03 Hrs
3	PCC	ITP4002	Database Management System Lab	0	0	2	1	50	-	50	-
4	PCC	ITT4003	Software Engineering	2	1	0	3	50	50	100	03 Hrs
5	PCC	ITP4003	Software Engineering Lab	0	0	2	1	50	-	50	-
6	VSEC	ITP4005	Software Tools	0	0	4	2	50	-	50	-
7	HSSM-VEC	ITT4006	Cyber Laws and Ethics	2	0	0	2	50	50	100	02 Hrs
8	MDM	MAT4001	Linear Algebra	3	0	0	3	50	50	100	03 Hrs
9	OE	ITT2990	Open Elective -II	3	0	0	3	50	50	100	03 Hrs
10	HSSM-AEC	HUT4003	Managerial Economics	2	0	0	2	50	50	100	02 Hrs
	TOTAL			**16**	**3**	**8**	**23**	**500**	**350**	**850**	

Exit Courses			
1	Web Design & Development	Online/offline Certification Course	8

Course Code	Open Elective-II
ITT2990-1	Mobile App Development
IDT2990-1	Massive Open Online Course(s) of Swayam - MOOC SWAYAM
IDT2990-2	Massive Open Online Course(s) of Coursera - MOOC COURSERA

Semester - V

Sr. No.	Category	Course Code	Course Title	L	T	P	Credits	Continuous Evaluation	End Sem Exam	Total	ESE Duration
1	PCC	ITT5001	Compiler Design	3	0	0	3	50	50	100	03 Hrs
2	PCC	ITT5002	Operating Systems	3	0	0	3	50	50	100	03 Hrs
3	PCC	ITP5002	Operating Systems Lab	0	0	2	1	50	-	50	-
4	PCC	ITT5003	Computer Networks	3	0	0	3	50	50	100	03 Hrs
5	PCC	ITP5003	Computer Networks Lab	0	0	2	1	50	-	50	-
6	PEC	ITT5004	Elective -I	3	0	0	3	50	50	100	03 Hrs
7	MDM	ITT5005	Artificial Intelligence	3	0	0	3	50	50	100	03 Hrs
8	MDM	ITP5005	Artificial Intelligence Lab	0	0	2	1	50	-	50	-
9	OE	ITT3980	Open Elective -III	3	0	0	3	50	50	100	03 Hrs
10	HSSM-AEC	HUT5001	Organizational Behaviour	2	0	0	2	50	50	100	02 Hrs
11	ELC	ITP5007	Project-I	0	0	2	1	75	75	150	-
	TOTAL			**20**	**0**	**8**	**24**	**575**	**425**	**1000**	

Course Code	Elective-I
ITT5004-1	Customer Relationship Management
ITT5004-2	Product and Project Management

Course Code	Open Elective-III
ITT3980-1	Open-Source Technologies

Semester - VI											
Sr. No.	**Category**		**Course Title**	**L**	**T**	**P**	**Credits**	**Continuous Evaluation**	**End Sem Exam**	**Total**	**ESE Duration**
1	PCC	ITT6001	Cryptography and Network Security	3	0	0	3	50	50	100	03 Hrs
2	PCC	ITT6002	Internet and Web Programming	2	1	0	3	50	50	100	03 Hrs
3	PCC	ITP6002	Internet and Web Programming Lab	0	0	2	1	50	-	50	-
4	PCC	ITT6003	Cloud Computing	3	0	0	3	50	50	100	03 Hrs
5	PCC	ITP6003	Cloud Computing Lab	0	0	2	1	50	-	50	-
6	PEC	ITT6004	Elective -II	3	0	0	3	50	50	100	03 Hrs
7	PEC	ITP6004	Elective -II Lab	0	0	2	1	50	-	50	-
8	MDM	ITT6005	Machine Learning	2	1	0	3	50	50	100	03 Hrs
9	MDM	ITP6005	Machine Learning Lab	0	0	2	1	50	-	50	-
10	ELC	ITP6006	Project -II	0	0	4	2	75	75	150	-
		TOTAL		**13**	**2**	**12**	**21**	**525**	**325**	**850**	

Course Code	**Elective-II**
ITT6004-01/ ITP6004-01	Mobile Apps Development
ITT6004-02 /ITP6004-02	Advanced Java Programming

Exit Courses			
1	Software Project Management	Online/offline Certification Course	8

Semester - VII											
Sr. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Continuous Evaluation**	**End Sem Exam**	**Total**	**ESE Duration**
1	PCC	ITT7001	Software Architecture	3	1	0	4	50	50	100	03 Hrs
2	PCC	ITT7002	Human Computer Interaction	3	0	0	3	50	50	100	03 Hrs
3	PEC	ITT7003	Elective -III	3	0	0	3	50	50	100	03 Hrs
4	PEC	ITP7003	Elective -III Lab	0	0	2	1	50		50	
5	MDM	ITT7004	Introduction to Deep Learning	3	0	0	3	50	50	100	03 Hrs
6	MDM	ITP7004	Introduction to Deep Learning Lab	0	0	2	1	50		50	-
7	RM	ITT7005	Research Methodology	3	0	0	3	50	50	100	03 Hrs
8	ELC	ITP7006	Project -III	0	0	4	2	75	75	150	-
9	PROJC	ITP484	Industry Internship Evaluation	0	0	2	0	-	-	-	-
		TOTAL		**15**	**1**	**10**	**20**	**425**	**375**	**750**	

Course Code	Elective-III
ITT7003-01/ ITP7003-01	Data Warehouse and Business Intelligence
ITT7003-02/ ITP7003-02	Digital Forensics

Semester - VIII

Sr. No.	Category	Course Code	Course Title	L	T	P	Credits	Continuous Evaluation	End Sem Exam	Total	ESE Duration
1	PCC	ITT8001	Cyber Physical Systems	3	0	2	3	50	50	100	03 Hrs
2	PCC	ITP8001	Cyber Physical Systems	0	0	2	1	50	-	50	-
3	PEC	ITT8002	Elective -IV	4	0	0	4	50	50	100	03 Hrs
4	PEC	ITT8003	Elective -V	3	0	2	3	50	50	100	03 Hrs
5	PEC	ITP8003	Elective -V Lab	0	0	2	1	50		50	
TOTAL				**10**	**0**	**8**	**12**	**250**	**150**	**400**	

Course Code	Elective-IV
ITT8002-01	Natural Language Processing
ITT8002-02	Blockchain & Cryptocurrency Technologies

Course Code	Elective-V
ITT8003-01/ ITP8003-01	Information Retrieval
ITT8003-02/ ITP8003-02	Social and Information Networks

OR

Sr. No.	Category	Course Title	L	T	P	Credits	Continuous Evaluation	End Sem Exam	Total	ESE Duration
1	ELC	Full Semester Internship/ Research Internship/TBI	0	0	0	12	200	200	400	-

Scheme of Teaching & Examination of HONOR 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	ITTH3100-1	Blockchain and Web3 Programming	3	-	-	3	100	-	100	-.
		ITTH3100-2	NPTEL Course	-	-	-	3	100	-	100	-
02	IV	ITTH4100-1	Development of Progressive Web Applications	3	-	-	3	100	-	100	-
		ITTH4100-2	NPTEL Course	-	-	-	3	100	-	100	-
03	V	ITTH5100-2	Cloud Native Apps Development	4	-	-	4	100	-	100	-
		ITTH5100-2	NPTEL Course	-	-	-	4	100	-	100	-
04	VI	ITTH6100-1	DevOps Engineering	4	-	-	4	100	-	100	-
		ITTH6100-2	NPTEL Course	-	-	-	4	100	-	100	-
05	VII	ITPH7100	Project	-	-	08	4	50	50	100	-
Total				**14**	**-**	**08**	**18**	**-**	**-**	**500**	

The Scheme of Teaching & Examination of MINOR 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	ITTM3100-1	Web Designing	2	1	-	3	50	50	100	03 Hrs.
		ITTM3100-2	NPTEL Course	-	-	-	3	100	-	100	-
02	IV	ITTM4100-1	Advanced Java Programming	2	1	-	3	50	50	100	03 Hrs.
		ITTM4100-2	NPTEL Course	-	-	-	3	100	-	100	-
03	V	ITTM5100-1	Data Warehousing and Business Intelligence	3	1	-	4	50	50	100	03 Hrs.
		ITTM5100-2	NPTEL Course	-	-	-	3	100	-	100	-
04	VI	ITTM6100-1	Introduction to Emerging Technologies	3	1	-	4	50	50	100	03 Hrs.
		ITTM6100-2	NPTEL Course	-	-	-	3	100	-	100	-
05	VII	ITTM7100	Project	-	-	8	4	50	50	100	-
Total				**10**	**04**	**08**	**18**	**-**	**-**	**500**	

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

Course Code	ITT5001				
Category	PCC				
Course Title	Compiler Design				
Scheme& Credits	L	T	P	Credits	Semester V
	3	0	0	3	

Course Outcomes

On successful completion of the course student will be able to:
1. Understand the Lexical Analyzer and associated data structures
2. Demonstrate the working of various Parsing techniques
3. Apply the knowledge of semantic rules to generate Intermediate code
4. Analyze various code optimization and generation techniques

Unit I: Introduction
Introduction to Compilers: Compilers and Translators, Phases of compilation and overview, cross compiler, Bootstrapping, Design of Lexical analyzer, study of Lex / Flex.
Study of Symbol Table Organization.

Unit II: Parsers
Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser technique, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers. Study of Yacc / Bison.

Unit III: Intermediate Code
Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate code notations: postfix, syntax tree, TAC. Using SDTS for translation of expression, controls structures, declarations, procedure calls, and Array reference.

Unit IV: Code Optimization
Code optimization: Analysis of code using basic blocks, Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression.

Unit V: Code Generation
Code generation: Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization, Runtime Organization-Activation Records. Automatic Parallelization- Optimizations for Cache Locality and Vectorization,

Text Books

1. Principal of Compiler Design: Alfred V. Aho & Jeffery D. Ullman, Narosa Pub.
2. Compilers: Principles, Techniques and Tools: A. Aho, Ravi Sethi, Jeffrey Ullman, Second Edition, Addison-Wesley Pub.

Reference Books

1. Compiler Design : O. G. Kakde, 4th Edition, University Science Press.
2. Principles of Compiler Design : V. Raghavan, MGH.

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

Course Code	ITT5002				
Category	Program Core Course				
Course Title	Operating Systems				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes:

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

1. Understand different Operating System services and CPU scheduling algorithms
2. Apply the concept of process synchronization
3. Identify the occurrence of deadlock and handle it
4. Apply various memory management techniques
5. Analyse various file management and protection techniques

Syllabus:

Unit I:

Introduction**:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls.

Process Management: Concept of a process, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching, Types of Schedulers and their role, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. Scheduling algorithms: Pre-emptive and Non-pre-emptive: FCFS, SRTF, Priority, RR, Multilevel queue and multilevel feedback queue.

Unit II:

Threads: difference between a process and a thread, Benefits of threads, Types of threads, Concept of multithreads. Inter-process Synchronization: Critical Section, Race Conditions, Mutual Exclusion, Peterson's solution for synchronization, Hardware Solutions, Semaphores, Monitors, Classical synchronization Problems: Producer-Consumer Problem, Reader-Writer Problem, Dinning Philosopher Problem.

Unit III:

Deadlocks: Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection and Recovery.

Unit IV:

Memory Management: Memory management techniques, contiguous and non-contiguous, paging and segmentation, translation look-aside buffers and overheads, virtual memory and

demand paging, page faults and instruction restart, problems of large address spaces, page tables and page replacement algorithms, miscellaneous issues.

Unit V:

File Management: Concept of File, Access methods, File types, File operations, Directory structure, File System structure, Allocation methods, Free-space management.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, Boot block, Bad blocks.

Protection: Principles, Rings, Access Matrix, Role-based Access Control, Mandatory Access control, Capability-based systems, Language-based protection.

Text Books

1. Operating System Concepts, 8th Edition by A. Silberschatz, P.Galvin, G. Gagne, Wiley India.
2. Modern Operating Systems, 2nd Edition by Andrew Tanenbaum, PHI.

Reference Books:

1. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
2. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly

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

Course Code	ITP5002				
Category	Program Core Course				
Course Title	Operating systems Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	V

Course Outcomes

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

1. Demonstrate the use of various System calls
2. Write programs for CPU scheduling.
3. Write programs using cooperating processes.
4. Write a program for deadlock avoidance.
5. Write programs for memory management.
6. Write virus programs and their counter measures.

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

Course Code	ITT5003				
Category	Program Core Course				
Course Title	Computer Networks				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes:

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

1. Demonstrate the knowledge of layered architecture for networking.
2. Understand the design issues at different layers in network architecture.
3. Exhibit knowledge of IP addressing and standard network services.
4. Apply the algorithms at different layers to solve problems.
5. Analyze the protocols with respect to their performance at different layers.

Syllabus:

Unit I

Introduction: Network hardware, Network software, Protocol hierarchies, Design issues for layers. The ISO-OSI reference model, TCP/IP model. Physical Layer: Issues, Transmission Impairments, Data Rate Limits, Performance. Bandwidth Utilization: Multiplexing, Transmission Media: Guided and Unguided.

Unit II

Data Link Layer - Design issues, Services, Error Detection and Correction, Data Link Control, Elementary Data Link Layer protocols. Medium Access Sub Layer: Multiple Access Protocols, IEEE standards: Ethernet (802.3), Wireless LAN (802.11).

Unit III

Network Layer: Design issues, Comparison of Virtual Circuit and Datagram subnets, Routing algorithms, Congestion control algorithms, Congestion control in Virtual Circuit subnets.

Unit IV

IPv4 Addressing: Datagram forwarding in IP4, Subnetting, CIDR Notation. Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Introduction to IPv6.

Unit V

Transport and Application layers: Services, Addressing, Establishing and releasing a connection, Flow control/buffering, Multiplexing and Crash recovery. Congestion control and Quality of Service. Introduction to UDP and TCP. Application Layer: Domain Name Space (DNS), MAIL server, File Transfer Protocol (FTP)

Text Books

1. Computer Networks: Andrew Tanenbaum, PHI.
2. Data Communication and Networking: Behrouz Forouzan, TMH.

Reference Books

1. Introduction to Data Communications and Networking: Wayne Tomasi, Pearson Education.
2. Computer Networks: A systems approach: Larry. L. Peterson, Bruce. S. Davie, 3rd Edition, Morgan Kaufmann publishers.
3. Computer Networks and Internet: Douglas Comer, PHI.

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

Course Code	ITP5003				
Category	Program Core Course				
Course Title	Computer Networks Lab.				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	V

Course Outcomes

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

1. Demonstrate the functionality of various software and hardware components of networking
2. Implement the layered functionalities at different layers
3. Configure various Network devices
4. Design and evaluate Network performance

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

Course Code	ITT5004-01				
Category	Program Elective Course (Elective I)				
Course Title	Customer Relationship Management				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes

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

1. Exhibit understanding of the Salesforce platform
2. Demonstrate knowledge of the administration services of the Salesforce platform
3. Configure the Salesforce platform for business requirements
4. Automate business processes using Salesforce tools

Syllabus:

Unit I:
Introduction to CRM, Identity Confirmation: CRM functionalities, Products of Salesforce, Sales Architecture, Accounts, Contacts, Leads, Cases.

Unit II:
Customization: Create Custom Profiles and Users, Custom Objects & Custom Fields & Custom Tabs, Customizing Relationships, Formula fields and Rollup summary fields, Define Dependent Picklists, customize page Layouts, Records Types, Customize Standards related lists, Learn About Record Types & Business Processes, Use Field Level Security.

Unit III:
Security and Access: Set Organization-Wide Defaults, Role Hierarchy, Public Groups, Queues, Permission Sets Sharing Rules, Workflow: Define Workflow, Set up workflow rules, Setup workflow tasks & Email Alerts & Field Updates, Time dependant workflows.

Unit IV:
Introduction to Apex: Data Types, Use DML Statements, Retrieving records from database: sObject Relationships, SOQL, SOSL, Apex Sharing, Sample programs using the above concepts Collections: Types of Collections, Creating an Apex Class, Calling a Class Method, Alternative Apex Class Creation, Trigger: Syntax, Events, Context Variables, Bulk Triggers, Sample Programs using above concepts.

Unit V:

Testing in Apex: Annotations, Testing Examples, Batch Apex and Debugging Apex: By using Changes Sets, By using Force.com IDE tool, By using Force.com Migration tool kit. Sample programs using the above concept.

Textbook:

1. Salesforce for Beginners -Sharif Shaalan, 2nd Edition, Packt Publishing
2. Learning Salesforce Development with Apex, Paul Battisson, BPB Publication

Reference Book:

1. Salesforce CRM – The Definitive Admin Handbook – Paul Goodey, Packt Publishing, 4th Edition

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

Course Code	ITT5004-02				
Category	Program Elective Course (Elective I)				
Course Title	Product and Project Management				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes

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

1. Know the role and responsibilities of a product and project manager
2. Demonstrate techniques for the product development process
3. Exhibit skills in product and project strategy formulation
4. Apply product and project management tools for planning and tracking

Unit I:

Introduction to Product Management, Product Management Lifecycle, Product Manager vs Project Manager, Role and Characteristics of a Product Manager, Ideal Workflow of a Product Manager, Key terms in product management: Minimum Viable Product (MVP), Product Requirements Document (PRD), CI/CD etc.

Unit II:

Market Research, Competitor Analysis, Red Ocean & Blue Ocean, SWOT Analysis, Segment, Target, Position, Pricing Strategy

Unit III:

User Persona & Experience, Interview your Users, Persona Builder, Wireframes

Unit IV:

Introduction to Project Management, Project Manager Role, Triple Constraint, Project Management Framework, Stakeholder Engagement, Project Cycle Management

Unit V:

Project Life Cycle: Project Initiation, Execution and Closure, Project Monitoring and Risk Management, Case Study for Product and Project Management

Textbooks:

1. Inspired: How to Create Products Customers Love , by Marty Cagan
2. A Guide to the Project Management Body of Knowledge (PMBOK Guide)"

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

Course Code	ITT5005				
Category	MDM				
Course Title	Artificial Intelligence				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes

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

1. Formulate an efficient problem space for a problem
2. Apply a search technique for problem-solving
3. Demonstrate the use of logic agents programming to solve AI programs
4. Apply the theory of uncertainty and planning to solve the problems

Unit I: Introduction

Evolution of AI, State of Art -Different Types of Artificial Intelligence- Applications of AI-Subfields of AI-Intelligent Agents- Structure of Intelligent Agents, Characteristics of Environments, Types of Agents.

Unit II: Problem Solving based on Searching

Problem Solving by searching Methods-State Space search, Uninformed Search Methods – Uniform Cost Search, Breadth First Search- Depth First Search-Depth limited search, Iterative deepening depth-first, Informed Search Methods- Best First Search, A* Search, RBFS.

Unit III: Local and Adversarial Search

Local Search algorithms – Hill-climbing search, Simulated annealing, Genetic Algorithm, Adversarial Search: Game Trees and Minimax Evaluation, Elementary two-players games: tic-tac-toe, Minimax with Alpha-Beta Pruning. Constraint Satisfaction Problem: Cryptarithmetic problem, Backtrack search and Constraint Propagation.

Unit IV: Logic and Reasoning

Propositional Logic: Representation and Inference Techniques.
First Order Logic: Representation, Inference using Unification, Forward Chaining, Backward Chaining, Resolution.

Unit V: Uncertain Knowledge and Planning
Quantifying Uncertainty- Bayes Rule -Bayesian Belief Network, Approximate Inference in Bayesian networks**.**
Introduction to Classical Planning, Hierarchical Planning.

Text Books

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition Prentice-Hall.
2. Introduction to Artificial Intelligence & Expert System: D. Patterson, 1st Edition, PHI

Reference Books

1. Fundamentals of Artificial Intelligence, K. R. Chowdhary, Springer, 2020.

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

Course Code	ITP5005				
Category	MDM				
Course Title	Artificial Intelligence Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	V

Course Outcomes

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

1. Apply problem-solving search algorithms for toy problems
2. Use of tool for the Constraint Satisfaction Problem
3. Apply Minimax algorithm in game playing
4. Develop programming solutions for Bayesian Networks

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

Course Code	ITT3980-1				
Category	OE (Open Elective-III)				
Course Title	Open Source Technologies				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes

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

1. Differentiate between open-source software policies, licensing procedures, and ethics
2. Use Open Source Development Tools and Techniques
3. Manage Open Source Projects
4. Deploy and Maintain Open Source Software
5. Develop web applications using open-source technologies

UNIT 1: Introduction to Open Source (Theory and Concepts)

Definition of Open Source and Free Software, History and Evolution of Open Source Movement, Characteristics of Open Source Software (OSS), Difference between Freeware, Shareware, and OSS, Advantages and Disadvantages of OSS, Business Models of Open Source, Types of Open Source Licenses: GPL (General Public License), LGPL,BSD License, Apache License, MIT License, Copyleft and Permissive Licensing, Dual Licensing Concepts, Important Open Source Communities: Free Software Foundation (FSF), Open Source Initiative (OSI), Mozilla Foundation, Business Models and Ethics: Revenue Models: Dual Licensing, Open Core Model, Services and Support, Examples of Businesses Using OSS: Red Hat, Canonical, Mozilla Ethical Aspects: Community Collaboration, Transparency

Unit II: Version Control Systems and Open Source Development Workflows
Introduction to Version Control: Importance of VCS in Software Development, Centralized VCS: CVS, SVN, Distributed VCS: Git, Mercurial, Introduction to Git: Git Architecture: Working Directory, Staging Area, Local Repository, Git Installation and Initial Configuration, Git Operations Basic Commands, Branching and Merging, Conflict Resolution, Resetting, Reverting and Rebasing, Remote Repositories (GitHub, GitLab, Bitbucket), Cloning Repositories, Pushing and Pulling Changes, Forking and Pull Requests, Understanding GitHub Actions (Introduction to CI/CD), Open Source Project Structure, Structure of a Typical Project (README.md, CONTRIBUTING.md, LICENSE, .gitignore), Semantic Versioning, Importance of Documentation, Open Source Development Tools: Code Editors: VS Code, Atom, IDEs: Eclipse, NetBeans, Debuggers: GDB, Build Tools: Make, Maven, Containerization (Introduction to Docker)

Unit III: Open Source Software Development Models:

Introduction to Open Source Development, Open Source Development Approaches: Cathedral Model: Controlled, centralized, periodic releases, Limited contributor base, Examples: Early GNU projects, Bazaar Model: Open, decentralized, continuous development, Large number of contributors, Hybrid Models: A mix of controlled core development with community contributions, Contribution Models and Workflows: Forking and Pull Requests, Patch Submission via Mailing Lists, Shared Repository Contribution, Importance of Code Reviews and Peer Evaluation, Quality Assurance in Open Source: Peer Reviews and Testing, Bug Tracking and Bug Bounty Programs, Community Driven QA

Unit IV: Web Development Using Open Source Technologies

Frontend Development: HTML5, CSS, JavaScript, Backend Development with PHP: PHP Syntax and Variables, Conditional Statements, Loops, Functions and Arrays, Handling Form Submissions, Sessions and Cookies, Connecting to MySQL Database Using PHP (mysqli, PDO), Web Server Management: Installing Apache HTTP Server, Configuring Virtual Hosts, Introduction to Nginx, Server Security Basics: SSL Certificates, Basic Authentication

Unit V: Open Source Operating System

Linux Architecture and File System, Basic Linux Commands: ile Handling: ls, cp, mv, rm, cat, more, less, Directory Commands: mkdir, cd, pwd, rmdir

Permission Commands: chmod, chown, chgrp, Process Commands: ps, top, kill, Linux User and Group Management: Adding Users/Groups, User Switching (su, sudo), Managing Permissions and Ownerships, Package Management: APT (Debian/Ubuntu): apt-get, apt-cache, YUM/DNF (Fedora/Red Hat): yum install, yum update, Introduction to RPM Package Manager: Basic Shell Scripting: Writing First Shell Script, Variables and Operators, Conditional Statements (if, case), Loops (for, while, until), Script Automation Examples

Text Books:

1. Open Source Technology, Kailash Vadera, Bhavyesh Gandhi, Laxmi Publication
2. Linux: The Complete Reference: Richard Petersen, McGraw-Hill
3. Pro Git Scott Chacon, Ben Straub, Apress
4. PHP and MySQL Web Development, Luke Welling, Laura Thomson, Pearson Education

Reference Books:

1. Pro Git, Scott Chacon, Ben Straub, Apress, Pragmatic Bookshelf
2. The Cathedral and the Bazaar – Eric S. Raymond, O'Reilly

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

Course Code	ITP5007				
Category	PROJC				
Course Title	Project-I				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	V

Course Outcomes

Upon completion of the course, students would be able to

1. Identify the problem statement through a literature survey and formulate the solution
2. Select the appropriate tools and techniques to provide a sustainable solution for the identified problem
3. Demonstrate the ability to work in a team
4. Present the work carried out professionally
5. Exhibit ethical practices during project development and management.

Syllabus for B. Tech. V Semester
Department of Information Technology
HONOR COURSE

Course Code	ITTH5100-2				
Category	HONOR COURSE				
Course Title	Cloud-Native Apps Development				
Scheme& Credits	L	T	P	Credits	Semester
	4	0	0	4	V

Course Outcomes

At the end of the course students will be able to

1. Understand the principles and practices of cloud-native application development.
2. Develop proficiency in building scalable, resilient, and portable applications using Node.js.
3. Deploy and manage cloud-native applications on cloud platforms.
4. Leverage cloud services and infrastructure to optimize application performance and reliability.
5. Adopt best practices for designing and architecting microservices-based applications.
6. Demonstrate skills in automated testing, continuous integration, and continuous deployment (CI/CD) for cloud-native applications.

Syllabus:

Unit 1: Introduction to Cloud-Native Development
Overview of cloud computing and its benefits, Introduction to cloud-native architecture and design principles, Understanding microservices and containerization, Introduction to Node.js and its role in cloud-native development

Unit 2: Building Cloud-Native Applications with Node.js
Setting up development environment with Node.js and npm, Basics of asynchronous programming in Node.js, Designing RESTful APIs with Express.js, Integrating databases with Node.js applications (MongoDB, PostgreSQL), Implementing authentication and authorization using Passport.js

Unit 3: Containerization with Docker
Introduction to Docker and containerization concepts, Building Docker images for Node.js applications, Managing multi-container applications with Docker Compose, Best practices for container security and optimization, Deploying Docker containers to local and cloud environments

Unit 4: Serverless Computing
Introduction to serverless computing and its benefits, Developing serverless functions with AWS Lambda or Google Cloud Functions, Integrating serverless functions with Node.js applications,

Serverless architectures and event-driven design patterns, Deploying serverless applications to cloud platforms

Unit 5: CI/CD for Cloud-Native Applications
Introduction to continuous integration and continuous deployment (CI/CD), Setting up CI/CD pipelines for Node.js applications with Jenkins or GitLab CI, Automating testing and code quality checks in CI/CD pipelines, Deploying applications to cloud platforms using CI/CD pipelines, Implementing blue-green deployments and canary releases

Unit 6: Cloud-Native Services and Best Practices
Overview of cloud-native services (AWS, Azure, Google Cloud), Leveraging managed services for databases, storage, and messaging, Implementing service mesh for microservices communication, Designing for scalability, resilience, and observability, Best practices for securing cloud-native applications

Text Books:

1. Rojas, C. (2019). Building Progressive Web Applications with Vue. js: Reliable, Fast, and Engaging Apps with Vue. js. Apress, First Edition.
2. Ater, T. (2017). Building progressive web apps: bringing the power of native to the browser. " O'Reilly Media, Inc." First Edition.

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

Course Code	ITTM5100-1				
Category	Minor Course				
Course Title	Data Warehousing and Business Intelligence				
Scheme& Credits	L	T	P	Credits	Semester
	3	1	0	4	V

Course Outcomes

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

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

Data Mining: Introduction to Data Mining, Mining Multimedia Databases, Mining Time Series and Sequence Data, Mining Text Database, Mining World Wide Web, Data Mining Applications, Additional themes on Data Mining, Social Impacts of Data Mining.

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
3. Mining : David Taniar , IGI Publication
4. Business Intelligence: David Loshin, 2nd Edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd.
5. Business intelligence for the enterprise: Mike Biere, First edition.

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

Course Code	ITT6001				
Category	Professional Core Course				
Course Title	Cryptography and Network Security				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

Course Outcomes

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

1. Exhibit knowledge of different attacks and its counter measures.
2. Apply knowledge of Mathematics required for cryptography.
3. Apply cryptographic techniques for providing information security.
4. Analyse various standard security protocols.

Syllabus:

Unit I

Types of Attacks and Software Vulnerabilities, System Security: Buffer overflow and malicious software, Intrusion detection system, Firewalls. Mathematics of Cryptography.

Unit II

Classical Ciphers, Modern Block Ciphers: DES, Triple DES, Blowfish, AES. Block cipher modes of operation, Asymmetric key ciphers: RSA.

Unit III

Message Integrity and Authentication: Requirements of Hash functions and MAC, Algorithms: MD5, SHA-1, Whirlpool, HMAC. Digital Signatures: Algorithms: RSA, DSS, Attacks, variations, and applications.

Unit IV

Key Management: Symmetric key distribution, Symmetric key agreement, Public key distribution. Entity Authentication: Password-based, Challenge Response protocols, Zero knowledge protocols, Biometrics.

Unit V

Security at Application layer: PGP, SET, Security at Network layer: IPSec, Security at Transport layer: SSL and TLS

Text Books

1. Cryptography & Network Security: Behrouz A. Forouzan, Debdeep Mukhopadhyay, MGH.

2. Cryptography & Networks Security Principles & Practice: William Stallings, PearsonEducation.

Reference Books

1. Network Security and Cryptography: Bernard Menezes, 1st Edition, Cengage Learning.

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

Course Code	ITT6002				
Category	Program Core Course (PCC)				
Course Title	Internet and Web Programming				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	VI

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

1. Understand the concepts of the Internet, Web architecture, and protocols.
2. Design structured and responsive web pages using HTML and CSS.
3. Implement interactive features on web pages using JavaScript and client-side scripting.
4. Develop dynamic web applications using server-side programming and database integration.
5. Use modern tools and frameworks for efficient web development and deployment.

Syllabus:

Unit I: Introduction to Internet and Web Technologies:

Evolution of Internet and World Wide Web, Internet protocols: HTTP, HTTPS, FTP, TCP/IP, DNS, Domain Names, Hosting, and Web Servers, Introduction to Web Browsers and Search Engines, Web Architecture: Client-Server, 2-tier, 3-tier, n-tier architectures

Unit II: HTML and CSS

Structure of HTML5 Document, Elements, Attributes, Forms, Tables, Multimedia Elements, Introduction to CSS: Inline, Internal, External CSS, CSS3 Features: Box Model, Flexbox, Grid, Media Queries, Responsive Web Design using CSS

Unit III: Client-Side Scripting with JavaScript

JavaScript Basics: Syntax, Variables, Data Types, Operators, Control Structures, Functions, Arrays, Objects, DOM Manipulation and Event Handling, Form Validation Techniques, Introduction to ES6 Features

Unit IV: Server-Side Programming

Introduction to Web Servers (Apache, Nginx),Basics of PHP or Node.js (choose per curriculum needs), Handling Form Data, File Uploads, Working with Sessions and Cookies, Error Handling and Security Basics

Unit V: Database Integration and Web Development Tools

MySQL or MongoDB Basics (Tables/Collections, CRUD operations), Connecting Web Applications to Databases, Introduction to AJAX and JSON, Using Web Development

Tools: VS Code, Git, Browser DevTools, Introduction to Frontend Frameworks (e.g., Bootstrap) and Backend (e.g., Express.js)

Textbooks:

1. Achyut Godbole and Atul Kahate, Web Technologies, McGraw Hill
2. Robin Nixon, Learning PHP, MySQL & JavaScript, O'Reilly

References:

1. Jon Duckett, HTML & CSS: Design and Build Websites, Wiley

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

Course Code	ITP6002				
Category	Program Core Course (PCC)				
Course Title	Internet and Web Programming Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

Course Outcomes

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

1. Design and build responsive web interfaces using HTML5 and CSS3.
2. Apply JavaScript for client-side programming and DOM manipulation.
3. Develop server-side components using PHP/Node.js and interact with databases.
4. Demonstrate full-stack development through mini projects and lab assignments.
5. Use web development tools and version control systems effectively.

List of Sample Practical's:

1. Create a personal webpage using HTML5 and CSS.
2. Design a responsive layout using Flexbox and Media Queries.
3. Develop a web form with JavaScript validation.
4. Create a dynamic web page that manipulates DOM elements.
5. Develop a login form using PHP/Node.js and validate user credentials.
6. Store and retrieve data using MySQL or MongoDB.
7. Implement session management in a web application.
8. Create a mini project (e.g., blog, student portal, or e-commerce product page).

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

Course Code	ITT6003				
Category	Program Core Course (PCC)				
Course Title	Cloud Computing				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

Course Outcomes

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

1. Exhibit an understanding of virtualization technologies.
2. Apply the existing virtualization technologies to solve real-world problems.
3. Analyze architecture, services, and challenges in Cloud computing.
4. Know the services of the AWS platform and their usage.
5. Know services on the Microsoft Azure platform and their usage.

Syllabus:

Unit I

Introduction: Traditional server concept: pros and cons. Need of Virtualized Technology, Benefits of Virtualization. Hypervisors, Types of Hypervisors, Full Virtualization, Para Virtualization, Hardware Assisted Virtualization, Types of virtualizations: Various forms of virtualization: Desktop, Application, Server, Hardware, Storage, Memory and I/O virtualization. Virtualization at different levels. Virtualization Vs Containerization, Concept of Containers, Container Orchestration.

Unit II

Virtualization Technologies: Software Virtualization, Hardware Virtualization, Application Virtualization, Storage Virtualization, OS Virtualization. Accomplishing Virtualization. High availability of Data Centers, Planned and unplanned maintenance activities in a datacenter. Migration: Migration consideration, Things to do before migration of servers- Discovery, Assessment and Migration. Concepts of Networking: CIDR Blocks, Subnet Mask, Designing a network.

Unit III

Cloud Computing Fundamental: Cloud deployment models, Cloud service models. Benefits and challenges of cloud computing. Regions, Availability zones, Edge locations. Fundamentals of pricing: Total cost of ownership (TCO) and monthly calculator.

Unit IV

Amazon Web services (AWS): AWS core services: Storage: Simple Storage service (S3), Elastic Block Store (EBS), Elastic File Store (EFS), Content Delivery Network (CDN), Cloudfront, Snowball, Snowmobile, Route53.

Unit V

Introduction to Microsoft Azure, Subscription, Resource Group, Resource Deployment Models, Different methods of creating resources: Azure portal, Cloud shell, ARM templates, Virtual Networking in cloud.

Unit VI

Compute Services in AWS and Azure: Elastic Compute Cloud (EC2) in AWS and VMs in Azure, Virtual Machine creation in Windows and Linux platform, Remote Desktop Protocol (RDP), Secure Shell (SSH) protocol, Security Groups, Load balancer, Auto scaling.

Text Books:

1. Distributed and Cloud Computing : Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, 1st Edition Elsevier
2. Cloud Computing Basics: A Non-Technical Introduction, Anders Lisdorf, Apress Publication.
3. Cloud Computing Bible : Barrie sosinsky, Wiley- India Edition
4. Cloud Computing : A Practical approach for learning and Implementation, A. Srinivasan, J. Suresh, 1stEdition, Pearson Publication

Reference Books:

1. The Complete Cornerstone Guide to Virtualization Best Practices: Ivanka Menken, Paperback, 2nd Edition, Emereo Pty Ltd.
2. Cloud Computing Explained: Implementation Handbook for Enterprise, 2013 Edition, Recursive Press Publication.
3. Enterprise Cloud Computing: Technology, Architecture, Applications, Gautam Shroff, 1st Edition, Cambridge University Press
4. Cloud Computing: Dr. Kumar Saurabh, 2nd Edition, Wiley- India Edition

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

Course Code	ITP6003				
Category	Program Core Course (PCC)				
Course Title	Cloud Computing Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

Course Outcomes

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

1. Use the appropriate cloud service for a given application.
2. Demonstrate the use of Virtualization technology.
3. Demonstrate the need for high availability in the Cloud environment.
4. Design a Virtual Network in the Cloud
5. Deploy Storage and application services on the Cloud platform.

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

Course Code	ITT6004-01				
Category	Program Core Course				
Course Title	Mobile Application Development				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

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, acase study on Mobile app development.

Unit II

Building blocks of mobiles 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, 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. VI Semester
Department of Information Technology

Course Code	ITP6004-01				
Category	Program Core Course				
Course Title	Mobile Application Development Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

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. Deploy Android Apps

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

Course Code	ITT6004-02				
Category	PEC				
Course Title	Advanced Java Programming				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

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

1. Develop web applications using J2EE architecture
2. Create a dynamic web application using JDBC.
3. Create dynamic web pages using Servlets and JSP.
4. Use the Struts and Hibernate frameworks.
5. Use the Spring framework.

Unit I:

J2EE and Web Applications: J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers, Set up Tomcat Container on a machine, Web application project structure.

Unit II:
JDBC and Database Connectivity**:** Creating a Database and Tables, Getting Information from Database, Obtaining Result Set Information, connecting a Java program to a Database, Prepared Statements and Statement Classes in Java, Inserting, Updating & Deleting Table data

Unit III:
Servlets and JSP: Web Applications and Java Servlets, Servlet lifecycle and session management, Building and deploying Servlets, Introduction to JSP (JSP Page Life Cycle, Basic Tags, JSP Tag Library), Implementing MVC Architecture with JSP, developing dynamic web pages using JSP and Servlets

Unit IV:
Struts and Hibernate**:** Struts Framework: Introduction to MVC1 and MVC2 Architecture, Overview of Struts Framework, Action Classes, Handling Requests, Generating Views, Form Validation (Validator Plug-in), Using Struts Tiles for UI Layout Management
Hibernate Framework: Introduction to Hibernate and ORM (Object Relational Mapping), Persistent Classes, Mapping Collections, Hibernate Query Language (HQL), Caching and Transactions

Unit V:
Introduction to Spring Framework, Spring Framework Architecture, Spring bean wiring, AOP with Spring, Transactions management, Spring with database

Text Book:

1. Database Programming with JDBC and Java 2e,
2. Head First Servlets and JSP, Kathy Sierra, Bryan Basham, Bert Bates, O'Reilly Media, Inc.
3. Spring in Action, Craig Walls, Manning Publication
4. Struts: The Complete Reference, James Holmes McGraw-Hill Education
5. Java Persistence with Hibernate, Gary Gregory, Christian Bauer, Manning Publication

Reference Book:

1. Spring Microservices in Action, John Cornell, Manning Publication
2. The Struts Framework: Practical Guide for Java Programmers, The Struts Framework: Practical Guide for Java Programmers, Sue Spielman, Morgan Kaufmann
3. Hibernate in Action, Christian Bauer and Gavin King, Manning Publication

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

Course Code	ITP6004-02				
Category	PEC				
Course Title	Advanced Java Programming Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

Course Outcomes

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

1. Develop Web Applications using J2EE
2. Implement Database Connectivity with JDBC
3. Create Dynamic Web Pages using Servlets & JSP
4. Develop Enterprise Applications using Struts and Hibernate
5. Utilize Spring Framework for Web Development

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

Course Code	ITT6005				
Category	MDM				
Course Title	Machine Learning				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	VI

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

1. Demonstrate the use of various concepts in machine learning.
2. Analyse different models of learning on different performance parameters.
3. Create probabilistic and unsupervised learning models for handling unknown patterns.
4. Apply various learning models.

Unit I:
Basics of Machine Learning, Supervised Learning, Unsupervised Learning, Cost Function, Overfitting, Cross validation concepts.
Regression, Linear Regression, Multiple linear regressions, Loss function.

Unit II:
Instance-Based Learning: k-Nearest Neighbour algorithm, Decision Tree Learning, Case-based learning, Multiclass classification, Multilabel classification, Logistic regression.

Unit III: Probabilistic and Ensemble Machine Learning: Maximum Likelihood Estimation, MAP, Bayes Classifiers Naïve Bayes, Bayes optimal classifiers, Minimum description length principle.

Unit IV:
Artificial Neural Networks: Types of Learning, Introduction of Multilayer Networks and back-propagation, Activation functions, recurrent neural networks, Types of RNN, Vanishing and Exploding gradient problem, Applications of ANN and RNN.

Unit V:
Introduction to Unsupervised Learning: Clustering, Hierarchical Clustering, K-means Clustering, Ensemble Learning, Ensemble Learning techniques, Stacking, Blending, Bagging, Boosting, Adaboost, Gradient Boosting.

Text Books

1. Mitchell Tom. Machine Learning. Tata McGraw Hill, 1997.
2. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Second Edition, Wiley, New York, 2001.
3. Christopher Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics), First Edition

Reference Books

1. Ethem Alpaydin, Introduction to Machine Learning, PHI.

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

Course Code	ITP6005				
Category	MDM				
Course Title	Machine Learning Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

Course Outcomes

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

1. Demonstrate the use of different data cleaning techniques.
2. Apply machine learning algorithms to solve problems.
3. Apply ensemble models for solving problems
4. Use various tools and packages for problem solving.

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

Course Code	ITP6006				
Category	PROJC				
Course Title	Project-II				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	4	2	VI

Course Outcomes

Upon completion of the course, students would be able to

1. Identify the problem statement through a literature survey and formulate the solution
2. Select the appropriate tools and techniques to provide a sustainable solution for the identified problem
3. Demonstrate the ability to work in a team
4. Present the work carried out professionally
5. Exhibit ethical practices during project development and management.

Syllabus for B. Tech. VI Semester
Department of Information Technology
HONOR COURSE

Course Code	ITTH6100-01				
Category	Honor Course				
Course Title	DevOps Engineering				
Scheme& Credits	L	T	P	Credits	Semester
	4	0	0	4	VI

Course Outcomes
At the end of the course students will be able to

1. Understand the principles and concepts of DevOps.
2. Implement automation and collaboration techniques in software development and IT operations.
3. Exhibit skills in using popular DevOps tools and technologies.
4. Explore best practices for developing and managing software applications.
5. Understand the cultural aspects and organizational implications of adopting DevOps practices.

Syllabus:

Unit 1: Introduction to DevOps

Definition and evolution of DevOps, Key principles and goals of DevOps
- Benefits and challenges of adopting DevOps practices
- Cultural and organizational aspects of DevOps adoption

Unit 2: Continuous Integration (CI)
- Introduction to continuous integration (CI) concepts
- Setting up CI pipelines with Jenkins or GitLab CI
- Automating builds, tests, and code quality checks
- Best practices for CI, including version control and automated testing

Unit 3: Continuous Deployment and Delivery (CD)
- Introduction to continuous deployment and delivery (CD)
- Implementing CD pipelines with tools like Jenkins, GitLab CI, or CircleCI
- Automating deployment processes and release management
- Implementing blue-green deployments and canary releases

Unit 4: Infrastructure as Code (IaC)
- Introduction to infrastructure as code (IaC) concepts
- Managing infrastructure with tools like Terraform or AWS CloudFormation
- Automating provisioning, configuration, and management of infrastructure
- Benefits of IaC for scalability, repeatability, and reliability

Unit 5: Configuration Management

- Introduction to configuration management concepts
- Managing configuration with tools like Ansible, Puppet, or Chef
- Automating configuration tasks, such as software installation and updates
- Ensuring consistency and compliance across infrastructure environments

Unit 6: Monitoring and Logging

- Importance of monitoring and logging in DevOps practices
- Implementing monitoring solutions with tools like Prometheus or Grafana
- Collecting and analyzing metrics to identify performance bottlenecks
- Implementing centralized logging and log aggregation for troubleshooting

Text Books:

1. Rojas, C. (2019). Building Progressive Web Applications with Vue. js: Reliable, Fast, and Engaging Apps with Vue. js. Apress.
2. Ater, T. (2017). Building progressive web apps: bringing the power of native to the browser. " O'Reilly Media, Inc.".

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

Course Code	ITTM6100-01				
Category	Minor				
Course Title	Introduction to Emerging Technologies				
Scheme& Credits	L	T	P	Credits	Semester
	3	1	0	4	VI

Course Outcomes

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

1. Exhibit an understanding of the concepts of the Internet of Things.
2. Differentiate between different Cloud Computing Models.
3. Understand the concepts of SDLC and DevOps.
4. Analyze the services in Cloud Computing.
5. Apply the concepts of DevOps in various applications

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, Introduction to Sensor Interfacing.

Unit II

Cloud Computing Fundamental: Concept of Virtualization, Cloud Computing definition, Service Models in Cloud: IaaS, PaaS, SaaS. Deployment Models in Cloud: Private, Public, Community and Hybrid cloud. Benefits and challenges of Cloud Computing.

Unit III

Cloud Platform: Introduction to Amazon Web Services (AWS), Core Services offered by AWS for Compute, Storage and Networks.

Unit IV

Cloud Platform: Services offered by AWS for Security and Monitoring: Identity and Access Management (IAM), Network Security Groups (NSGs), CloudWatch, CloudTrail etc., Services offered by AWS for IoT application deployment.

Unit V

Software Development Life Cycle (SDLC): Introduction to SDLC, SDLC Models: Waterfall Model, Agile Model etc.

Unit VI

Introduction to DevOps: Introduction to DevOps, DevOps Tools, CICD Pipeline, DevOps on Cloud.

Text Books:

1. Learning Internet of Things By: Peter Waher Publisher: Packt Publishing.
2. Cloud Computing: A Practical approach for learning and implementation, A. Srinivasan, J. Suresh, 1st Edition, Pearson Publication.
3. AWS Documentation.
4. Introduction to DevOps, Kallori Vikram; 1st edition.
5. Software Engineering: A Practitioner Approach, Roger S. Pressman, 7th Edition, McGraw-Hill

Reference Books:

1. The Internet of Things: Key Applications and Protocol By: Olivier Hersent; David Boswarthick
2. Omar Elloumi, Publisher: John Wiley & Sons. M2M Communications: A Systems Approach By: David Boswarthick; Omar Elloumi; Olivier Hersent, John Wiley & Sons
3. Cloud Computing Explained: Implementation Handbook for Enterprise, 2013 Edition, Recursive Press Publication.
4. Enterprise Cloud Computing: Technology, Architecture, Applications, Gautam Shroff, 1st Edition, Cambridge University Press
5. Cloud Computing: Dr. Kumar Saurabh, 2nd Edition, Wiley- India Edition