



St. John College of Engineering and Management

Autonomous Institute

(A Christian Religious Minority Institution)

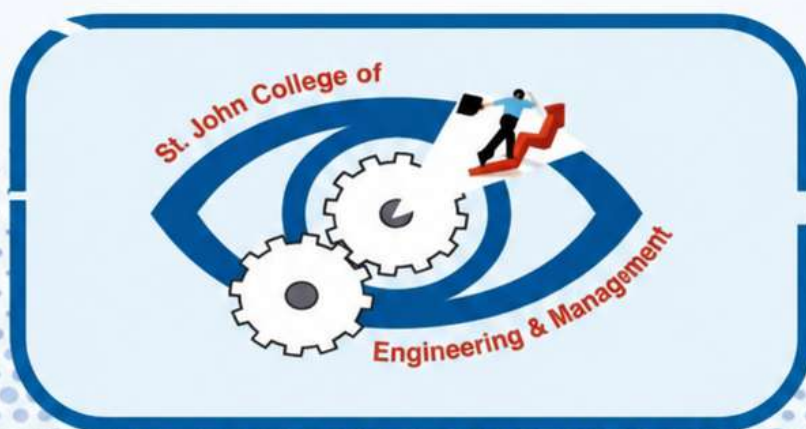
Approved by AICTE and DTE, Affiliated to University of Mumbai / MSBTE

DTE Code : 3218 AICTE Permanent ID : 1-4790201



NAAC Accredited with Grade 'A+', Three Programs NBA Accredited

Autonomy Syllabus Scheme of Bachelor of Engineering in Information Technology (Semester: IV, VI, VIII)



Academic Year 2025-2026

AUTONOMY SCHEME

SJCEM: R-24

Sr. No	Heading	Particulars
1	Title of the Course	Information Technology
2	Eligibility for Admission	As per the Institute Examination Ordinance
3	Theory Passing Marks (IAE / ESE)	40%
4	Continuous Assessment (CA) / Oral / Practical	50%
5	To be implemented from Academic Year	With effect from Academic Year:2025-26
6	Total Credits	Maximum 173
7	Honor / Minor Courses offered	Data Science (Additional Credits: 18)
8	Eligibility Criteria for Honor / Minor	- Students with no backlog in semester I, II and III. - The CGPI based on Semester I, II and III of the students must be 6.75 and above. - For Direct Second Year (DSE) Students – No backlog in semester III and CGPI must be 6.75 and above.

Preface

University Grants Commission with Letter No. F. 2-10/2023 (AC-Policy) dated 19th January 2024 conferred the autonomous status to St. John College of Engineering and Management, Village Vevoor, Manor Road, Palghar (East), 401404 affiliated to University of Mumbai for a period of 10 years from the academic year 2024-2025 to 2033-2034 as per clause 7.5 of the UGC (Conferment of Autonomous Status Upon Colleges and Measures for Maintenance of Standards in Autonomous Colleges) Regulations 2023. Designing the curriculum as an autonomous institution raises challenges pertaining to maintaining quality engineering education.

Systematic approach has been adapted in the design and implementation of curriculum with the intent of ensuring quality education catering to the sensitive needs of a learner, society, and industry. The curriculum is aligned with NEP and UGC guidelines as per Government of Maharashtra guidelines for autonomous institutions Government Resolution dated 4th July 2023.

Based on recent recommendations of the GR, holistic curriculum for 2024-28, a “H-Tree Model” of Engineering Education is offered. A unique “H-Tree Model” of Engineering Education Curriculum is followed and curriculum is designed to systematically develop IQ (Intelligence Quotient), PQ (Physical Quotient), EQ (Emotional Quotient), and SQ (Spiritual Quotient) of a learner. This curriculum aims at the development of an all-rounded personality with holistic approach to education in which a learner receives 34% teacher-led learning, 15% peer learning, 26% self-learning, and 25% experiential learning. The curriculum model is outcome based that focuses on learning by doing. Curriculum is designed to provide multiple learning opportunities for students to acquire and demonstrate competencies for rewarding careers. It ensures multiple choices to a learner acquiring skills through systematic planning. It has 7 verticals aligned to GR recommendations with strong science and mathematics foundation and program core, sequel of electives, multidisciplinary minor courses, humanities & management courses, and sufficient experiential learning through projects and semester-long industry/research internship along with employable skill-based courses. A learner gets an opportunity to acquire skills through NSDC aligned courses during summer vacations. Additional options of choosing from Honors/Double Minor/Honors with Research are also provided to a learner.

The curriculum balances contact hours and total credits of the entire program. The total credits are 173, wherein focus is not only on providing knowledge but also on building skills, attitude and self-learning. Therefore, in the present curriculum, skill-based laboratories, mini-projects, multi-disciplinary projects, and internships are made mandatory across all disciplines of engineering, which will definitely facilitate self-learning of students. The overall credits and approach of curriculum proposed in the scheme and syllabus are in line with AICTE model curriculum. SJCEM: R-24 curriculum will be implemented for Information Technology from the academic year 2024-25.

Nomenclature

Abbreviation	Title
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Program Core Courses
PEC	Program Elective Courses
MDM	Multidisciplinary Minor
OE	Open Elective
SC	Skill Courses
LLC	Liberal Learning Courses
VSEC	Vocational and Skill Enhancement Course
VEC	Value Education Course
SEC	Skill Enhancement Courses
AEC	Ability Enhancement Course
IKS	Indian Knowledge System
CC	Co-curricular Courses
OJT	On Job Training
PRJ	Project

Credit Specification:

- Theory: 1 credit = 15 hrs of teaching
- Lab: 1 Credit = 30 hrs of lab work.
- Workshop Based Activities: 1 Credit = 30 hrs of hands-on activities related to vocation/professional practice/skill based
- Seminar/Group Discussion: 1 Credit = 15 hrs of participation
- Community Engagement Projects: 1 Credit = 30 hrs of contact time along with 15 hrs of activities preparation, report writing, independent reading etc.

Dr. Arun Saxena

BoS Chairman

Dr. Kamal Shah

Principal

Bachelor of Technology In Information Technology

S. Tech
Semester – IV

SJCEM: R-24

Effective from Academic Year 2025-26

Scheme of Second Year (Fourth Semester) Information Technology (With Effect from 2024-2025)

Semester IV

Course Code	Vertical	Course Name	Contact Hrs			Credit Allotted			Total Credits
			Th	Tut	Pr	Th	Tut	Pr	
24ITPCC401B	PCC	Statistics and Probability	2	1	-	2	1	-	3
24ITPCC402B	PCC	Analysis of Algorithm	3	-	2	3	-	1	4
24ITPCC403B	PCC	Computer Networks	3	-	-	3	-	-	3
24ITPCC404B	PCC	Operating System	3	-	2	3	-	1	4
24ITAEC401B	AEC	Employability Enhancement Program -II (Communication)	-	-	2	-	-	1	1
24ITVSE401B	VSEC	Employability Enhancement Program -III (Industry Certification)	-	-	2	-	-	1	1
24MDM401WCEB	MDM	Multidisciplinary Minor (MDM)	3	-	2	3	-	1	4
24ITOJT401B	OJT	Internship I	-	-	3	-	-	1	1
Total			14	1	13	14	1	06	21

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/PR	
24ITPCC401B	PCC	Statistics and Probability	20	20	60	25	-	125
24ITPCC402B	PCC	Analysis of Algorithm	20	20	60	25	25	150
24ITPCC403B	PCC	Computer Networks	20	20	60	-	-	100
24ITPCC404B	PCC	Operating System	20	20	60	25	25	150
24ITAEC401B	AEC	Employability Enhancement Program -II (Communication)	-	-	-	25	-	25
24ITVSE401B	VSEC	Employability Enhancement Program-III(Industry Certification)	-	-	-	-	25	25
24MDM401WCEB	MDM	Multidisciplinary Minor (MDM)	20	20	60	25	-	125
24ITOJT401B	OJT	Internship I	-	-	-	-	25	25
Total			100	100	300	125	100	725



Multidisciplinary Minor

Semester	Course Code	Course Name
Sem IV	24MDM401WCEB	Introduction to Web Technology
Sem V	24MDM501WCEB	Cloud Computing
Sem VI	24MDM601WCEB	DevOps
SemVII	24MDM701WCEB	Web Applications Security

Course Title: Statistics and Probability

Semester: IV			Term: Even			Course Code: 24ITPCC401B						
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
2	1	-	2	1	-	3	20	20	60	25	--	125

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives:

The course aims

1. To study the basic techniques of statistics like correlation, regression for data analysis, Machine learning and AI.
2. To understand probability theory and random process that serve as an essential tool for applications of engineering sciences.
3. To acquaint students with the concepts of probability distributions.
4. To understand the various types of hypothesis tests and learn how to choose the most appropriate test based on the type of data and the research question.
5. Enhance problem-solving skills through the application of counting principles to solve a wide range of problems in mathematics, computer science, engineering, and other disciplines.
6. To learn about different types of graphs, Understand their properties and characteristics.

Course Outcomes:

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

1. Apply the concept of Correlation and Regression to the engineering problems in data Science, machine learning and AI.
2. Illustrate understanding of concepts of probability and expectation for getting the speed of the data and distribution of probabilities.
3. Apply the concepts of probability distribution to engineering problems.
4. Apply the most suitable hypothesis test for different types of data and research designs, such as t-tests, chi-square tests.
5. Apply counting principles and recurrence relations effectively in various mathematical, computational, and real-world problem-solving contexts.
6. Develop proficiency in applying various graph algorithms.

Module	Contents	Hours	COs
1	Statistical Techniques: Karl Pearson's coefficient of correlation (r), Spearman's Rank correlation coefficient (R) (with repeated and non-repeated ranks), Lines of regression. Self-learning Topics: Curve Fitting, Covariance.	6	1
2	Probability Theory: Definition and basics of probability, Discrete and continuous random variable with probability distribution and probability density function, Expectation, Variance and Standard Deviation. Self-learning Topics: Cumulative Distribution Function, Skewness and Kurtosis of distribution (data).	5	2
3	Probability Distribution: Probability Distribution: Binomial, Poisson and Normal distribution - problems (No derivation for mean and standard deviation) Self-learning Topics: Bernoulli's Distribution, Uniform Distribution, Exponential Distribution	4	3
4	Sampling Theory: Introduction, Parameter and Statistics, Test of Hypothesis, Level of Significance, Critical region, One-tailed, and two-tailed test, Degree of freedom. Students' t-distribution (Small sample). Test the significance of mean and Difference between the means of two samples. Chi-Square Test: Independence of attributes. Self-learning Topics: Z- Test, Goodness of fit and Yate's Correction.	5	4
5	Counting: Basic Counting Principle-Sum Rule, Product Rule, Inclusion Exclusion Principle, Recurrence relations -Linear Homogeneous Recurrence Relation. Self-learning Topics: Pigeonhole Principle, Non-Homogeneous Recurrence Relation.	5	5
6	Graph Theory: Introduction, Simple Graphs, Multigraphs, Isomorphic Graphs, Subgraphs, Complete graph, Regular, Planar graph, Walks, Trails, Path, Cycle, Connected and Disconnected Graph, Bipartite graph, Euler and Hamiltonian Graphs, Components of graph, Weighted graph, Dijkstra's Algorithm. Self-learning Topics: Traversal algorithms- breadth-first search, depth-first search,	5	6
Total		30	

Evaluation Scheme and Assessment:

A. Internal Assessment Examination:

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination:

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any Other

Reference Books:

1. Probability, Statistics, and Random Processes, T. Veerarajan, McGraw-Hill Education.
2. Narsing Deo, "Graph Theory with applications to engineering and computer science", PHI Publications.

Text Books:

1. Introductory Probability and Statistical Applications, B L Mayer, Wiley Eastern Limited, 2nd Edition.
2. Discrete and Combinatorial Mathematics-An Applied Introduction, Ralph P. Grimaldi and B V Ramana, Pearson Education, Asia, 5th Edition.

Useful Links

1. <https://www.coursera.org/specializations/discrete-mathematics>
2. <https://www.edx.org/learn/discrete-mathematics>

Course Title: Analysis of Algorithms

Semester: IV			Term: EVEN				Course Code: 24ITPCC402B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credi t	IAE 1	IAE 2	ESE	CA	Oral/Pract	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	2	3	-	1	4	20	20	60	25	25	150

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The course aims

1. To provide mathematical approaches for Analysis of Algorithms
2. To understand and solve problems using various algorithmic approaches
3. To analyse algorithms using various method
4. To solve problems using various strategies
5. To analyse strategies for solving problems not solvable in polynomial time.
6. To provide mathematical approach for Analysis of Algorithms.

Course Outcomes:

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

1. Analyse algorithm efficiency and apply the divide and conquer approach.
2. Design and implement dynamic programming solutions for optimization problems.
3. Apply the greedy approach to solve optimization problems like shortest path and spanning trees.
4. Solve combinatorial problems using backtracking and branch-and-bound techniques.
5. Implement and analyse various string-matching algorithms for pattern searching.
6. Understand NP-completeness, polynomial-time verification and solve NP-complete problems.

Module	Contents	Hours	COs
1	Introduction to analysis of algorithm	13	CO1
	Performance analysis, Space and Time complexity, Growth of function– Big –Oh, Omega, Theta notation, Mathematical background for algorithm analysis, Analysis of selection sort, Insertion sort. Recurrences: -The substitution method -Recursion tree method -Master method Divide and Conquer Approach: General method. Analysis of Merge sort, Analysis of Quick sort , Analysis of Binary search, Finding minimum and maximum algorithm and analysis Self-Learning Topics: Strassen' s matrix multiplication		
2	Dynamic Programming Approach	7	CO2
	General Method, Multistage Graphs, Single source shortest path, All pair shortest path Assembly-line scheduling , 0/1 knapsack Travelling salesman problem, longest common subsequence Self-Learning Topics: Principles of Dynamic Programming Approach		
3	Greedy Method Approach	7	CO3
	General Method, Single Source Shortest Path, Knapsack problem, Job Sequencing with deadlines Minimum cost spanning Trees-Kruskal's and Prim's algorithm Self-Learning Topics: Optimal storage on tapes		
4	Backtracking and Branch-and-bound:	7	CO4
	General Method, N-queen problem, Sum of subsets, Graph coloring, 15 puzzle problem, Travelling salesman problem. Self-Learning Topics: Optimization in Backtracking, Constraint Propagation		
5	String Matching Algorithms:	6	CO5
	The naïve string matching, Algorithms, The Rabin Karp algorithm, The Knuth-Morris-Pratt algorithm, Finite Automate for String Checking. Self-Learning Topics: Boyer-Moore Algorithm		
6	Non-deterministic polynomial algorithms: Polynomial time, Polynomial time verification, NP Completeness and reducibility, NP Completeness proofs, Vertex Cover Problems , Clique Problems Self-Learning Topics: Importance of NP Problems	5	CO6
Total		45	

List Of Experiments:

Exp. No.	Experiment Name	COs
1	Implementation of Selection Sort and Insertion Sort.	CO1
2	Implementation of Merge sort and Quick sort.	CO1
3	Implementation of All pair shortest path	CO2
4	Implementation of Longest common subsequence	CO2
5	Implementation of Fractional Knapsack problem	CO3
6	Implementation of Job sequencing with deadlines	CO3
7	Implementation of N-queen problem	CO4, CO6
8	Implementation of Graph Coloring	CO4, CO6
9	Implementation of the naïve string-matching Algorithms	CO5
10	Implementation of the Rabin Karp algorithm	CO5, CO6

Evaluation Scheme and Assessment:

A. Internal Assessment Examination:

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination:

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment

DEPARTMENT OF INFORMATION TECHNOLOGY

2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any Other

D. Oral & Practical Exam

Based on the entire syllabus, oral (10 marks) & practical/implementation (15 marks) examination will be conducted.

Reference Books:

1. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, "Algorithms", Tata McGraw- Hill Edition.
2. S. K. Basu, "Design Methods and Analysis of Algorithm", PHI.
3. John Kleinberg, Eva Tardos, "Algorithm Design", Pearson.
4. Michael T. Goodrich, Roberto Tamassia, "Algorithm Design", Wiley Publication.

Text Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, "Introduction to algorithms", 2nd edition, PHI publication 2005.
2. Ellis Horowitz, Sartaj Sahni, S. Rajasekaran. "Fundamentals of computer algorithms" University Press

Useful Links:

1. <https://leetcode.com/explore/interview/card/leetcode-interview-crash-course-data-structures-and-algorithms/703/arraystrings/>
2. <https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/>
3. <https://visualgo.net/en>

Course Title: Computer Networks

Semester: IV			Term: Even			Course Code: 24ITPCC403B						
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
03	--	--	03	--	--	03	20	20	60	--	--	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives:

The course aims

1. To introduce concepts and fundamentals of data communication and computer networks.
2. To explore the inter-working of various layers of OSI.
3. To explore the issues and challenges of protocol design while delving into the TCP/IP protocol suite.
4. To assess the strengths and weaknesses of various routing algorithms.
5. To understand various transport layer and application layer protocols.
6. To understand various application layer protocols.

Course Outcomes:

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

1. Demonstrate the concepts of data communication and compare the ISO–OSI model with the TCP/IP model.
2. Explore different concepts and design issues at the physical layer.
3. Explore different design issues at the data link layer.
4. Design the network using IP addressing and subnetting / supernetting schemes.
5. Analyze transport layer protocols and congestion control algorithms.
6. Explore protocols at the application layer

Module	Contents	Hours	COs
I	Introduction to Networking Introduction to computer network, network application, network software and hardware components (interconnection networking devices), network topology, protocol hierarchies, design issues for the layers, connection-oriented and connectionless services. Reference models: Layer details of OSI, TCP/IP models. Communication between layers. Self-learning Topics: Explore real-world applications of each network topology.	5	CO1
II	Physical Layer Introduction to communication: Electromagnetic spectrum Guided transmission media: Twisted pair, coaxial, fiber optics. Unguided transmission media: Radio waves, micro waves, infrared Self-learning Topics: Examine use cases where guided or unguided transmission media are preferred based on factors like bandwidth, distance, and cost.	4	CO2
III	Data Link Layer DLL design issues (services, framing, error control, flow control), error detection and correction (Hamming code, CRC, checksum), Elementary data link protocols, Stop and Wait, Sliding Window (Go Back N and Selective Repeat) Medium access control sublayer: Channel allocation problem, multiple access protocol (ALOHA, Carrier Sense Multiple Access (CSMA/CD) & (CSMA/CA)) Self-learning Topics: Analyze how ALOHA, CSMA/CD, and CSMA/CA protocols are applied in wired and wireless networks to optimize medium access.	9	CO3
IV	Network Layer Network layer design issues, Communication primitives: unicast, multicast, broadcast. IPv4 addressing (classfull and classless), subnetting, supernetting design problems, IPv4 protocol, network address translation (NAT), IPv6 Routing algorithms: Shortest path (Dijkstra's), link state routing, distance vector routing Protocols - ARP, RARP, ICMP, IGMP Congestion control algorithms: Open loop congestion control, Closed loop congestion control, QoS parameters, token & leaky bucket algorithms Self-learning Topics: Compare the differences between IPv4 and IPv6, focusing on their features and migration strategies.	13	CO4

V	Transport Layer Transport service: Transport service primitives, Berkeley sockets, connection management (handshake), UDP, TCP, TCP state transition, TCP timers TCP flow control (sliding window), TCP congestion control: Slow start algorithm Self-learning Topics: Role of TCP timers in ensuring reliable data transmission.	7	CO5
VI	Application Layer DNS: Name Space, Resource Record, and Types of Name Server. HTTP, SMTP, Telnet, FTP, and DHCP Self-learning Topics: Learn about various types of name servers and their functions within the DNS ecosystem.	7	CO6
Total		45	

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. A. S. Tanenbaum, Computer Networks, 4th Edition, Pearson Education
2. B. A. Forouzan, Data Communications and Networking, 5th Edition, TMH
3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach
Featuring
the Internet, 6th Edition, Addison Wesley

Text Books:

1. S. Keshav, An Engineering Approach to Computer Networking, Pearson
2. Natalia Olifer & Victor Olifer, Computer Networks: Principles, Technologies & Protocols for Network
Design, Wiley India, 2011.
3. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Second Edition,
The
Morgan Kaufmann Series in Networking.

Useful Links

1. <https://www.netacad.com/courses/networking/networking-essentials>
2. <https://www.coursera.org/learn/computer-networking>

3. <https://nptel.ac.in/courses/106/105/106105081>
4. <https://www.edx.org/course/introduction-to-networking>

Course Title: Operating System												
Semester: IV			Term: EVEN				Course Code: 24ITPCC404B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA/TW	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	2	3	-	1	4	20	20	60	25	25	150

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment, TW: Term Work

Course Objectives:

1. Understand the fundamental concepts, functions, and structures of modern operating systems.
2. Analyze the mechanisms for process management, scheduling, synchronization, and deadlock handling.
3. Apply various memory management and file system techniques to optimize system performance.
4. Develop and evaluate solutions for system-level problems using appropriate OS algorithms and programming constructs.

Course Outcomes:

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

1. Explain the structure, services, and functionalities of operating systems.
2. Demonstrate process creation, scheduling, and inter-process communication mechanisms.
3. Analyze process synchronization and concurrency control using semaphores, mutexes, and monitors.
4. Evaluate deadlock prevention, avoidance, and recovery strategies using system models and algorithms.
5. Implement and compare memory management and page replacement algorithms for efficient memory utilization.
6. Evaluate and analyze file management and disk scheduling techniques to determine their efficiency and performance trade-offs.

Module	Contents	Hours	COs
1	Overview of Operating Systems Objectives, functions, and services of OS; Evolution and types; System structures – monolithic, microkernel, layered, modular; System calls and their types. Self-Learning Topics: Case Study: Linux vs Windows OS Architecture	4	CO1
2	Module 2: Process Management Concept of a Process, Process States, Process Description, Process Control Block, Operations on Processes. Threads: Definition and Types, Concept of Multithreading, Scheduling: Types of Scheduling: Preemptive and Non-preemptive, Scheduling algorithms and their performance evaluation: FCFS, SJF, SRTF, Priority based, Round Robin Self-Learning Topics: Linux Process Management Internals	8	CO2
3	Module 3: Process Synchronization and Concurrency Concurrency: Principles of Concurrency, Inter-Process Communication, Process/Thread Synchronization. Mutual Exclusion: Requirements, Hardware and Software Support, Semaphores and Mutex, Monitors, Classical synchronization problems: Producer and Consumer problem, Readers/Writers Problem Self-Learning Topics: Synchronization in Multicore and Distributed Systems	8	CO3
4	Module 4: Deadlock Principles of deadlock, Conditions for deadlock, Resource Allocation Graph, Deadlock Prevention, Deadlock Avoidance: Banker's Algorithm for Single & Multiple Resources, Deadlock Detection and Recovery. Dining Philosophers Problem. Self-Learning Topics: Modeling Deadlocks using Simulation Tools	8	CO4
5	Module 5: Memory Management Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Memory Allocation Strategies: Best-Fit, First Fit, Worst Fit, Next Fit, Relocation, Paging, Segmentation. Virtual Memory: Demand Paging, Structure of Page Tables, Page Replacement Strategies: FIFO, Optimal, LRU, LFU, Thrashing.	9	CO5

Module	Contents	Hours	COs
	Self-Learning Topics: Memory Management in Linux Kernel		
6	Module 6: File System and I/O Management File Management: Overview, File Organization and Access, Secondary Storage Management: File Allocation Methods Input /Output Management I/O Management and Disk Scheduling: I/O Devices, I/O Buffering, Disk Scheduling algorithm: FCFS, SSTF, SCAN, CSCAN, LOOK, C-LOOK. Self-Learning Topics: File Systems in Linux (EXT4) and Windows (NTFS), SSD-based Disk Scheduling Concepts	8	CO6
Total		45	

List Of Experiment:

Sr. No.	Title of Experiment	COs Mapped
1	Explore the internal commands of linux and Write shell scripts to do the following: 1. Display top 10 processes in descending order 2. Display processes with highest memory usage. 3. Display current logged in user and logname. 4. Display current shell, home directory, operating system type, current path setting, current working directory. 5. Display OS version, release number, kernel version. 6. Illustrate the use of sort, grep, awk, etc.	CO1
2	Implement system calls for file manipulation (open, read, write, lseek, close)	CO1
3	Write shell scripts for automation tasks (e.g., displaying system info, sorting files, user management)	CO2
4	Implement CPU Scheduling Algorithms – FCFS, SJF, SRTF, Priority, Round Robin	CO2
5	Implement Inter-Process Communication (IPC) using pipes or message queues	CO2
6	Implement Synchronization Problems using Semaphores or Mutex (Producer–Consumer / Reader–Writer)	CO3
7	Simulation of Dining Philosophers Problem using threads and semaphores	CO3
8	Implement Deadlock Avoidance using Banker's Algorithm	CO4
9	Implement Memory Allocation Algorithms – Best Fit, First Fit, Worst Fit	CO5
10	Implement Page Replacement Algorithms – FIFO, LRU, Optimal	CO5

Sr. No.	Title of Experiment	COs Mapped
11	Implement File Allocation Techniques – Sequential, Indexed, Linked	CO6
12	Implement Disk Scheduling Algorithms - FCFS, SSTF, SCAN, CSCAN, LOOK	CO6

Evaluation Scheme and Assessment:

A. Internal Assessment Examination:

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B. End Semester Theory Examination:

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

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Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any Other

Note: Number of activities to be conducted under TAE would be as per the subject need.

D. Oral Practical

Based on the entire syllabus, oral (10 marks) & practical/implementation (15 marks) examination will be conducted.

Reference Books:

1. A Tanenbaum, "Operating System Design and Implementation", 3rd Edition, Pearson, January 2015.
2. Phillip A. Laplante, Seppo J. Ovaska, "Real Time Systems Design and Analysis", 4th Edition, Wiley-IEEE Press, Dec 2011.



3. Naresh Chauhan, "Principles of Operating Systems", 1 st Edition, Oxford University Press, 2014

Text Books:

1. Abraham Silberschatz, Greg Gagne, Peter Baer Galvin, "Operating System Concepts", 8th Edition, Wiley, 2018.
2. Tanenbaum, "Modern Operating System", 4 th Edition, Pearson Education, 2014
3. William Stallings, "Operating Systems: Internal and Design Principles", 8 th Edition, Pearson, 2014.
4. Randal. K. Michael, "Mastering Shell Scripting", 2 nd Edition, Wiley Publication, 2008.

Useful Links:

1. <https://nptel.ac.in/courses/106105214>
2. https://onlinecourses.nptel.ac.in/noc25_cs94/preview onlinecourses.nptel.ac.in
3. <https://www.cse.iitb.ac.in/~mythili/os/>



St. John College of Engineering and Management

Autonomous Institute

(A Christian Religious Minority Institution)

Approved by AICTE and DTE, Affiliated to University of Mumbai / MSBTE

DTE Code : 3218 AICTE Permanent ID : 1-4790201



NAAC Accredited with Grade 'A+', Three Programs NBA Accredited

Course Title: Employability Enhancement Program – II (Communication)												
Semester: IV			Term: Even			Course Code: 24ITAEC401B						
Teaching Scheme						Evaluation Scheme:						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
-	-	2	-	-	1	1	-	-	-	25	-	25

Course Objectives:

1. To understand the importance of active listening in effective communication.
2. To cultivate effective inter-personal skills and employment skills for organizational development.

Course Outcomes:

After successful completion of the course, learner will be able to

1. Understand the importance of active listening and social etiquette for effective communication.
2. Enhance written communication, official and technical skills
3. Strengthen their personal and professional relationship in career building.
4. Ace their Employability Skills through personal SWOT, Group Discussion and Resume Writing

Module	Contents	Hours	COs
I	Listening & Social Skills • Importance of Listening, Difference between hearing & listening • Types of Listening • Barriers of Listening • Listening (Audios/Videos) • Etiquette-Social Etiquette, Dining Etiquette, Telephonic Etiquette, Email Etiquette • Reading Comprehension Skills	06	CO1
II	Proposal & Report Writing • Letter Writing: Permission Letter, Leave Letter, Apology Letter • Meetings – Notice, Agenda & Minutes • Introduction to Proposal Writing • Parts of a Proposal • Types of Proposal: Research, Business • What is Technical paper writing in IEEE? • Types of Paper Writing: Journal, Conference Paper • Writing a Review Paper	08	CO2
III	Interpersonal Skills • Presentation Skills: Power Point, Demo Presentation • Managerial Skills: Time Management, Goal Setting, Decision Making, Conflict Resolution, Team Building, Leadership, Emotional Intelligence, Critical Thinking, Assertiveness, Negotiation	08	CO3

IV	Employability Skills - SWOT Analysis: Personal & Organizational - Verbal Aptitude Test - Group Discussion Skills: Types of GD, Do's and Don'ts, Tips for cracking a GD - Resume Writing - Interview Techniques	08	CO4
Total		30	

Tutorial. No.	List of Experiments / Tutorials	COs
1.	Listening Activity	CO1
2.	Comprehending Unseen Passages	CO1
3.	Writing Email Etiquette/Do's & Don'ts of Email Writing	CO1
4.	Meeting and Documentation- Notice, Agenda & Minutes	CO2
5.	Letter Writing- Permission, Leave & Apology	CO2
6.	PPT Presentation on any Technical Topic (Group Activity)	CO2, CO3
7.	Case Study Based GD-1	CO3
8.	Case Study-2	CO3
9.	SWOT Analysis: Personal	CO4
10.	Resume Writing	CO4

Evaluation and Assessment Scheme:

Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flip Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

- 1) M Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill, 2008



- 2) Gadyalji Vaishali K, Communication Skills, Nandu Publications, 2010
- 3) Rai Urmila & Rai S.M, Business Communication, Himalaya Publishing House, 2007
- 4) Rai Urmila & Rai S.M, Business Communication, Himalaya Publishing House, 2008
- 5) Raman Meenakshi & Sharma Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2015
- 6) Raman Meenakshi & Singh Prakash, Business Communication, Oxford University Press, 2008
- 7) Luthans Fred, Organizational Behavior An Evidence-Based Approach, McGraw Hill Education Private Limited, 2013
- 8) Locker O Kitty & Kaczmarek Kyo Stephen, Business Communication Building Critical Skills, McGraw Hill Education Private Limited, 2007
- 9) Chaturvedi P D & Chaturvedi Mukesh, Business Communication Concepts, Cases and Applications, Pearson Education, 2008

Useful links:

<https://youtu.be/TTARLuquJeE>

<https://youtu.be/jPj0Z2lb8jg>

<https://youtu.be/2nEvKZ4SG2c>

PD & Social Etiquette

<https://youtu.be/wPorhmnMDdc>

<https://youtu.be/n6F5icYGnSg>

7Cs of Effective Communication

<https://youtu.be/XuGCDRNIU-M>

Letter Writing

<https://youtu.be/ci47OQLFjao>

<https://youtu.be/uj6rlM62Bqk>

Motivational Speech

<https://youtu.be/xrEq-1UujOo>

https://youtu.be/W7BW9gv_OkU

Reading Comprehension

<https://youtu.be/3yYjYvdcCw8>

Public Speaking Tips

<https://youtu.be/UNGLa--HOXQ>

Barriers to Communication: A Case Study

https://youtu.be/k9KK_0zr3LU

Course Title: Employability Enhance Program – III (Industry Certification)

Semester: IV

Term: Even

Course Code: 24ITVSE401B

Teaching Scheme

Evaluation Scheme

Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
-	-	2	-	-	1	1	-	-	-	-	25	25

Introduction

As global competition intensifies, industries seek candidates who are not only skilled but also adaptable and ready to meet the demands of an evolving workforce. To bridge the gap between academic learning and industry expectations, SJCEM has introduced certification courses aimed at preparing students for impactful internships. These courses provide students with essential knowledge and skills, empowering them to excel in professional environments and increase their employability.

Course Objectives: The objectives of this course are to

1. Develop Professional Skills
2. Enhance Technical Competency
3. Cultivate Problem-Solving Abilities
4. Promote Ethical and Professional Conduct
5. Familiarize with Industry Standards and Expectations
6. Prepare for a Transition from Classroom to Workplace

Course Outcomes: After completion of this course, students will be able to

1. Communicate and Collaborate Effectively
2. Acquire Job-Ready Technical Skills
3. Enhanced Critical Thinking and Problem-Solving
4. Understand Ethical and Professional Standards
5. Use Industry Tools and Standards
6. Industry Integration effectively

Certification GUIDELINES:

The general procedure for organizing certification courses is as follows:

1. Identification of Industry Partners

Industries have been identified to provide in-house certification courses in various domains. Students are regularly informed and encouraged to pursue these certification courses.

2. Selection of Certification Domain

Students can choose two domains of their interest for the certification course and express their willingness to pursue the certification.

Following combination of domains are offered in the even semesters:

	Domain 1	Domain 2
Track 1	SQL	Dotnet
Track 2	CCNA	AI-IBM
Track 3	Cyber Security	AI-IBM
Track 4	Creo	Solid Works
Track 5	Data Science	Prompt Engineering and AI
Track 6	MernStack	Flutter
Track 7	Augmented Reality- Virtual Reality	Game Development
Track 8	Drone	Data Analytics
Track 9	IELTS/GRE	Certificate in Social Science
Track 10	Robotic	IOT
Track 11	Blockchain Basics	Blockchain Intelligence
Track 12	AWS	MernStack
Track 13	Microsoft Tools	AI-IBM
Track 14	Augmented Reality	Virtual Reality
Track 15	Professional Edge Training (PET)	

3. Allocation of Tracks

Each track can accommodate a maximum of 60 students or as per the availability of maximum seats. Allocation will be based on a first-come first-served basis. However, the institute reserves the right to reassign tracks as per the requirement.

4. Course Duration

Students have to complete the certification course, which has a minimum duration of 30 hours.

5. Oral & Practical Exam

Based on the entire syllabus, oral (20 marks) & practical/implementation (30 marks) examination will be conducted. Grades will be assigned as per the examination rules.

Note: A minimum of 90% attendance is required to award the certificate. If a student fails to meet this requirement, the student needs to re-register for the course internally or externally until successfully completed.

Course Title: Introduction to Web Technology

Course Title: Introduction to Web Technology												
Semester: IV			Term: Even				Course Code: 24MDM401WCEB					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	2	3	-	1	4	20	20	60	25	-	125

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. Explain the basic concepts of internet and web development.
2. Develop web based application
3. Design web pages using HTML, XML, CSS and JavaScript.
4. Create front end using basic React.
5. Build back end application using Node JS framework
6. Demonstrate understanding of emerging web technologies and frameworks

Course Outcomes:

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

1. Explain internet and web basics.
2. Use CSS for styling and XML for data structuring.
3. Build dynamic frontends with React.
4. Apply best practices in UI, animations, and React development.
5. Implement Node concepts for backend solutions.

Integrate RESTful APIs, use JSON/AJAX, and understand cloud deployment.

Module	Content	Hours	COs
1	Fundamentals of Internet and Web Technologies: Overview of Internet and Web, Web Architecture and Components, Web Development Life Cycle, Web Servers and Browsers, Web Services and Protocols, HTTP, HTTPS, Domain Name System (DNS), IP Addressing and URL Structure	6	1
2	Web Markup and Styling Technologies: HTML5 Elements and Structure, Lists, Tables, Forms, and Multimedia tags, CSS: Syntax, Selectors, Box model, Layouts, XML: Structure, Schema, DTD, XSLT	6	2
3	JavaScript: Variables, Operators, Control Structures, Functions, Arrays, and Objects in JS, DOM Manipulation and Event Handling Responsive Design Basics	7	3
4	React.js Fundamentals and Application Development: Installation, Installing Libraries, Folder and File Structure, Components, Component lifecycle, State and Props, React Router and Single Page Applications, UI design, Forms, Events, Animations, Best practices.	8	4
5	Node.js Fundamentals and Core Modules: Environment Setup, First app, Asynchronous Programming, Callback Concept,	10	5

	Event Loops, REPL, Event Emitter, Networking Module, Buffers, Streams, File System, Web Module.		
6	Advanced Web Technologies and Emerging Trends: Introduction to Other Web Frameworks , RESTful Web Services, JSON and AJAX for Dynamic Content, Introduction to APIs and API Integration, Cloud and Web Hosting Basics, Overview of Progressive Web Apps (PWAs), Future trends: AI in web.	8	6
Total		45	

Sr No.	List of Experiment	COs
1	Case study on different web architectures implemented in the industry	1
2	Case study on Web Development Life Cycle.	1
3	Create a basic HTML5 web page using structural tags, HTML5 formatting tags, hyperlinks, and lists (ordered, unordered, definition)	2
4	Design a user registration form using HTML5 form elements (text, radio, checkbox, dropdown, date, etc.) with proper attributes	2
5	Write a JavaScript program demonstrating variables, operators, conditions, and loops with user input/output	3
6	Develop a JavaScript form validation program using functions, events, and error handling.	3
7	Build a simple React app using functional components, props, and state; display a list of items dynamically	4
8	Implement a React form handling user input and trigger events; demonstrate use of refs and keys	4
9	Create a Node.js Express application to handle simple GET and POST requests using callback functions and event loop.	5
10	Create a Node.js Express application to implement a i. React Router ii. SPA	5
11	Building a RESTful Web Service and Consuming it using AJAX	6
12	Deploying a Progressive Web App (PWA) with API Integration on Cloud	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Reference Books:

1. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5 — Robin Nixon, O'Reilly.
2. Web Technologies: TCP/IP Architecture, and Java Programming — Achyut S. Godbole, Atul Kahate, Tata McGraw-Hill.
3. The Complete Guide to Web Development with React AND Node.js: Techniques for Fast, Scalable, and Secure Apps — By Joseph Elmer
4. Modern Web Development with Deno: Develop Modern JavaScript and TypeScript Code with Svelte, React, and GraphQL — By Mayur Borse
5. Modern Web Applications with Next.JS — By Shubham Jain, Mathew Dony Chittezhath

Text Books:

1. Web Technologies: HTML, CSS, JavaScript, PHP, Java, JSP, XML, and AJAX, Black Book — Kogent Learning Solutions Inc., Dreamtech Press.
2. Internet & World Wide Web: How to Program — Paul Deitel, Harvey Deitel, Abbey Deitel, Pearson Education.
3. Web Technology: A Developer's Perspective — N.P. Gopalan & J. Akilandeswari, PHI Learning.
4. Programming the World Wide Web — Robert W. Sebesta, Pearson Education.
5. HTML5 and CSS3: Visual QuickStart Guide — Elizabeth Castro and Bruce Hyslop, Peachpit Press.

Useful Links:

1. <https://developer.mozilla.org/en-US/>
2. <https://www.w3schools.com/>
3. <https://www.geeksforgeeks.org/web-technology/>
4. <https://www.youtube.com/@TraversyMedia>

Course Title: Internship- I

Semester: IV			Term: Even			Course Code: 24ITOJT401B						
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
-	-	3	-	-	1	1	-	-	-	-	25	25

Introduction

The rise in global competition has prompted organizations to devise strategies to have a talented and innovative workforce to gain a competitive edge. Developing an internship policy is an impactful strategy for creating a future talent pool for the industry. The internship (a form of experiential learning) program helps fresh pass-outs in gaining professional know-how and benefits corporate sectors. The internship also enhances the student's employability skills passing out from Technical Institutions.

Objectives:

1. Integration of workshop with workplace in physical and/or hybrid model.
2. Developing research aptitude in emerging technologies
3. Enhance entrepreneurial capabilities and professional competency
4. Development of decision-making and teamwork skills
5. Cultivate a sense of Social Imagery and Citizenship Responsibility

Outcomes: After completion of this course, students will be able to

1. Apply practical skills effectively in physical and hybrid workplace settings.
2. Conduct and communicate research on emerging technologies.
3. Demonstrate creative problem-solving and an entrepreneurial mindset.
4. Meet industry standards with strong communication and technical skills.
5. Collaborate effectively and make informed decisions within teams.

INTERNSHIP GUIDELINES:

- The students should apply for internships of their choice with the permission of the Institute.
- The internship duration ranges from 4 to 6 weeks and is scheduled during the summer vacation period for students
- Industry will confirm the training slots and the number of seats allocated for internships via confirmation letter/ email.
- Students on joining Training at the concerned Industry / Organization, submit the Joining Report/Letters / Email.
- Students undergo industrial training at the concerned Industry / Organization.
- Training and placement team will visit the industry and evaluate(s) the performance of students regularly and evaluation Report of the students is submitted in department office/TPO with the consent of Industry persons/ Trainers.
- Students will submit training report after completion of internship.
- Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training.



- It will be evaluated on the basis of the following criteria:
 - Regularity in maintenance of the diary.
 - Project/Case study/Completion of assigned task by industry undertaken during the internship
 - Employer feedback
- Training Certificate to be obtained from industry followed by the presentation in the department.



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Bachelor of Technology In Information Technology

T. Tech
Semester – VI
SJCEM: R-24

Effective from Academic Year 2025-26

Scheme for T. Tech (Sixth Semester) Information

Technology (With Effect from 2025-2026)

Semester VI

Course Code	Vertical	Course Name	Contact Hours			Credits Allotted			Total Credit
			Th	Tu	Pr	Th	Tu	Pr	Total
24ITPCC601B	PCC	Data Mining & Business Analytics	3	-	2	3	-	1	4
24ITPCC602B	PCC	Advance Artificial Intelligence and Machine Learning	3	-	2	3	-	1	4
24ITPEC601XB	PEC	Professional Elective III	3	1	-	3	1	-	4
24ITPEC602XB	PEC	Professional Elective IV	3	-	2	3	-	1	4
24OE601XB	OE	Open Elective II	3	-	-	3	-	-	3
24ITVSE601B	VSEC	Employability Enhancement Program -III (Industry Certification)	-	-	2	-	-	1	1
24ITOJT601B	OJT	Internship II	-	-	3	-	-	1	1
Total			15	01	11	15	01	05	21

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/P R	
24ITPCC601B	PCC	Data Mining & Business Analytics	20	20	60	25	25	150
24ITPCC602B	PCC	Advance Artificial Intelligence and Machine Learning	20	20	60	25	25	150
24ITPEC601XB	PEC	Professional Elective III	20	20	60	25	-	125
24ITPEC602XB	PEC	Professional Elective IV	20	20	60	25	-	125
24OE601XB	OE	Open Elective II	20	20	60	-	-	100
24ITVSE601B	VSEC	Employability Enhancement Program -III (Industry Certification)	-	-	-	-	25	25
24ITOJT601B	OJT	Internship II	-	-	-	-	25	25
Total			100	100	300	100	100	700

Professional Elective Courses (PEC)

Semester	Professional Elective III			
	Track 01		Track 01	
	Cloud Computing		Cyber Security	
Sem VI	24ITPEC6011B	Cloud Administration	24ITPEC6012B	Cyber Security and Ethical Hacking -I

Semester	Professional Elective IV			
	Track 02		Track 02	
	Web and App Development		Software Development	
Sem VI	24ITPEC6021B	Web X.0	24ITPEC6022B	Devops

Open Elective Courses

Semester	Track 01		Track 02		Track 03		Track 04	
	Entrepreneurship		Research Methodology		Foreign Language		Business Management	
	Code	Subject	Code	Subject	Code	Subject	Code	Subject
Sem VI	24OE6011B	Organisational Behaviour	24OE6012B	Publication guidelines and selections of publishers	24OE6013B	Foreign Language –II (Japanese)	24OE6014B	Basics of Finance Management

Course Title: Data Mining & Business Analytics												
Semester: VI			Term: Even				Course Code: 24ITPCC601B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/Tut .	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	2	3	-	1	4	20	20	60	25	25	150

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. To introduce the concept of data warehouse data Mining as an important tool for enterprise data management and as a cutting-edge technology for building competitive advantage.
2. To enable students to effectively identify sources of data and process it for data mining.
3. To make students well versed in all data mining algorithms, methods of evaluation.
4. To impart knowledge of tools used for data mining
5. To provide knowledge on how to gather and analyse large sets of data to gain useful business understanding.
6. To impart skills that can enable students to approach business problems analytically identifying opportunities to derive business value from data.

Course Outcomes:

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

1. Demonstrate an understanding of the importance of data warehousing and data mining and the principles of business intelligence.
2. Organise and prepare the data needed for data mining using pre preprocessing techniques.
3. Perform exploratory analysis of the data to be used for mining.
4. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.
5. Define and apply metrics to measure the performance of various data mining algorithm.
6. Apply BI to solve practical problems: Analyse the problem domain, use the data collected in enterprise, apply the appropriate data mining technique, interpret and visualise the results and provide decision support.

Module	Content	Hours	COs
1	Data Warehouse (DWH) Fundamentals with Introduction to Data Mining Basic Knowledge of databases, DWH characteristics, Dimensional modelling: Star, Snowflakes, OLAP operation, OLTP vs OLAP Data Mining as a step in KDD, Kind of patterns to be mined, Technologies used, Data Mining applications. Self-learning Topics: Data Marts, Major issues in Data Mining.	6	1
2	Data Exploration and Data Pre-processing Types of Attributes, Statistical Description of Data, Measuring Data Similarity and Dissimilarity. Why Preprocessing? Data Cleaning, Data Integration, Data Reduction: Attribute Subset Selection, Histograms, Clustering, Sampling, Data Cube aggregation, Data transformation and Data Discretization: Normalization, Binning, Histogram Analysis Self-learning Topics: Data Visualization, Concept hierarchy generation	7	2
3	Classification Basic Concepts; Classification methods: 1. Decision Tree Induction: Attribute Selection Measures, Tree pruning. 2. Bayesian Classification: Naïve Bayes Classifier. Prediction: Structure of regression models; Simple linear regression, Accuracy and Error measures, Precision, Recall, Holdout, Random Sampling, Cross Validation, Bootstrap, Introduction of Ensemble methods, Bagging, Boosting, AdaBoost and Random Forest. Self-learning Topics: Multiple linear regression, logistic regression, Random Forest, nearest neighbour classifier, SVM	9	3
4	Clustering and Outlier Detection Cluster Analysis: Basic Concepts; Partitioning Methods: K-Means, K Medoids; Hierarchical Methods: Agglomerative, Divisive, BIRCH; Density-Based Methods: DBSCAN. What are outliers? Types, Challenges; Outlier Detection Methods: Supervised, Semi Supervised, Unsupervised, Proximity based, Clustering Based. Self-learning Topics: Hierarchical methods: Chameleon, Density based methods: OPTICS, Grid based methods: STING, CLIQUE	9	4
5	Frequent Pattern Mining Basic Concepts: Market Basket Analysis, Frequent Itemset, Closed Itemset, and Association Rules; Frequent Itemset. Mining Methods: The Apriori Algorithm: Finding Frequent Itemset Using Candidate Generation, Generating Association Rules from Frequent Itemset, Improving the Efficiency of Apriori, A pattern growth approach for mining Frequent Itemset, Mining Frequent Itemset using vertical data formats; Introduction to Advanced Pattern Mining: Mining Multilevel Association Rules and Multidimensional Association Rules. Self-learning Topics: Node.js with MongoDB	9	5
6	Business Intelligence and Data Visualisation	5	6

	Business Intelligence Architecture and Components, BI Tools and Platforms: Power BI, Tableau, QlikView, Dashboard Design and Reporting, Decision Support Systems and Data Warehousing Concepts, Emerging Trends in Business Analytics: AI, Big Data, Cloud BI Self-Learning Topics: Real-world BI Case Studies – Fraud Detection, Sentiment Analysis		
Total		45	

Sr No.	List of Experiment	COs
1	Build Data Warehouse/Data Mart for a given problem statement. 1. Identifying the source tables and populating sample data 2. Making information package diagram 3. Design dimensional data model i.e. Star schema, Snowflake schema and Fact Constellation schema	1
2	To perform various OLAP operations such as slice, dice, drilldown, rollup, pivot	1
3	Perform data cleaning, integration, transformation, and normalization on raw business data.	2
4	Implement using tools data Pre-processing and Data- Exploration tasks on your dataset.	2
5	Implementation of Classification algorithm Implement Decision Tree and Naïve Bayes classifiers to predict business outcomes	3
6	Apply simple and multiple linear regression to forecast business metrics such as sales or demand	3
7	Implementation of Clustering algorithm Apply K-Means and Hierarchical clustering for customer segmentation and visualize results.	4
8	Implement outlier detection methods to identify anomalies in transaction data.	4
9	Perform association rule mining to find frequent item sets and association rules from retail data.	5
10	Use FP-Growth to discover high-confidence association rules and interpret business insights.	5
11	Create an interactive BI dashboard showing KPIs, charts, and trends for decision support.	6
12	Mini Project: Implement a complete analytics workflow on real-world data (problem identification, data preparation, modelling, and visualization).	6

Evaluation and Assessment Scheme:**A. Internal Assessment Examination (IAE):**

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping

Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

D. Oral & Practical Exam

Based On Entire Syllabus, Oral (10 Marks) and Practical/Implementation (15 Marks) Examination will be Conducted.

Reference Books:

1. Michael Berry and Gordon Linoff "Data Mining Techniques", 2nd Edition Wiley Publications.
2. Michael Berry and Gordon Linoff "Mastering Data Mining- Art & science of CRM", Wiley Student Edition.
3. Vikram Pudi & Radha Krishna, "Data Mining", Oxford Higher Education.

Text Books:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3rd Edition.
2. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education.
3. Paulraj Ponniah "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals" Wiley Publications
4. Business Intelligence: Data Mining and Optimization for Decision Making by Carlo Vercellis, Wiley India Publications.



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5. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", 2nd Edition, Wiley India.

Useful Links:

- 1 <https://infyspringboard.onwingspan.com/web/en/app/toc/>
2. https://onlinecourses.nptel.ac.in/noc25_mg154/preview

Course Title: Advance Artificial Intelligence and Machine learning												
Semester: VI			Term: Even				Course Code: 24ITPCC602B					
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	--	2	3	--	1	4	20	20	60	25	25	150

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. To model a decision making for a new problem in an uncertain domain.
2. To demonstrate Cognitive skills of Artificial Intelligence.
3. To become familiar with the basics of Fuzzy Logic and Fuzzy Systems.
4. To become familiar with Deep Learning Concepts and Architectures.
5. To define and apply metrics to measure the performance of various learning algorithms.
6. Students should be familiar with the recent trends in Deep Learning.

Course Outcomes:

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

1. Design models for reasoning with uncertainty as well as the use of unreliable information.
2. Analyse the process of building a Cognitive application.
3. Design fuzzy controller system.
4. Apply learning concepts to develop real life applications.
5. Evaluate performance of learning algorithms.
6. Gain familiarity with recent trends and applications of Deep Learning.

Module	Content	Hours	COs
1	Uncertainty: Uncertainty in AI, Inference using full joint distributions, Bayes Theorem, the semantics of Bayesian Networks, Inference in Bayesian networks, Decision Theory, Markov Decision Processes. Self-learning Topics: Hidden Markov Model (HMM), Gaussian Mixture Model (GMM).	06	1
2	Cognitive Computing: Foundation of Cognitive Computing, Design Principles for Cognitive Systems, Natural Language Processing in	08	2

	Support of a Cognitive System, Representing Knowledge in Taxonomies and Ontologies, Applying Advanced Analytics to Cognitive Computing, The Process of Building a Cognitive Application. Self-learning Topics: Cognitive Systems such as IBM's Watson.		
3	Fuzzy Logic & Its Applications: Introduction to Fuzzy Sets, Properties of Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Membership Functions, Fuzzy Relations with Operations and its Properties, Fuzzy Composition: Max-Min Composition, Max-Product Composition, Defuzzification Methods, Architecture of Mamdani Type Fuzzy Control System, Design of Fuzzy Controllers like Domestic Shower Controller, Washing Machine Controller, Water Purifier Controller, etc. Self-learning Topics: Other Fuzzy Composition Operations, Fuzzy Inference System (FIS) & ANFIS.	08	3
4	Introduction to Deep Learning: Introduction to Deep Learning, ANN, Machine Learning Vs Deep Learning, Working of Deep Learning; Convolutional Neural Network: Introduction, Components of CNN Architecture, Properties of CNN, Architectures of CNN, Applications of CNN, Recurrent Neural Network: Introduction, Simple RNN, LSTM Implementation, Deep RNN, Autoencoder: Introduction, Features, Types, Applications of Deep Learning. Self-learning Topics: Restricted Boltzmann Machine (RBM).	09	4
5	Advanced ML Classification Techniques: Metrics for Evaluating Classifier Performance, Holdout Method and Random Subsampling, Cross-Validation, Bootstrap, Model Selection Using Statistical Tests of Significance, Comparing Classifiers Based on Cost-Benefit and ROC Curves. Ensemble Classifiers: Introduction to Ensemble Methods, Bagging, Boosting, Random forests, Improving classification accuracy of Class-Imbalanced Data. Self-learning Topics: Leave-One-Out Cross Validation (LOOCV), Oversampling (SMOTE, ADASYN)	08	5
6	Recent Trends and Applications: Introduction to Reinforcement Learning, Deep Reinforcement Learning (DRL), Multimodal Deep learning, Generative Adversarial Network (GAN): Architecture, Applications: Image Generation, DeepFake,	06	6
Total		45	

Sr No.	List of Experiment	COs
1	Implement Inferencing with Bayesian Network in Python.	1
2	Basic Implementation of MDP: Value Iteration and Q-Learning Approach	1

3	Building a Cognitive Healthcare Application	2
4	Building a Cognitive Smart Cities Application	2
5	Implementation of Fuzzy Membership Functions and Fuzzy set Properties.	3
6	Design of a Fuzzy control system using Fuzzy tool.	3
7	Implementing Deep Learning Application : Image Classification System	4
8	Implementing Deep Learning Application : Handwritten Digit Recognition System (like MNIST Dataset)	4
9	Implementation and Evaluation of supervised learning algorithm : Ada-Boosting	5
10	Implementation and Evaluation of supervised learning algorithm : Random Forests	5
11	Design and implement LSTM for Sentiment Analysis.	6
12	Design and implement GRU for classification on text data.	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.



D. Oral & Practical Exam

Based On Entire Syllabus, Oral (10 Marks) and Practical/Implementation (15 Marks) Examination will be Conducted.

Reference Books:

1. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Publication.
2. Ethem Alpaydin, "Introduction to Machine Learning", PHI Learning Pvt. Ltd.
3. Jon Krohn, Grant Beyleveld, Aglae Bassens, "Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence", Pearson Education.
4. Prateek Joshi, "Artificial Intelligence with Python", Packt Publishing.
5. Douwe Osinga. —Deep Learning Cookbook, O'REILLY, SPD Publishers, Delhi.

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Pearson Education.
2. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive Computing and Big Data Analytics", Wiley India, 2015.
3. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley Publication.
4. Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr. D Karthika Renuka, "Deep Learning Using Python", Wiley India, 2020.
5. Uma Maheshwari, R. Sujatha, "Introduction to Data Science Practical Approach with R and Python", Wiley India, 2021.
6. François Chollet, "Deep Learning with Python", Manning Publications, 2018.

Useful Links:

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs35/preview
3. <https://www.coursera.org/specializations/deep-learning>
4. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

Course Title: Cloud Administration												
Semester: VI			Term: Even				Course Code: 24ITPEC6011B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	1	--	3	1	--	4	20	20	60	25	-	125

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. Understand the fundamental concepts, service models, and deployment models of cloud computing.
2. Understand the Infrastructure Of Cloud Computing.
3. Gain practical experience in managing core cloud infrastructure components (compute, storage, networking).
4. Develop skills in monitoring performance, implementing basic security measures, and managing costs within a cloud environment.
5. Prepare students for vendor-specific certifications (e.g., AWS Certified Cloud Practitioner, Azure Administrator Associate)
6. Develop Skill in Emerging Trends in Cloud Computing.

Course Outcomes:

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

1. Articulate the core concepts and economic benefits of cloud computing.
2. Differentiate between various service and deployment models.
3. Manage foundational cloud infrastructure components, including VMs, storage, and networking.
4. Implement basic security controls and manage user access within a cloud environment.
5. Monitor cloud resources and understand cost management principles.
6. Identify the Emerging Trends in Cloud Computing.

Module	Content	Hours	COs
1	Cloud Fundamentals & Concepts Definition and evolution of cloud computing (NIST model), Key characteristics (On-demand self-service, elasticity, etc.) , Service Models: IaaS, PaaS, SaaS, Deployment Models: Public, Private, Hybrid, Community, Benefits, risks, and challenges of cloud adoption, Overview of major cloud providers (AWS, Azure, GCP)	8	1
2	Cloud Infrastructure & Virtualization Fundamentals of virtualization and hypervisors, Managing Virtual Machines (VMs): Provisioning, configuration, sizing, Introduction to containers	7	2

	(Docker) and orchestration (Kubernetes), Virtual networking basics: VPCs, subnets, IP addressing, firewalls, VPNs		
3	Cloud Storage and Databases Types of cloud storage: Object, Block, File storage, Data lifecycle management and redundancy, Introduction to cloud databases: Relational (e.g., RDS) and NoSQL (e.g., DynamoDB, Cosmos DB), Data backup, recovery, and archival strategies	7	3
4	Identity, Security, and Compliance Identity and Access Management (IAM): Users, groups, roles, permissions, Security best practices: Encryption (at rest and in transit), security groups, Network ACLs, Compliance standards overview and shared responsibility model, Monitoring and auditing tools (e.g., CloudTrail, CloudWatch, Azure Monitor)	8	4
5	Cloud Operations and Management Performance monitoring and optimization strategies, Cost management and billing analysis tools, Automation basics: Using CLIs, simple scripting (Bash/PowerShell), Introduction to Infrastructure as Code (IaC) tools (e.g., Terraform, AWS CloudFormation)	8	5
6	Emerging Trends & Case Studies Serverless computing basics (e.g., AWS Lambda, Azure Functions), DevOps in the cloud environment, Real-world case studies of cloud implementations and challenges	7	6
Total		45	

List Of Tutorials:

Sr. No	Topic	CO
1	Create a free-tier account on a major cloud provider (e.g., AWS, Azure, GCP). Explore the management console, understand the dashboard, locate core services, and configure billing alerts.	1
2	Launch a virtual machine instance (e.g., AWS EC2, Azure VM, GCP Compute Engine). Connect to the instance using SSH or RDP, install basic software, and practice stopping, starting, and terminating the VM	2
3	Create and manage object storage buckets (e.g., Amazon S3, Azure Blob Storage, GCP Cloud Storage). Upload, download, delete objects, configure access permissions, and set up lifecycle policies	2
4	Create a Virtual Private Cloud (VPC) or Virtual Network (VNet). Configure subnets, internet gateways, and basic routing tables to allow internet connectivity for a VM.	3
5	Create a new user account, a user group, and an IAM policy with specific permissions (e.g., read-only access to storage). Assign the user to the group and test the access levels	3
6	Utilize a Platform as a Service (PaaS) offering (e.g., AWS Elastic Beanstalk, Azure	4

	App Service) to deploy a pre-built sample web application without managing the underlying infrastructure.	
7	Set up monitoring dashboards and configure alerts for resource utilization (CPU usage, memory usage, network traffic) of a running VM. Trigger and review an alert	4
8	Configure a load balancer across two web server VMs. Set up an auto-scaling group or scale set to automatically add or remove VM instances based on CPU utilization metrics.	5
9	Create snapshots of a VM's disk volume and test restoring the data from a backup. Explore the process of setting up automated backup schedules	6
10	Use a basic IaC tool (e.g., AWS CloudFormation or a simple Terraform template) to provision resources (like a VM and a storage bucket) programmatically instead of using the management console.	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following :

Experiments / Tutorials (8 to 10): 10 marks (All COs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.



Text Books:

1. Cloud Computing: Theory and Practice by Dan C. Marinescu
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi
3. Cloud Computing Bible by Barrie Sosinsky
4. Microsoft Azure Administrator Exam Ref AZ-104 by Haider Khalid

Reference Books:

1. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood Prentice Hall (part of Pearson Education)
2. Hands-On Cloud Administration in Azure by Mustafa Toroman Packt Publishing
3. AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud by Mike Ryan Packt Publishing
4. Official Google Cloud Certified Professional Cloud Administrator Guide by Brian Dorsey and Jesse Friedman Sybex

Important Links:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs15/preview
3. <https://med.stanford.edu/irt/security/stanfordinfo/share-send-store/cloud.html>

Course Title: Cyber Security and Ethical Hacking												
Semester: VI			Term: Even				Course Code: 24ITPEC6012B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	1	--	3	1	--	4	20	20	60	25	-	125

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The course aims

1. Able to Understand Principle Of Ethical Hacking and Network Vulnerabilities.
2. Able to Apply Different Methods and Tools for Ethical Hacking.
3. Able To Find Out Vulnerabilities in Web Application and Exploit it Using Penetration Testing.
4. Able to Gather Information Using Network Scanner and Use Packet Sniffer for Traffic Monitoring.
5. Able to Evade IDS, Firewall and Honeypots for Intruding into Network.
6. Able to Write their Own Encryption Algorithm for Securing Credentials.

Course Outcomes:

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

1. Identify Network Vulnerabilities.
2. Apply Different Methods and Tools for Ethical Hacking
3. Identity Vulnerabilities in Web Application and Exploit it Using Penetration Testing.
4. Analyse Information Collected using Network Scanner. Apply Packet Sniffer for Traffic Monitoring.
5. Apply Evading Techniques on IDS, Firewall and Honeypots for Intruding into Network.
6. Create Own Method / Technique / Algorithm for Encryption.

Module	Content	Hours	COs
I	Ethical Hacking and Network Basics: Hacking concept, Terms we use in hacking, Need of Ethical hacking, Types Of Hackers, Role of Ethical Hacker, Principles of Ethical hacking, Hacking Methodologies. Network Basics: IP Addressing, Routing, IP Subnetting, DNS, Port Addressing, Physical Addressing. Protocol Vulnerabilities: IP, TCP, UDP, ARP, RARP, DHCP. Self learning: AFLNET	8	1
II	System Hacking: Definition System Hacking, Ethical vs. Malicious Hackers, Stages Of System Hacking, Common System Hacking Methods, System Hacking Counter Measures and Protection, Other Methods Used By Hackers: Stenography, Buffer Overflow, Privilege Escalation, Vulnerability Chaining. System Hacking Tools: Nmap (Network Mapper), Metasploit Framework, John The Ripper and Hashcat, Kali Linux, Wireshark. Self learning: Write a Keylogger.	7	2

III	Web Application and Web server Hacking: What is Web Application, Working Of Web application, Types Of Attack. Vulnerability Assessment, vulnerability assessment tools, Penetration Testing, Penetration Testing Tools. Web Server Attack: Types Of Web Servers, Working Of Web Server, Functions Of Web Server, Benefits Of Web Server, Attacks On Web Server, Web Server Vulnerabilities, Web Server Misconfiguration, Burp Suite. Self learning: Vulnerabilities in Internet Information Servers	7	3
IV	Network Scanners and Network Sniffers: What is Network Sniffing, Working Of Network Sniffing, Types Of Network Sniffing, Placement Of Sniffer, Wired and Wireless Network Sniffing, Applications Of Network Sniffing, Network Flow Analysis, Network Sniffing Tools, Potential Risks Of Network Sniffers, Protection against Sniffers, Ethical and Unethical use Of Packet Sniffer, Detecting Sniffer in the Network, Defence/Counter Measures Against Network Sniffing. Network Scanner: Self learning: Machine Learning Driven Anomaly Detection.	8	4
V	Evading IDS, Firewall and HoneyPots: Methods to Detect Suspicious Activity in IDS, Challenges in IDS, IDS vs, IPS, Types Of Evasion Techniques for IDS, Tools for IDS Evasion, Firewall Evasion: Firewall Classification, Common Firewall Evasion Techniques, Tools for Firewall Evasion, Challenges in Firewall Evasion, The Sneaky Pizza Delivery in Firewall, HoneyPots: What is HoneyPot, Working Of HoneyPots, Use Of HoneyPots, Classification Of HoneyPots, Types Of HoneyPots, HoneyPot Evasion Techniques. Self Learning: AI Powered HoneyPots.	8	5
VI	Cryptography: Cryptography and its types, Applications Of Cryptography, Cryptographic Keys, Key Management, Cryptographic algorithms:(Symmetric Key) AES, DES, 3DES and RC4. Asymmetric Key: RSA, Diffie-Hellman and Elliptic Curve Cryptography. Hashing Algorithms: SHA and MD5. Use Case: Securing API communication, Blockchain security. Self Learning: Homomorphic encryption	7	6
Total		45	

List Of Tutorials :

Sr No.	Topic	COs
1	Case Study: Protocol Vulnerability Analysis	1
2	Network Scanner: Monitoring TCP/IP Connections Using CurrPorts Tool.	4
3	Basic Network Trouble Shooting Using MegaPing.	2
4	Extracting Administrator Password Using LCP.	2
5	System Monitoring Using RemoteExec.	3
6	Spoofing MAC Address Using SMAC.	4
7	Testing Web Application Using Burp Suit.	3
8	Detecting Intrusion Using Snort.	5

9	Exploiting Firefox Vulnerabilities using Metasploit	3
10	Implement Encryption Algorithm Using Python/Java/C/C++.	6

Evaluation and Assessment Scheme:**A. Internal Assessment Examination (IAE):**

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other

Note: Number of activities to be conducted under TAE would be as per the subject need.

Text Books:

1. Hacking: The Art Of Exploitation by Jon Erickson
2. Metasploit: The Penetration Tester's Guide by David Kennedy, Jim O'Gorman, Devon Kearns.
3. Penetration Testing: A Hands-On Introduction to Hacking
4. Applied Cryptography: Protocols, Algorithms, and Source Code in C by Bruce Schneier
5. Computer Hacking Beginners Guide by Alan T. Norman

Reference Books:

1. Introduction to Cyber Security by Mrs. Shalini Verma
2. Cyber Security: The complete guide to cyber threats and protection by David Sutton
3. Cyber Security By Vipul Baibhav

Important Links:

1. <https://nptel.ac.in/courses/106105217>
2. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
3. <https://online.stanford.edu/programs/advanced-cybersecurity-program>

Course Title: Web X.0												
Semester: VI			Term: Even				Course Code: 24ITPEC6021B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	--	2	3	--	1	4	20	20	60	25	-	125

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. To understand the digital evolution of web technology.
2. To learn TypeScript and programming in TypeScript for designing web applications.
3. To empower the use of Angular JS to create web applications that depends on the Model-View-Controller Architecture
4. Use NoSQL Database For Web Applications.
5. To build web applications using Flask framework.
6. Create different Web Application Using Different Frameworks.

Course Outcomes:

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

1. Understand the fundamental concepts of web analytics and semantic web development and deployment.
2. Comprehend the core features of TypeScript and apply them to minimize bugs and enhance code scalability.
3. Utilize the AngularJS framework to design and develop dynamic, responsive single-page web applications.
4. Implement MongoDB for seamless frontend and backend connectivity using RESTful APIs.
5. Apply the Flask web development framework to efficiently build scalable web applications with minimal code.
6. Develop rich internet applications by selecting and integrating appropriate frameworks effectively.

Module	Content	Hours	COs
1	Introduction to WebX.0 Evolution of WebX.0; Web Analytics 2.0: Introduction to Web Analytics, Web Analytics 2.0, Clickstream Analysis, Strategy to choose your web analytics tool, Measuring the success of a website; Web3.0 and Semantic Web: Characteristics of Semantic Web, Components of Semantic Web, Semantic Web Stack, N-Triples and Turtle, Ontology, RDF and SPARQL. Self-learning: Semantic Web Vs AI, SPARQL Vs SQL.	06	1

2	TypeScript Overview, TypeScript Internal Architecture, Environment Setup, Types, Variables and Operators, Decision Making and Loops, Functions, Classes and Objects, DOM manipulation, Inheritance, Modules. Self-learning: JavaScript Vs TypeScript	10	2
3	Introduction to AngularJS Overview, Need of AngularJS in web sites, Modules, Built-in & Custom Directives, Expressions, Data Binding, Filters, Controllers, Scope, Dependency Injection, Services, Form Validation, Routing (ng-Route), ng-Repeat, ng-style, ng-view, Built-in Helper Functions, Using AngularJS with TypeScript. Self-learning: MVC model, DOM model, JavaScript functions and Error Handling	09	3
4	MongoDB & REST API Understanding MongoDB, Data Types, Administering User Accounts, Configuring Access Control, Adding Driver to Node.js, Connecting to MongoDB from Node.js, Accessing & Manipulating Databases, Mongoose for Schema & Validation. REST API: Rules, Patterns, CRUD functions, Express & Mongoose, Testing Endpoints. Self-learning: MongoDB vs SQL DB	08	4
5	Flask Introduction, Environment Setup, App Routing, URL Building, HTTP Methods, Request Object, Cookies, File Uploading in Flask. Self-learning: Flask Vs Django	06	5
6	Rich Internet Application & Frameworks AJAX: Introduction, Working, Techniques for RIA: CSS, HTML, DOM, XML HTTP Request, JavaScript, PHP, AJAX as REST Client. Open Source Frameworks & CMS for RIA: Django, Drupal, Joomla. Self-learning: AJAX in Blogs, Wikis, RSS Feeds	06	6
Total		45	

List of Experiments :

Sr No.	List of Experiment	COs
1	Study web analytics using open source tools like Matomo, Open Web Analytics, AWStats, Countly, Plausible.	1
2	Study Semantic Web Open Source Tools like Apache TinkerPop, RDFLib, Apache Jena, Protégé, Sesame.	1
3	Small code snippets for programs like Hello World, Calculator using TypeScript.	2
4	Building a Simple Website with TypeScript	2

5	Create a simple HTML “Hello World” Project using AngularJS Framework and apply ng-controller, ng-model and expressions	3
6	Create an application for like Library Book Record using AngularJS	3
7	Write a program to use AJAX for user validation using and to show the result on the same page below the submit button	4
8	Design and develop small web application using AJAX, HTML and JSP.	4
9	Build a RESTful API using MongoDB.	5
10	Build a TypeScript REST API using MongoDB.	5
11	Design Weather App using Flask	6
12	Design Portfolio Website using Flask.	6

Evaluation and Assessment Scheme:**A. Internal Assessment Examination (IAE):**

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

References:

1. John Davies, Rudi Studer and Paul Warren, “Semantic Web Technologies Trends and Research in Ontology-based Systems”, Wiley, 2006 Edition.



2. Yakov Fain and Anton Moiseev, "TypeScript Quickly", Manning Publications, 2020 Edition.
3. Steve Fenton, "Pro TypeScript: Application - Scale Javascript Development", Apress, 2014 Edition.
4. Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications", 2nd Edition, AddisonWesley Professional, 2018 Edition.

Text Books:

1. John Hebler, Matthew Fisher, Ryan Blace, Andrew Perez-Lopez, "Semantic Web Programming", Wiley Publishing, Inc, 1st Edition, 2009.
2. Boris Cherny, "Programming TypeScript- Making Your Javascript Application Scale", O'Reilly Media Inc., 2019 Edition.
3. Adam Bretz and Colin J. Ihrig, "Full Stack JavaScript Development with MEAN", SitePoint Pty. Ltd., 2015 Edition.
4. Simon Holmes Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Manning Publications, 2019 Edition.
5. Dr. Deven Shah, "Advanced **Internet Programming**", **StarEdu Solutions, 2019 Edition.**
6. Miguel Grinberg, "Flask Web Development: Developing Web Applications with Python", O'Reilly, 2018 Edition

Useful Links:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed123/preview
2. <https://www.coursera.org/courses?query=web+development>

Course Title: DevOps												
Semester: VI			Term: Even				Course Code: 24ITPEC6022B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Or/Pr/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	--	2	3	--	1	4	20	20	60	25	-	125

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives

The Course aims:

1. **Understand** the cultural aspects, core principles, and the complete lifecycle of DevOps, integrating Agile methodologies.
2. **Utilize** essential DevOps tools for version control, continuous integration, and automated testing in a collaborative environment.
3. **Design and implement** basic continuous delivery pipelines to automate the build, test, and deployment phases.
4. **Explore** modern concepts like containerization and infrastructure as code (IaC) for consistent and reproducible environments.
5. **Analyze and apply** monitoring and logging mechanisms for observing system performance and ensuring operational stability.
6. **Evaluate** different DevOps practices and tools to select appropriate solutions for specific software development and operational needs.

Course Outcomes

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

1. Explain the core concepts, methodologies, and cultural shift associated with DevOps and its relationship with Agile development.
2. Apply effective version control strategies and integrate automated testing into the CI process using relevant tools.
3. Design and implement an end-to-end CI/CD pipeline for a given application using popular CI/CD platforms.
4. Utilize containerization technologies like Docker and basic orchestration with Kubernetes to manage application environments.
5. Analyze system performance, troubleshoot issues, and ensure system reliability using monitoring, logging, and feedback mechanisms.
6. Justify and select the appropriate DevOps tools, strategies, and cloud services for real-world software engineering scenarios.

Module	Content	Hours	CO
1	Introduction to DevOps Culture and SDLC Definition and benefits of DevOps. The Three Ways of DevOps (Flow, Feedback, Continuous Learning). DevOps lifecycle: Plan, Code, Build, Test, Release, Deploy, Operate, Monitor. Integration with Agile, Scrum, and Kanban methodologies. Introduction to DevSecOps.	6	1
2	Version Control and Continuous Integration CI Git fundamentals (branching strategies, pull requests). CI principles. Build automation (Maven/Gradle). Integrating unit tests and code quality analysis (SonarQube). Tools: Git, GitHub/GitLab, Jenkins/GitHub Actions.	8	2
3	Containerization Introduction to Docker: images, containers, Dockerfiles, Docker Hub. Running multi-container applications with Docker Compose. Benefits for consistency in development/testing environments.	8	3
4	Container Orchestration and Infrastructure as Code (IaC) Introduction to Kubernetes (K8s) architecture (Pods, Services, Deployments). Principles of IaC. Introduction to configuration management using Ansible (playbooks, modules, roles).	7	4
5	Continuous Delivery (CD) & Cloud Platforms Designing and implementing a complete CI/CD pipeline. Deployment strategies (Blue-Green, Canary). Integrating with cloud services (AWS/Azure/GCP overview). Artifact management.	8	5
6	Monitoring, Logging, and Feedback Loops Importance of observability. Key metrics (availability, latency). Centralized logging (ELK stack overview). Monitoring and alerting tools (Prometheus, Grafana). Incident response and the importance of feedback loops for continuous improvement.	8	6
Total		45	

List Of Experiments:

Sr No	Experiment Title	CO
1	Setup Git on a local machine. Create a local repository, perform basic operations (commit, status, log). Work with branching strategies (create, switch, merge branches). Resolve merge conflicts manually.	1
2	Create a remote repository on GitHub/GitLab. Clone it locally, push local changes to the remote, and perform a pull request with a peer to simulate collaborative development.	1

3	Install and configure a CI server (Jenkins/GitHub Actions). Integrate a sample source code repository (e.g., a simple Java/Python application). Configure the CI job to automatically build the application upon a code commit.	2
4	Enhance the CI job from Experiment 3 to include automated unit testing. Integrate a code quality tool (e.g., SonarQube) to scan the code and display the results within the CI dashboard.	3
5	Write a Dockerfile to containerize a simple web application (e.g., Nginx, Python Flask app). Build the image locally, tag it, and push it to Docker Hub. Run the container and verify access.	4
6	Use Docker Compose to set up a multi-container application (e.g., a web application and a database server). Configure environment variables and basic container networking to allow communication between services.	4
7	Set up a virtual lab environment (e.g., two VMs: one control node, one managed node). Write an Ansible inventory file and a basic playbook to perform a task (e.g., install Apache web server, start the service, and deploy a static HTML page).	5
8	Create an end-to-end pipeline in Jenkins (or GitHub Actions) that: 1. Pulls the code, 2. Builds the Docker image (from Exp 5), 3. Pushes the image to a registry, and 4. Deploys the container to a local environment or a basic cloud service.	5
9	Set up a local Kubernetes cluster (e.g., Minikube). Write a K8s Deployment manifest (YAML) to deploy the application image from Experiment 5. Expose the application using a K8s Service and access it via a browser.	6
10	Set up basic monitoring for a running containerized application using Prometheus and Grafana. Configure Prometheus to scrape metrics from the application and visualize the data in a Grafana dashboard.	6

Evaluation and Assessment Scheme:

A. Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

C. Continuous Assessment (CA):

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study

3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flipped Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other.

Note: Number of activities to be conducted under TAE would be as per the subject need.

Text Books:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by Gene Kim, Jez Humble, Patrick Debois, and John Willis IT Revolution Press
2. The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win by Gene Kim, Kevin Behr, and George Spafford IT Revolution Press
3. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation by Jez Humble and David Farley Addison-Wesley Professional

Reference Books:

1. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale by Jennifer Davis and Katherine Daniels O'Reilly Media
2. Ansible: Up and Running: Automating Configuration Management and Deployment by Lorin Hochstein and Rene Moser O'Reilly Media
3. Kubernetes: Up and Running: Dive into the Future of Infrastructure by Kelsey Hightower, Brendan Burns, Joe Beda O'Reilly Media

Important Links:

1. <https://nptel.ac.in/courses/128106012>
2. <https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/azure-devops-and-micro-services-azure-kubernetes-deployment-models/?v=13b5bfe96f3e>
3. https://skillsacademy.iitm.ac.in/course_details.php?courseID=35&cart=



Course Title: Employability Enhance Program- III (Industry Certification)

Semester: VI			Term: Even				Course Code: 24ITVSE601B						
Teaching Scheme							Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE2	ESE	CA	OR/PR	Total	
Th	Tu	Pr	Th	Tu	Pr								
-	-	2	-	-	1	1	-	-	-	-	25	25	

Introduction

As global competition intensifies, industries seek candidates who are not only skilled but also adaptable and ready to meet the demands of an evolving workforce. To bridge the gap between academic learning and industry expectations, SJCEM has introduced certification courses aimed at preparing students for impactful internships. These courses provide students with essential knowledge and skills, empowering them to excel in professional environments and increase their employability.

Objectives: The objectives of this course are to

1. Develop Professional Skills
2. Enhance Technical Competency
3. Cultivate Problem-Solving Abilities
4. Promote Ethical and Professional Conduct
5. Familiarize with Industry Standards and Expectations
6. Prepare for a Transition from Classroom to Workplace

Outcomes: After completion of this course, students will be able to

1. Communicate and Collaborate Effectively
2. Acquire Job-Ready Technical Skills
3. Enhanced Critical Thinking and Problem-Solving
4. Understand Ethical and Professional Standards
5. Use Industry Tools and Standards
6. Industry Integration effectively

Certification GUIDELINES:

The general procedure for organizing certification courses is as follows:

1. Identification of Industry Partners

Industries have been identified to provide in-house certification courses in various domains. Students are regularly informed and encouraged to pursue these certification courses.

2. Selection of Certification Domain

Students can choose two domains of their interest for the certification course and express their willingness to pursue the certification.

Following combination of domains are offered in the even semesters:



	Domain 1	Domain 2
Track 1	SQL	Dotnet
Track 2	CCNA	AI-IBM
Track 3	Cyber Security	AI-IBM
Track 4	Creo	Solid Works
Track 5	Data Science	Prompt Engineering and AI
Track 6	MernStack	Flutter
Track 7	Augmented Reality- Virtual Reality	Game Development
Track 8	Drone	Data Analytics
Track 9	IELTS/GRE	Certificate in Social Science
Track 10	Robotic	IOT
Track 11	Blockchain Basics	Blockchain Intelligence
Track 12	AWS	MernStack
Track 13	Microsoft Tools	AI-IBM
Track 14	Augmented Reality	Virtual Reality
Track 15	Professional Edge Training (PET)	

3. Allocation of Tracks

Each track can accommodate a maximum of 60 students or as per the availability of maximum seats. Allocation will be based on a first-come first-served basis. However, the institute reserves the right to reassign tracks as per the requirement.

4. Course Duration

Students have to complete the certification course, which has a minimum duration of 30 hours.

5. Oral & Practical Exam

Based on the entire syllabus, oral (20 marks) & practical/implementation (30 marks) examination will be conducted. Grades will be assigned as per the examination rules.

Note: A minimum of 90% attendance is required to award the certificate. If a student fails to meet this requirement, the student needs to re-register for the course internally or externally until successfully completed.

Course Title: Internship- II

Semester: VI			Term: Even			Course Code: 24ITOJT601B						
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pra ct/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
-	-	3	-	-	1	1	-	-	-	-	25	25

Introduction

The rise in global competition has prompted organizations to devise strategies to have a talented and innovative workforce to gain a competitive edge. Developing an internship policy is an impactful strategy for creating a future talent pool for the industry. The internship (a form of experiential learning) program helps fresh pass-outs in gaining professional know-how and benefits corporate sectors. The internship also enhances the student's employability skills passing out from Technical Institutions.

Objectives: The objectives of this course are to

1. Integration of workshop with workplace in physical and/or hybrid model.
2. Developing research aptitude in emerging technologies
3. Enhance entrepreneurial capabilities and professional competency
4. Development of decision-making and teamwork skills
5. Cultivate a sense of Social Imagery and Citizenship Responsibility

Outcomes: After completion of this course, students will be able to

1. Apply practical skills effectively in physical and hybrid workplace settings.
2. Conduct and communicate research on emerging technologies.
3. Demonstrate creative problem-solving and an entrepreneurial mindset.
4. Meet industry standards with strong communication and technical skills.
5. Collaborate effectively and make informed decisions within teams.

INTERNSHIP GUIDELINES:

- The students should apply for internships of their choice with the permission of the Institute.
- The internship duration ranges from 4 to 6 weeks and is scheduled during the summer vacation period for students.
- Industry will confirm the training slots and the number of seats allocated for internships via confirmation letter/ email.
- Students on joining Training at the concerned Industry / Organization, submit the Joining Report/Letters / Email.
- Students undergo industrial training at the concerned Industry / Organization.
- Training and placement team will visit the industry and evaluate(s) the performance of students regularly and evaluation Report of the students is submitted in department office/TPO with the consent of Industry persons/ Trainers.
- Students will submit training report after completion of internship.
- Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training.



St. John College of Engineering and Management

Autonomous Institute

(A Christian Religious Minority Institution)

Approved by AICTE and DTE, Affiliated to University of Mumbai / MSBTE

DTE Code : 3218 AICTE Permanent ID : 1-4790201



NAAC Accredited with Grade 'A+', Three Programs NBA Accredited

Bachelor of Technology In Information Technology

Fourth Year Semester – VIII

SJCEM : R-24

Effective from Academic Year 2025-26

Scheme for Final Year (Eighth Semester)

Information Technology (With Effect from 2025-2026)

Semester VIII

Course Code	Vertical	Course Name	Contact Hours			Credits Allotted			Total Credit
			Th	Tu	Pr	Th	Tu	Pr	Total
24ITPCC801B	PCC	Blockchain and DLT	3	-	2	3	-	1	4
24ITPEC801XB	PEC	Department Level Optional Course 5	3	-	-	3	-	-	3
24ITPEC802XB	PEC	Department Level Optional Course 6	3	-	-	3	-	-	3
24ILO802XB	OE	Institute Level Optional Course 2	3	-	-	3	-	-	3
24ITVSE802B	VSEC	Cloud computing	-	-	2	-	-	1	1
24ITVSE801B	VSEC	Industry Certification	-	-	-	-	-	1	1
24ITPRJ801B	PRJ	Major Project 2 / Internship - III	-	-	10	-	-	5	5
Total			12	0	14	12	0	8	20

Course Code	Vertical	Course Name	Evaluation Scheme					
			Theory			Practical		Total
			IAE 1	IAE 2	ESE	CA	OR/PR	
24ITPCC801B	PCC	Blockchain and DLT	20	20	60	25	25	150
24ITPEC801XB	PEC	Department Level Optional Course 5	20	20	60	-	-	100
24ITPEC802XB	PEC	Department Level Optional Course 6	20	20	60	-	-	100
24ILO802XB	OE	Institute Level Optional Course 2	20	20	60	-	-	100
24ITVSE802B	VSEC	Cloud computing	-	-	-	25	25	50
24ITVSE801B	VSEC	Industry Certification	-	-	-	-	25	25
24ITPRJ801B	PRJ	Major Project 2 / Internship - III	-	-	-	75	50	125
Total			80	80	240	125	125	650



Department Optional Courses

Course Code	Sem. VIII: Department Optional Course- 5	Course Code	Sem. VIII: Department Optional Course – 6
24ITPEC8011B	Big Data Analytics	24ITPEC8021B	User Interface Design
24ITPEC8012B	Reinforcement learning	24ITPEC8022B	Robotics
24ITPEC8013B	Simulation and Modeling	24ITPEC8023B	Enterprise Resource Planning
24ITPEC8014B	Knowledge Management	24ITPEC8024B	Cloud computing and Services
24ITPEC8015B	Data Analytics Using Python	24ITPEC8025B	Full Stack Development

Institute Elective Courses

Course Code	Institute Elective Course-II #
24ILO8021B	Project Management
24ILO8022B	Finance Management
24ILO8023B	Entrepreneurship Development and Management
24ILO8024B	Human Resource Management
24ILO8025B	Professional Ethics and CSR
24ILO8026B	Research Methodology
24ILO8027B	IPR and Patenting
24ILO8028B	Digital Business Management
24ILO8029B	Environmental Management

Common with all branches

Course Title: Blockchain and DLT

Semester: VIII			Term: EVEN				Course Code: 24ITPCC801B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	2	3	-	1	4	20	20	60	25	25	150

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The course aims

1. To get acquainted with the concept of Distributed ledger system and Blockchain
2. To learn the concepts of consensus and mining in Blockchain through the Bitcoin network.
3. To understand Ethereum and develop-deploy smart contracts using different tools and frameworks.
4. To understand permissioned Blockchain and explore Hyperledger Fabric.
5. To understand different types of crypto assets.
6. To apply Blockchain for different domains IOT, AI and Cyber Security.

Course Outcomes:

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

1. Describe the basic concept of Blockchain and Distributed Ledger Technology.
2. Interpret the knowledge of the Bitcoin network, nodes, keys, wallets and transactions
3. Implement smart contracts in Ethereum using different development frameworks.
4. Develop applications in permissioned Hyperledger Fabric network.
5. Interpret different Crypto assets and Crypto currencies
6. Analyze the use of Blockchain with AI, IoT and Cyber Security using case studies.

Module	Content	Hours	CO
I	Introduction to DLT and Blockchain Introduction to Blockchain: Technical definition of Blockchain. Elements of a blockchain Features of Blockchain Type of Blockchain, What is DLT. DLT V/ Blockchain CAP theorem Byzantine Generals Problem Consensus Mechanism and its Type Cryptographic primitives and data structure used in blockchain Block in a Blockchain: Structure of a Block, Block Header Hash and Block Height, The Genesis Block, Linking Blocks in the Blockchain, Merkle Tree. Self-learning Topics: Blockchain Demo	06	CO1
II	Bitcoin What is Bitcoin and the history of Bitcoin, Bitcoin Transactions, Bitcoin Concepts: keys, addresses and wallets, Bitcoin Transactions, UTXO. Validation of transactions, Bitcoin Keys , Addresses, ECC , Base58 , BIP-38 , Pay-to-Script and Multisig Addresses, Vanity Addresses , Concept of Wallet, Wallet Technologies in Bitcoin HD wallet from Seed. Transaction Scripts and Scripts address, Bitcoin Mining and Difficulty levels Structure of Blocks and Blockheader and Genesis Block , linking of Block. Bitcoin Network: Bitcoin Core node and API, Peer-to Peer Network Architecture, Node Types and Roles, Incentive based Engineering, The Extended Bitcoin Network, Bitcoin Relay Networks, Network Discovery, Full Nodes, Exchanging “Inventory”, Simplified Payment Verification (SPV) Nodes, SPV Nodes and Privacy, Transaction Pools, Blockchain Forks Bitcoin Testnet Basics of Bitcoin Forensics: Analysis of Address and Wallet , Clustering of Addresses following Money Self-learning Topics: Study and compare different consensus algorithms like PoA, PoS, pBFT	10	CO2
III	Permissionless Blockchain: Ethereum Introduction to Ethereum, Ethereum 1.0 and 2.0 , Turing completeness EVM and compare with bitcoin Basics of Ether Units, Ethereum Wallets Working with Metamask EOA and Contracts Transaction:: Structure of Transaction, Transaction Nonce, Transaction GAS, Recipient, Values and Data, Transmitting Values to EOA and Contracts Smart Contracts and Solidity Development environment and client , Basic of Solidity and Web 3 Life cycle of Smart contract, Smart Contract programming using solidity, Metamask (Ethereum Wallet), Setting up development environment, Use cases of Smart Contract, Smart Contracts: Opportunities and Risk. Smart Contract Deployment: Introduction to Truffle, Use of Remix and test networks for deployment Self-learning Topics: Smart contract development using Java or Python	11	CO3

IV	Permissioned Blockchain: Hyperledger Fabric Introduction to Framework, Tools and Architecture of Hyperledger Fabric Blockchain. Components: Certificate Authority, Nodes, Chain codes, Channels, Consensus: Solo, Kafka, RAFT Designing Hyperledger Blockchain Other Challenges: Interoperability and Scalability of blockchain Self-learning Topics: Fundamentals of Hyperledger Composer	08	CO4
V	Crypto assets and Cryptocurrencies ERC20 and ERC721 Tokens, comparison between ERC20 & ERC721, NFT, ICO, STO, Different Crypto currencies Self-learning Topics: Defi, Metaverse, Types of cryptocurrencies	05	CO5
VI	Blockchain Applications & case studies Blockchain in IoT, AI, Cyber Security Self-learning Topics: Applications of Blockchain in various domains Education, Energy, Healthcare, real estate, logistics, supply chain	05	CO6
Total		45	

List of Experiments:

Exp. No.	List of Experiments	CO
1	Introduction to blockchain development and testing smart contracts on local blockchain using Truffle and Remix IDE Mini Project: Allocation of the groups	CO1
2	Smart contract development and deployment using Metamask and Remix Mini Project: Topic selection	CO3
3	Write smart contracts using conditional statements in Solidity. Mini Project: Study the required programming language for smart contract	CO3
4	Write smart contracts using loops in Solidity. Mini Project: Study the required programming language for smart contract	CO3
5	Write smart contracts using object-oriented concepts such as inheritance and polymorphism in Solidity. Mini Project: Study the required programming language for smart contract	CO3
6	Ethereum Test networks (Ropsten/Gorelli/Rinkeby), deployment on test networks, Web3.js/Web3.py for interaction with Ethereum smart contract Mini Project: Topic validation and finalizing software requirements	CO3
7	Chain code development in Hyperledger fabric	CO4
8	Chain code deployment in Hyperledger fabric Mini project: Study required front end tools	CO4
9	Implementation of Mini Project 1. Design, configure and testing of mini project 2	CO1-CO6
10	Implementation of Mini Project 1. Design, configure and testing of mini project 2. Report submission as per guidelines	CO1-CO6

Evaluation Scheme and Assessment:

A. Internal Assessment Examination:

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

B. End Semester Theory Examination:

The End Semester exam of 60 Marks will be conducted based on the entire syllabus.

C. Continuous Assessment / Term Work (CA / TW):

1. Term work should consist of 8 - 10 experiments / tutorials (whichever is applicable)
2. Journal must include at least 02 assignments based on different pedagogy in group wise manner
3. The final certification and acceptance of term work ensures the satisfactory performance of laboratory work, attendance and minimum passing marks in term work.
4. Total 25 Marks: (Minimum passing marks is 40%)

Experiments/ Tutorials: 10 marks

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study
3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flip Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other

Note: Number of activities to be conducted under TAE would be as per the subject need.

D. Oral & Practical Exam

Based on the entire syllabus, oral/ viva (10 marks) & practical/implementation (15 marks) examination will be conducted.

Reference Books:

1. Mastering Blockchain, Imran Bashir, Packt Publishing
2. Mastering Bitcoin Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media
3. Blockchain Technology: Concepts and Applications, Kumar Saurabh and Ashutosh Saxena, Wiley.
4. The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them, Antony Lewis. for Ethereum and Blockchain, Ritesh Modi, Packt publication.
5. Mastering Bitcoin Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media.



Text Books: (3 to 5)

1. “Mastering Bitcoin, PROGRAMMING THE OPEN BLOCKCHAIN”, 2nd Edition by Andreas M. Antonopoulos, June 2017, Publisher(s): O'Reilly Media, Inc. ISBN: 9781491954386.
2. Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly.
3. Blockchain Technology, Chandramouli Subramanian, Asha A George, Abhillash K. A and Meena Karthikeyan, Universities press.
4. Hyperledger Fabric In-Depth: Learn, Build and Deploy Blockchain Applications Using Hyperledger Fabric, Ashwani Kumar, BPB publications
5. Solidity Programming Essentials: A beginner's Guide to Build Smart Contracts for Ethereum and Blockchain, Ritesh Modi, Packt publication
6. Cryptoassets: The Innovative Investor's Guide to Bitcoin and Beyond, Chris Burniske & Jack Tatar

Useful Links: (3 to 5 – You tube links, MOOCs, Blogs, Podcast, Swayam, Reputed Journals and research articles etc.)

1. NPTEL courses:
 - a. Blockchain and its Applications,
 - b. Blockchain Architecture Design and Use Cases
2. www.swayam.gov.in/
3. www.coursera.org
4. <https://ethereum.org/en/>
5. <https://www.trufflesuite.com/tutorials>
6. <https://hyperledger-fabric.readthedocs.io/en/release-2.2/whatis.h>
7. Blockchain demo: <https://andersbrownworth.com/blockchain/>
8. Blockchain Demo: Public / Private Keys & Signing: <https://andersbrownworth.com/blockchain/public-private-keys/>



Course Title: Big Data Analytics

Semester: VIII			Term: EVEN				Course Code: 24ITPEC8011B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The course aims

1. To provide an overview of an exciting growing field of Big Data analytics.
2. To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
3. To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
4. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
5. To introduce to the students several types of big data like social media, web graphs and data streams.
6. To enable students to have skills that will help them to solve complex real-world problems in decision support.

Course Outcomes:

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

1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store, retrieve and process Big Data for Analytics.
3. Implement several Data Intensive tasks using the Map Reduce Paradigm.
4. Apply several newer algorithms for Clustering Classifying and finding associations in Big Data.
5. Design algorithms to analyze Big data like streams, Web Graphs and Social Media data.
6. Design and implement successful Recommendation engines for enterprises.

Module	Content	Hours	CO
I	Introduction to Big Data Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, BigData Challenges, Examples of Big Data in Real Life, Big Data Applications Self-learning Topics: Identification of Big Data applications and its solutions	05	CO1
II	Introduction to Big Data Frameworks What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Working with Apache Spark What is NoSQL? NoSQL data architecture patterns: Key value stores, Graph stores, Column family (Bigtable) stores, Document stores, MongoDB Self-learning Topics: HDFS vs GFS, MongoDB vs other NoSQL system, Implementation of Apache Spark	07	CO2
III	MapReduce Paradigm MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping with Node Failures. Algorithms Using MapReduce: Matrix Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step. Illustrating use of MapReduce with use of real-life databases and applications. Self-learning Topics: Implementation of MapReduce algorithms like Word count, Matrix-Vector and Matrix Matrix algorithm	09	CO3
IV	Mining Big Data Streams The Stream Data Model: A DataStream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing. Sampling Data in a Stream: Sampling Techniques. Filtering Streams: The Bloom Filter Counting Distinct Elements in a Stream: The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements. Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-Indyk, Motwani Algorithm, Query Answering in the DGIM Algorithm. Self-learning Topics: Streaming services like Apache Kafka/Amazon Kinesis/Google Cloud DataFlow. Standard spark streaming library. Integration with IOT devices to capture real time stream data.	08	CO4
V	Big Data Mining Algorithms Frequent Pattern Mining: Handling Larger Datasets in Main Memory Basic Algorithm of Park, Chen, and Yu. The SON Algorithm and MapReduce. Clustering Algorithms: CURE Algorithm. Canopy Clustering, Clustering with MapReduce Classification Algorithms: Overview SVM classifiers, Parallel SVM, KNearest Neighbor classifications for Big Data, One Nearest Neighbour. Self-learning Topics: Standard libraries included with spark like graphX, MLlib	08	CO5

VI	Big Data Analytics Applications Link Analysis : PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: PageRank Iteration Using MapReduce, Topic sensitive Page Rank, link Spam, Hubs and Authorities, HITS Algorithm. Mining Social- Network Graphs : Social Networks as Graphs, Types , Clustering of Social Network Graphs, Direct	08	CO6
Total		45	

Evaluation Scheme and Assessment:

Internal Assessment Examination:

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination:

The End Semester exam of 60 Marks will be conducted based on the entire syllabus.

References Books:

1. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Bart Baesens , WILEY Big Data Series.
2. Big Data Analytics with R and Hadoop by Vignesh Prajapati Paperback, Packt Publishing Limited
3. Hadoop: The Definitive Guide by Tom White, O'Reilly Publications.

Text Books:

1. Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press.
2. Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press.
3. Professional NoSQL Paperback, by Shashank Tiwari, Dreamtech Press
4. Rajkumar Buyya, ,Rodrigo N. Calheiros and Amir Vahid Dastjerdi, "Big Data Principles and Paradigms", Morgan Kaufmann

Useful Links:

1. <https://nptel.ac.in/courses/106/104/106104189/>
2. <https://nptel.ac.in/courses/106106142/>
3. <https://nptel.ac.in/courses/106105186/>



Course Title: Reinforcement learning												
Semester: VIII			Term: EVEN				Course Code: 24ITPEC8012B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100
IAE: Internal Assessment Examination ESE: End Semester Examination CA: Continuous Assessment Course Objectives: The course aims 1. Define the key features of reinforcement learning that distinguishes it from AI and non-interactive machine learning. 2. Introduce to statistical learning techniques where an agent explicitly takes actions and interacts with the world. 3. Implement in code common RL algorithms. 4. Describe multiple criteria for analysing RL algorithms & evaluate algorithms on these metrics: e.g. regret, sample complexity, computational complexity, empirical performance, convergence, etc. 5. Know how to implement dynamic programming as an efficient solution approach to an industrial control problem. 6. Explore solutions to the Exploration-Exploitation Dilemma. Course Outcomes: At the end of the course students will be able to: 1. Learn how to define RL tasks and the core principles behind the RL, including policies,value functions deriving Bellman equations 2. Evaluate work with tabular methods to solve classical control problems. 3. Apply Markov Decision Processes to solve real-world problems 4. Understand the dynamic programming for policy Evaluation. 5. Implement reinforcement learning problems based on averaging sample returns using Monte Carlo method. 6. Recognize current advanced techniques and applications in RL.												

Module	Content	Hours	CO
I	Introduction to Reinforcement Learning: Reinforcement Learning: Key features and Elements of RL, Types of RL, rewards. Reinforcement Learning Algorithms: Q-Learning, State Action Reward State Action (SARSA) Self-learning Topics: Deep Q Neural Network (DQN), Applications of RL	07	CO1
II	Bandit problems and online learning: An n-Armed Bandit Problem, Action-Value Methods Tracking a Nonstationary Problem, Optimistic Initial Values Upper-Confidence-Bound Action Selection Gradient Bandits Self-learning Topics: Associative Search (Contextual Bandits)	08	CO2
III	Markov Decision Processes: The Agent-Environment Interface, Goals and Rewards, Returns, Markov properties, Markov Decision Process, Value Functions and Optimal Value Functions, Self-learning Topics: Optimality and Approximation	08	CO3
IV	Dynamic Programming: Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration Self-learning Topics: Policy Evaluation (Prediction), Policy Improvement	07	CO4
V	Monte Carlo Methods and Temporal-Difference Learning Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, TD Prediction, TD control using Q-Learning Self-learning Topics: Off-policy Prediction via Importance Sampling	08	CO5
VI	Applications and Case Studies Elevator Dispatching, Dynamic Channel Allocation, Job-Shop Scheduling Self-learning Topics: Study of applications.	07	CO6
Total		45	

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus.



References Books:

1. Maxim Lapan, Deep Reinforcement Learning Hands-On: Apply modern RL methods, with deep Q-networks, value iteration, policy gradients, TRPO, AlphaGo Zero.
2. Csaba Szepesvári, Algorithms for Reinforcement Learning, Morgan & Claypool Publishers
3. Alberto Leon-Garcia, Probability, Statistics and Random Processes for Electrical Engineering, Third Edition, Pearson Education, Inc.

Text Books:

1. Reinforcement Learning: An Introduction, by Richard S. Sutton and Andrew G. Barto
2. Alessandro Palmas, Dr. Alexandra Galina Petre, Emanuele Ghelfi, The Reinforcement Learning Workshop: Learn how to Apply Cutting-edge Reinforcement Learning Algorithms to a Wide Range of Control Problems, 2020 Packt publishing.
3. Phil Winder, Reinforcement Learning Industrial Applications with Intelligent Agents, O'Reilly
4. Dr Engr S M Farrukh Akhtar, Practical Reinforcement Learning, Packt Publishing, 2017.



Course Title: Simulation And Modelling												
Semester: VIII			Term: EVEN				Course Code:24ITPEC8013B					
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives:

The Course aims

1. To introduce the discrete event simulation systems.
2. To discuss the modelling techniques of entities, queues, resources and entity transfers in the discrete event environment.
3. To formulate and apply the statistical models in simulation and queuing theory.
4. To gain knowledge of random numbers, random variates and various statistical tests on random numbers.
5. To formulate and build valid models and perform simulation analysis of the system and analyze results properly.
6. To familiarize with various applications of Simulation.

Course Outcomes:

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

1. Understand the meaning of simulation and identify the common applications of discrete-event system simulation.
2. Practice formulation and modeling skills.
3. Analyze events and inter-arrival time, arrival process, queuing strategies, resources and disposal of entities using statistical models.
4. Understand pseudo-random numbers and perform statistical tests to measure the quality of pseudo-random numbers.
5. Apply different distributions to fit the collected data and describe the process of verification and validation of simulation models
6. Describe various applications of simulation.

Module	Content	Hours	CO
I	Introduction to Simulation Simulation Definition, When Simulation is an appropriate tool and when it is not, Advantages and disadvantages of simulation, Areas of application of simulation, System and its types, Models and its types, Steps in simulation study Self-learning Topics: Monte Carlo simulation	07	CO1
II	Simulation Examples and General Principles Simulation Process, Simulation of Single-server and multi-server queuing systems, Simulation of (M, N) Inventory and Newspaper Seller Problem, Simulation of Lead-time Demand Concepts in Discrete Event Simulation, Event Scheduling Algorithm, Manual Simulation of Single Server and Dump Truck Problem using Event Scheduling Algorithm Self-learning Topics: Simulation of Reliability Problem, Process Interaction Approach in Simulation.	09	CO2
III	Mathematical, Statistical and Queueing Models in Simulation Statistical Models: Terminology and concepts, Useful statistical models, Discrete Distributions (Bernoulli's trial, Binomial and Negative Binomial, Poisson Distributions), Continuous Distributions (Exponential, Uniform, Erlang, Triangular and Normal Distributions), Poisson Process, Queueing Models: Queueing Notations, Long Run Performance Measures, M/M/1 and M/G/1 Queueing Systems Self-learning Topics: Introduction to Statistical Models, Useful Statistical Models	08	CO3
IV	Random Numbers and Variates Random Number Generation: Why are random numbers required in simulation? Properties of random numbers, Linear Congruential Method to generate Random Numbers, Test for Uniformity: Kolmogorov-Smirnov, Chi-Square, Test for Independence: Runs up and runs down, Runs above and below mean, Poker test), Random Variate Generation: Inverse Transform Technique, Direct Transformation for Normal and Lognormal distribution, Acceptance Rejection Technique Self-learning Topics: Tests for Autocorrelation	09	CO4
V	Analysis of Simulation Data Steps in Input Modeling, Goodness-of-fit tests, Selecting Input Model without data, Multivariate and Time Series Models, Model Building verification and validation, Verification of simulation models, Naylor and Finger Approach for calibration and Validation of simulation models Self-learning Topics: Input-Output Validation: Using Historical Input Data	07	CO5
VI	Applications of Simulation High-Level Computer-System Simulation and Memory Simulation, Simulation of Manufacturing and Material Handling Systems Self-learning Topics: Simulation of Computer Networks	05	CO6
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus.

References Books:

1. A. M. Law and W. D. Kelton (2000), Simulation Modeling and Analysis, 4th Ed., McGraw Hill.
2. K. S. Trivedi (2001), Probability and Statistics with Reliability, Queuing and Computer Science Applications, Eastern Economy Edition, Prentice-Hall (India).
3. Banks C M, Sokolowski J A, Principles of Modeling and Simulation, Wiley Geoffrey Gordon, System Simulation, EEE.
4. Narsing Deo, System Simulation with Digital Computer; PHI.

Text Books:

1. J. Banks, J. S. Carson, B. L. Nelson and D. M. Nicol (2001), Discrete Event System Simulation, 3rd Ed., Prentice-Hall.
2. J. Banks, J. S. Carson, B. L. Nelson and D. M. Nicol (2001), Discrete Event System Simulation, 4th Ed., Prentice-Hall.

Useful Links:

1. <https://www.udemy.com/course/discrete-event-system-simulation/>
2. https://www.tutorialspoint.com/modelling_and_simulation/index.html



Course Title: Knowledge Management												
Semester: VIII			Term: EVEN				Course Code:24ITPEC8014B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100
IAE: Internal Assessment Examination ESE: End Semester Examination CA: Continuous Assessment Course Objectives: The course aims 1. Establish a foundation of key terms and concepts, historical events and contributions, organizational benefits, and guiding principles on which to build greater understanding of knowledge management. 2. Appreciate the role and use of knowledge for individuals, as well as organizations and institutions. 3. Increase information and understanding about knowledge transfer using low- and high technology strategies. 4. Explore the future of knowledge management and its influence on our jobs, communities, and society. 5. Explore different tools for knowledge codification and knowledge transfer. 6. Discuss impact of knowledge management on product, people and organization, etc. with qualitative and quantitative measures Course Outcomes: At the end of the course students will be able to: 1. Discuss KM, learning organizations, intellectual capital and related terminologies in clear terms and understand the role of knowledge management in organizations. 2. Demonstrate an understanding of the history, concepts, and the antecedents of management of knowledge and describe several successful knowledge management systems. 3. Evaluate the impact of technology including telecommunications, networks, and Internet/intranet role in managing knowledge. 4. Discuss new jobs, roles and responsibilities resulting from the New or Knowledge Economy Ponder KM’s current and future impact on individuals, organizations and society at large. 5. Apply different tools for knowledge transfer and Business Intelligence in knowledge sharing. 6. Analyze different modes of knowledge conversion and testing tools for knowledge codification.												

Module	Content	Hours	CO
I	Introduction to Knowledge Management What is Knowledge? Data, information and knowledge, Knowledge management process, Types of expertise – associational, motor skill, theoretical Characteristics of knowledge – explicitness, codifiability, teachability, specificity, Reservoirs of knowledge, Meaning of Knowledge Management, Forces Driving Organizational issues in KM, KM Systems & their role, Relevance of KM in today's dynamic & complex environment, Future of Knowledge Management Self-Learning Topics: Study the various KM process.	07	CO1
II	Knowledge management system life cycle Challenges in Building KM Systems – Conventional versus KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation, Knowledge Architecture. Self-Learning Topics: Case study for KMSLS	08	CO2
III	KM Solutions for capture, sharing & applications KM Processes, KM Systems, Mechanisms & Technologies, Knowledge Capturing Techniques: Brainstorming – Protocol Analysis – Consensus Decision Making – Repertory Grid- Concept Mapping –Blackboarding, Nominal Group Technique, Delphi method. Self-Learning Topics: Study various technologies used in KM in industry.	08	CO3
IV	Knowledge codification Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developer's Skill Sets – System Testing and Deployment – Knowledge Testing–Approaches to Logical Testing, User Acceptance Testing – KM System Deployment Issues – User Training – Post implementation. Self-Learning Topics: Study different tools for testing for KM.	07	CO4
V	Knowledge transfer and sharing Transfer Methods – Role of the Internet – Knowledge Transfer in e-world – KM System Tools – Neural Network – Association Rules – Classification Trees –Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing, Knowledge Workers. Self-Learning Topics: Case study for transfer	08	CO5
VI	KM Impact Dimensions of KM Impact – People, Processes, Products & Organizational Performance Factors Influencing impact – universalistic & contingency views Assessment of KM Impact – Qualitative & quantitative measures, Identification of appropriate KM solutions, Competing with Business Analytics ,Caveats for managing Knowledge and Business Intelligence, Corporate social Responsibility, Ethical Legal and Managerial Issues: PAPA, Security and controls. Self-Learning Topics: Case study on KM impact.	07	CO6
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus.

References Books:

1. Madanmohan Rao (2004). Knowledge Management Tools and Techniques: Practitioners and Experts Evaluate KM Solutions. Butterworth-Heinemann. ISBN: 0750678186.
2. Stuart Barnes (Ed.) (2002). Knowledge Management Systems Theory and Practice. Thomson Learning.
3. Kimiz Dalkir, Knowledge Management in Theory and Practice, Elsevier, Butterworth Hinemann.
4. Applying Knowledge Management: Techniques for Building Corporate Memories. Morgan Kaufmann. ISBN: 1558607609.

Text Books:

1. Irma Becerra-Fernandez, Avelino Gonzalez, Rajiv Sabherwal (2004). Knowledge Management Challenges, Solutions, and Technologies. Prentice Hall. ISBN: 0-13-109931-0.
2. Elias M. Awad, Hassan M. Ghaziri (2004). Knowledge Management. Prentice Hall. ISBN: 0-13-034820-1
3. Donald Hislop, Knowledge Management in Organizations, Oxford 2nd Edition. Ian Watson (2002).
4. Shelda Debowski, Knowledge Management, Wiley India Edition
5. Keri E Pearlson, Carol S. Saunders, Strategic Management of Information System, Wiley India Edition

Useful Links:

1. https://onlinecourses.nptel.ac.in/noc19_mg33/preview
2. <https://www.udemy.com/course/knowledge-management/>
3. <https://www.coursehero.com/file/70272191/km-pdf-imppdf/>
4. http://cs.unibo.it/~gaspari/www/teaching/slides_KM6.pdf

Course Title: Data Analysis Using Python												
Semester: VIII			Term: Even				Course Code: 24ITPEC8015B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives: The course aims:

1. To learn foundational Python programming concepts with practical exercises for coding skills development.
2. To enable efficient numerical data manipulation and analysis using advanced NumPy operations.
3. To equip students with skills for creating advanced data visualizations using Seaborn and Matplotlib.
4. To learn efficient data manipulation using pandas for optimized data analysis workflows.
5. To develop advanced pandas skills for data analysis, including EDA and handling time-series data.
6. To train students in analyzing and interpreting sales data using EDA and other advanced techniques.

Course Outcomes:

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

1. Build a solid foundation in Python programming with hands-on practice in key concepts and coding skills.
2. Perform efficient numerical data analysis and manipulation using advanced NumPy operations.
3. Create compelling data visualizations with Seaborn and Matplotlib, including advanced plotting techniques.
4. Manipulate, clean, and manage data efficiently using pandas for streamlined workflows.
5. Analyze real-world datasets using advanced DataFrame manipulation and Exploratory Data Analysis (EDA).
6. Students will gain skills to analyze and manipulate data effectively.

Module	Content	Hours	COs
I	Python Essentials: A Rapid Recap	5	CO1
	Foundations of Programming: Revisiting the building blocks and the "why" of programming. Your Python Workspace: Installation, editors, and environment setup essentials. Mastering Variables & Operators: The core of computations simplified. Decision-Making & Loops Unleashed: Streamlining logic with conditions and iterations. Power of Functions: Leveraging built-in tools for efficient coding. Strings Demystified: Navigating and manipulating text data. Data Collections Simplified: Working with lists and tuples seamlessly. Sets & Dictionaries Decoded: Unique and key-value data operations. Diving into OOP: Basics of Object-Oriented Programming and exception handling. Hands-On Exploration: Practical exercises to solidify understanding. Self-Learning Topics: Advanced Data Structures Exploration: Dive into Stacks, Queues, and Linked Lists. File Handling Fundamentals: Master reading, writing, and managing CSV/JSON files. Error Handling Mastery: Perfect your skills in try, except, finally, and custom exceptions. Comprehension Power: Unlock the potential of list, set, and dictionary comprehensions. Module Magic: Create and import custom modules and packages for modular code. Regex Mastery: Discover the world of regular expressions for pattern matching. Decorator Deep Dive: Enhance your code with function and class decorators. Generator & Iterator Essentials: Learn to create efficient iterators and generators using yield. Database Interaction: Build your skills in database operations with SQLite. Debugging Excellence: Master Python's built-in debugging tools and error logging techniques.		
II	NumPy Essentials	8	CO2
	Introduction to NumPy: Unlock the foundation of numerical data analysis. Mastering NumPy Data Types: Discover the building blocks for efficient data handling. Array Creation Mastery: Learn multiple ways to create powerful NumPy arrays. Indexing & Slicing Wizardry: Access and manipulate data with precision. Copy vs View Demystified: Understand memory management in NumPy arrays. Reshaping Arrays Like a Pro: Transform arrays to suit your analysis needs. NumPy Functions Unleashed: Explore search, split, sort, join, and filter operations. Randomness & Transposition: Generate random numbers and manipulate data structure. Statistical Power with NumPy: Leverage built-in statistical functions for deep		

	analysis. Mathematical & Logical Operations: Perform advanced calculations and logic with ease. Self-Learning Topics: Efficient Data Handling: Dive into NumPy data types and learn how they optimize data manipulation. Array Operations Mastery: Master slicing, reshaping, and understanding the nuances of copies vs. views. Mathematical & Statistical Power: Harness NumPy's functions for advanced calculations and data insights.		
III	Data Visualization Excellence	8	CO3
	The Art of Visualization: Unlock the power of data storytelling through visual representation. Seaborn & Matplotlib Mastery: Dive deep into two of the most popular libraries for creating stunning plots. Plotting Essentials: Master line, bar, histogram, pie, and scatter plots for clear data insights. Subplots for Clarity: Learn how to present multiple views in one cohesive display. Polishing Your Plots: Refine your visuals with expert formatting techniques for impactful presentations Self-Learning Topics: Trend Tracking: Visualize time-based data with the area plot. Distribution Unveiled: Detects outliers using the box plot. Data Density Insight: Unlock correlations with the heatmap. Visualizing Probabilities: Explore the violin plot for distribution clarity. Proportions in Perspective: Master the stacked bar plot for category breakdowns. Multidimensional Insights: Dive into the radar chart for complex data visualization. Three-Dimensional Data: Enhance insights with the bubble plot. Variable Relationships: Use pair plots to explore data connections. Cumulative Data Trends: Track growth with the area chart. Financial Insights: Analyze market movements with the candlestick chart.		
IV	Pandas Introduction	8	CO4
	Unleashing the Power of Pandas: Discover why pandas outshines NumPy in data manipulation. Series vs. DataFrame: Dive into pandas' core structures and understand their unique roles. Crafting and Managing DataFrames: Learn how to seamlessly create, update, and organize DataFrames. CSV Mastery: Effortlessly read and save data with pandas for smooth workflow. Data Perfection: Clean and prep your data by handling missing values and eliminating duplicates. Self-Learning Topics: Series Unleashed: Dive deep into the advanced manipulation of pandas Series. DataFrame Dynamics: Master the art of creating, updating, and managing DataFrames seamlessly. CSV Conqueror: Perfect the skill of importing and exporting data from CSVs		

	with pandas. Data Detox: Cleanse your datasets by handling missing values and eliminating duplicates effortlessly. Automation Alchemist: Build custom functions to streamline your data cleaning process.		
V	Advanced Data Analysis Mastery	8	CO5
	Mastering DataFrame Manipulation: Learn sorting, filtering, and merging DataFrames to enhance data organization. Mathematical Magic with DataFrames: Apply mathematical and custom functions to perform advanced operations on DataFrames. Pivoting Power: Create and manipulate Pivot Tables for better data aggregation and insights. Time Series Techniques: Master DateTime handling and resampling to analyze time-based data effectively. Exploratory Data Analysis (EDA): Gain hands-on experience with real-world datasets to perform comprehensive data analysis and uncover trends. Self-Learning Topics: DataFrame Wizardry: Master sorting and filtering with advanced techniques. Math in Motion: Dive into mathematical functions and apply them to your DataFrames. Function Mastery: Unlock the power of apply (), map(), and lambda for custom data transformations. Pivot Power: Create dynamic PivotTables to gain deeper insights from your data. Time Traveler: Navigate time series data with DateTime handling and resampling skills.		
VI	Pandas Sales Data Analysis	8	CO6
	Data Unveiling: Import and structure your sales data for analysis. Sorting & Filtering Mastery: Organize your sales data like a pro based on key criteria. Mathematical Insights: Calculate total sales, averages, and growth trends to uncover key metrics. Transformation Magic: Clean and customize sales data with apply(), map(), and lambda functions. Pivot Power Play: Analyze and visualize sales trends across categories, regions, and time. Time-Series Exploration: Harness DateTime handling and resampling to track sales over time. Insight Discovery: Dive deep into exploratory data analysis (EDA) to find hidden sales patterns. Self-Learning Topics: Import, explore, sort, filter, clean, and analyze sales data using Pandas functions, create PivotTables, resample time series data, and perform exploratory data analysis (EDA) to uncover key trends and insights.		
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester Examination of 60 Marks will be conducted based on the entire syllabus.

Reference Books:

1. Python for Data Analysis by Wes McKinney Kindle Edition.
2. Python For Data Sciences by Megane Noel Kindle Edition
3. "Data Science from Scratch: First Principles with Python" by Joel Grus

Text Books:

1. Python for Data Analysis, Craig Berg Kindle Edition.
2. Python for Data Science by Jake VanderPlas O'Really Publication
3. Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python by Andrew Bruce, Peter Bruce, and Peter Gedeck O'Reilly Publication

Useful Links:

1. <https://docs.python.org/3/tutorial/>
2. <https://towardsdatascience.com/>



Course Title: User Interface Design

Semester: VIII			Term: EVEN				Course Code: 24ITPEC8021B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/ Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives:

The Course aims

1. To stress the importance of good interface design.
2. To understand the importance of human psychology as well as social and emotional aspects in designing good interfaces.
3. To learn the techniques of data gathering, establishing requirements, analysis and data interpretation.
4. To learn the techniques for prototyping and evaluating user experiences.
5. To understand the interaction design process and evaluate design.
6. To bring out the creativity in each student – build innovative applications that are usable, effective and efficient for intended users.

Course Outcomes:

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

1. Identify and criticize bad features of interface designs.
2. Predict good features of interface designs.
3. Illustrate and analyze user needs and formulate user design specifications.
4. Interpret and evaluate the data collected during the process.
5. Evaluate designs based on theoretical frameworks and methodological approaches.
6. Apply better techniques to improve the user interaction design interfaces.

Module	Content	Hours	CO
I	Introduction to Interaction Design Good and Poor Design, what is Interaction Design, The User Experience, The Process Of Interaction Design, Interaction Design and the User Experience, Necessity of UI/UX Self-learning Topics: Study of Various interactive day to day application	06	CO1
II	Understanding and Conceptualizing Interaction Cognitive aspects and Social, Emotional Interaction Understanding the Problem Space and Conceptualizing Design, Conceptual Model, Interface Types, Cognitive aspects, Social Interaction and the Emerging Social Phenomena, Emotions and the User Experience, Expressive and Frustrating Interfaces, Persuasive Technologies Self-learning Topics: Study of Various interactive Interface Types	07	CO2
III	Data Gathering, Establishing Requirements, Analysis, Interpretation and Presentation Establishing Requirements, Five Key Issues, Techniques for Data Gathering, Data Analysis Interpretation and Presentation, Task Description and Task Analysis Self-learning Topics: Any case study of how to gather requirements eq.BE Project	09	CO3
IV	Process of Interaction Design, Prototyping, Construction. Interaction Design Process, Prototyping and Conceptual Design, Interface Metaphors and Analogies Self-learning Topics: Study of two websites with usability concepts.	08	CO4
V	Design rules and Industry standards Design principles, Principles to support Usability, Standards and Guidelines, Golden rules and Heuristics, ISO/IEC standards. The 15 Rules Every UI/UX Designer Should Know. Self-learning Topics: Study experiments on industry standards and design principles	09	CO5
VI	Evaluation Techniques and Framework The Why, What, Where and When of Evaluation, Types of Evaluation, case studies, DECIDE Framework, Usability Testing, conducting experiments, Field studies, Heuristic Evaluation and walkthroughs, Predictive models. Self-learning Topics: Evaluation of any GUI with usability principles.	06	CO6
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus

References Books:

1. The UX Book, by Rex Hartson and Pardha S Pyla
2. Donald A. Norman, "The design of everyday things", Basic books.
3. Jeff Johnson, "Designing with the mind in mind", Morgan Kaufmann Publication.
4. UI Design: Key to captivate User Understanding, by Nilakshi Jain, Dhananjay Kalbande

Text Books:

1. Interaction Design, by J. Preece, Y. Rogers and H. Sharp. ISBN 0-471-49278-7.
2. Human Computer Interaction, by Alan Dix, Janet Finlay, Gregory D Abowd, Russell Beale
3. Alan Cooper, Robert Reimann, David Cronin, "About Face3: Essentials of Interaction design", Wiley publication.
4. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley publication.

Useful Links:

1. https://onlinecourses.nptel.ac.in/noc21_ar05/preview
2. <https://nptel.ac.in/courses/124/107/124107008/>
3. <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/>
4. <https://nptel.ac.in/courses/107/103/107103083/>
5. <https://www.youtube.com/watch?v=6C2Ye1makdY&list=PLW-zSkCnZ-gD5TDfs1eL5EnH2mQ0f9g6B>
6. <https://xd.adobe.com/ideas/process/>

Course Title: Robotics

Semester: VIII			Term: EVEN			Course Code: 24ITPEC8022B						
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The course aims

1. Learn the basic concepts of Robot.
2. Learn the concepts of Kinematics of Robotics.
3. Learn the different types of Actuators and Sensors in Robot Designing.
4. Learn the concepts of Motions, Velocities and Dynamic Analysis of Force.
5. Learn the concepts of Trajectory and Motion Planning.
6. Learn the different Programming Languages to program Robot.

Course Outcomes:

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

1. Understand different types of robot, its characteristics and applications.
2. Analyze kinematics parameters of robotic manipulators.
3. Identify actuators, sensors and control of a robot for different applications.
4. Apply the differential relationships of motion, velocities and dynamic analysis of force.
5. Apply the concept of trajectory and motion planning in robot programming.
6. Use robot programming languages and acquire skills to program robots.

Module	Content	Hours	CO
I	Introduction and Fundamentals of Robotics: Automation and its types, definition of Robotics and a Robot, History of Robotics, Advantages and Disadvantages of Robot, Robotic Manipulators, Robot Motions, Robot Anatomy, Links and Joints, Classification of Robots, Specification of Robot, Applications of Robots Self-learning Topics: Robot Coordinate System, Economic and Social Aspects of Robotics	8	CO1
II	Direct and Inverse Kinematics: Homogeneous transformation matrices, Inverse transformation matrices, Forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg Representation of Forward Kinematic Equations of Robots, The Inverse Kinematic Solution of Robots, Case Studies: Three Axes Planar Articulated Robot Arm (Mini-Drafter) and Four Axes Adept-1 SCARA robot Self-learning Topics: Study of Five Axes Rhino XR- Robot Arm and Six Axes Articulated Intelledex 660 Robot Arm	8	CO2
III	Actuators and Sensors : Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic Devices, Pneumatic Devices, Electric Motors, Magnetostrictive Actuators, Sensor Characteristics, Position Sensors, Velocity Sensors, Acceleration Sensors, Force and Pressure Sensors, Torque Sensors, Light and Infrared Sensors, Touch and Tactile Sensors, Proximity Sensors, Sniff Sensors, Vision Systems, Voice Synthesizer Self-learning Topics: Microprocessor Control of Electric Motors, Microswitches, Range Finders, Voice Recognition Devices	7	CO3
IV	Motions, velocities and dynamic analysis of force: Differential relationship, Jacobian, Differential motions of a frame and robot, Inverse Jacobian, Lagrangian mechanics, Moments of Inertia, Dynamic equations of robots, Transformation of forces and moment between coordinate frames Self-learning Topics: Static Force Analysis of Robots	8	CO4
V	Trajectory and Motion Planning : Trajectory planning, Joint-space trajectory planning, Cartesian-space trajectories, Concept of motion planning, Bug Algorithms – Bug1, Bug2, Tangent Bug Self-learning Topics: Case Study based on real life application of motion planning (eg. Chess Game, Robotic Race, etc.)	7	CO5
VI	Introduction to Robot Programming : Definition of Robot Program, Robot Programming Techniques like Online programming, Leadthrough programming, Walk-through programming, Offline programming, Task programming, Motion Programming, Robotic Programming Language: Overview, Requirements for Standard Robot Language, Introduction to Robot Languages like AL, AML, RAIL, RPL, VAL, etc. Self-learning Topics: Example of Robot Program using VAL.	7	CO6
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus.

Reference Books:

1. John J. Craig, "Introduction to Robotics – Mechanics & Control", 3rd Edition, Pearson Education, India, 2009
2. Mark W. Spong & M. Vidyasagar, "Robot Dynamics & Control", 2nd Wiley India Pvt. Ltd., 2004
3. Aaron Martinez & Enrique Fernandez, "Learning ROS for Robotics Programming", 1st Edition, Shroff Publishers, 2013
4. Howie Choset, Kevin M. Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia E. Kavraki and Sebastian Thrun, "Principles of Robot Motion –Theory, Algorithms and Implementations", Prentice-Hall of India, 2005
5. Fu, Gonzalez, Lee, "Robotics: Control, Sensing, Vision and Intelligence", 1st Edition, Mc Graw Hill, India.

Text Books:

1. Robert Shilling, "Fundamentals of Robotics-Analysis and control", PHI, 2003.
2. Saeed B. Niku, "Introduction to Robotics Analysis, Systems, Applications", 3rd Edition, Wiley, 2019.
3. Saha, S.K., "Introduction to Robotics", 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
4. Ashitava Ghoshal, "Robotics-Fundamental Concepts and Analysis", Oxford University Press, Sixth impression, 2010
5. Mukherjee S., "Robotics Process Automation", 1st Edition, Khanna Publishing House, New Delhi, 2020.

Useful Links:

1. https://swayam.gov.in/nc_details/NPTEL
2. <https://www.udemy.com/course/robotics-course/>
3. <https://www.coursera.org/courses?query=robotics>

Course Title: Enterprise Resource Planning

Semester: VIII			Term: EVEN				Course Code: 24ITPEC8023B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The Course aims

1. To learn the basic concepts of ERP.
2. To learn different technologies used in ERP.
3. To learn the concepts of ERP Manufacturing Perspective and ERP Modules.
4. To learn what are the benefits of ERP.
5. To study and understand the ERP life cycle.
6. To learn the different tools used in ERP.

Course Outcomes:

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

1. Understand the basic concepts of ERP.
2. Identify different technologies used in ERP.
3. Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules.
4. Discuss the benefits of ERP.
5. Understand and implement the ERP life cycle.
6. Apply different tools used in ERP.

Module	Content	Hours	CO
I	Introduction to ERP: Enterprise An Overview Integrated Management Information, Business Modeling, Integrated Data Model Self-Learning Topics: Study of advantages of ERP.	03	CO1
II	ERP Technologies: Business Processing Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System Self-Learning Topics: Study different ERP technologies.	08	CO2
III	ERP Manufacturing Perspective and ERP Modules MRP - Material Requirement Planning, BOM - Bill Of Material, MRP - Manufacturing Resource Planning, DRP – Distributed Requirement Planning, PDM - Product Data Management. Finance, Plant Maintenance, Quality Management, Materials Management. Self-Learning Topics: Study different ERP modules.	09	CO3
IV	Benefits of ERP : Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality, Costs, Improved Information Accuracy and Design-making Capability. Self-Learning Topics: Study of benefits of ERP for real time application.	10	CO4
V	ERP Life cycle : Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post- implementation (Maintenance mode). Self-Learning Topics: ERP testing tools.	07	CO5
VI	E-Commerce to E-Business : E-Business structural transformation, Flexible Business Design, Customer Experience, Create the new techo enterprise, New generation e-business leaders, memo to CEO, Empower your customer, Integrate Sales and Service, Integrated Enterprise applications. Enterprise resource planning the Ebusiness Backbone Enterprise architecture, planning, ERP usage in Real world, ERP Implementation. Self-Learning Topics: ERP Applications.	08	CO6
Total		45	

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus.



Reference Books:

1. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGraw-Hill, 1997
2. The SAP R/3 Handbook, Jose Antonio, McGraw – Hill
3. E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota

Text Books:

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
3. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal, Galgotia.

Useful Links:

1. <https://www.udemy.com/>
2. <https://www.sap.com/>
3. <https://www.oracle.com/>

Course Title: Cloud Computing and Services												
Semester: VIII			Term: EVEN				Course Code: 24ITPEC8024B					
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

The Course aims

1. Understand and analyze the basics of cloud computing, service models, deployment models and architecture.
2. Define and understand the concept of virtualization and related technologies.
3. Understand the different cloud computing services and their relevance.
4. Describe the various services provided by Amazon Web Services cloud platform.
5. Understand and analyze the functionality of Openstack cloud platform & Serverless computing.
6. Describe the aspects of Security & Privacy in cloud computing.

Course Outcomes:

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

1. Explain the basics concepts of cloud computing like service models, deployment models and its architecture.
2. Describe and apply virtualization in cloud computing.
3. Use and Analyze different cloud computing services.
4. Understand and apply various services provided by Amazon Web Services cloud platform.
5. Discuss the functionality of Openstack cloud platform & Serverless computing.
6. Recognize and examine the security and privacy concerns in cloud computing.

Module	Content	Hours	CO
I	Introduction to cloud computing Introduction to cloud computing, need for cloud computing and its components, cloud & other similar configurations, cloud types: NIST and Cloud Cube Model, characteristics of cloud computing, deployment models, service models, advantages and disadvantages of Cloud Computing. Self-learning Topics: Study the recent trends in cloud computing architectures and related technologies.	08	CO1
II	Virtualization Characteristics of virtualized environment, structures of virtualization, implementation levels of virtualization, mechanisms of virtualization, pros and cons of virtualization, virtualization vs cloud computing, Xen and KVM architecture. Self-learning Topics: Comparison between different virtualization platforms.	07	CO2
III	Cloud Computing Services SPI Model of Cloud computing, Everything as a Service (XaaS): Database as a Service, Storage as a Service, Security as a Service, Collaboration as a	06	CO3

	Service, Monitoring as a Service, Network as a Service, Disaster Recovery as a service, Identity management as a Service, Analytics as a Service and Backup as a Service. Self-learning Topics: Study of different cloud computing platforms providing XaaS services.		
IV	Amazon Web Service Cloud Platform Introduction to the AWS Cloud, AWS core services by categories. Compute Service: Introduction to EC2, EC2 Instances, EC2 Amazon Machine Images, Instance Types, Instance Lifecycle. Storage Service: Introducing S3, working with Buckets, setting bucket security, S3 event and notification, bucket properties, working with Elastic Block Store Volumes, Object Storage Vs Block Storage, Archives versus backups, Introduction to Glacier. Virtual Private Cloud: Introduction, Subnet, Elastic Network Interfaces, Internet Gateways, Route Tables, Security Groups. CloudWatch: Introduction, CloudWatch Metrics, CloudWatch Alarms. Database as a Service: Introduction to Amazon Relational Database Service (RDS), Database Engines, Database Instance Classes, Backup and Recovery, Non-relational (No-SQL) Databases, Types of Non relational Databases, Introduction to DynamoDB, Features, Partition and Hash Keys. Self-learning Topics: Comparison of AWS services with other cloud service platforms like Azure and GCP.	10	CO4
V	Openstack Cloud platform & Serverless Computing Open source Cloud Platform: Introduction to Openstack cloud platform, Components and modes of Operations, Architecture of Openstack cloud platform. Mobile Cloud Computing: Definition, architecture, benefits and challenges of mobile cloud computing. Serverless Computing: Introduction, Working with Serverless environment, Basics of serverless events and functions, AWS Lambda. Self-learning Topics: To study different open source cloud computing platforms and compare them based on different XaaS services provided by them	07	CO5
VI	Cloud Security & Privacy What is security, why is it required in cloud computing, Different types of security in cloud, attacks, and vulnerabilities, IaaS security, PaaS security, SaaS security, trust boundary, Audit and reporting. Introduction to Identity and access Management (IAM), IAM Challenges, IAM Definition, IAM Architecture and Practice, Relevant IAM Standards and Protocols for Cloud Services. Privacy: What Is Privacy? What Are the Key Privacy Concerns in the Cloud?, Legal and Regulatory Implications: Laws and Regulations, Governance, Risk, and Compliance (GRC). Self-learning Topics: To assess and analyze how the security and privacy is maintained in different cloud computing platforms.	07	CO6
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on the entire syllabus.

Reference Books:

1. Distributed and Cloud Computing From Parallel Processing to the
2. Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack Dongarra, Morgan Kaufmann Publication
3. Cloud Computing for Dummies, Judith Hurwitz, Wiley Publication
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly Publication.
5. Cloud computing security: foundation and challenges, John R Vecca, CRC Press

Text Books:

1. Cloud computing Bible, Barrie Sosinsky, Wiley publication.
2. Cloud Computing Black Book, Kailash Jayaswal, Jagannath Kallalurchi, Donald J. Houde, Dr. Deven Shah, Dreamtech Press
3. Mastering Cloud Computing, Rajkumar Buyya, MGH publication
4. AWS certified solution Architect, Joe Baron et.al, Cybex publication
5. Cloud Security and Privacy, Tim Mather, Subra Kumaraswamy, and Shahed Latif, O'Reilly Publication.
6. Cloud security: A comprehensive guide to secure cloud computing by ronold L Krutz and Russell Dean Vines, Wiley publication.

Useful Links:

1. <https://www.aws.amazon.com>
2. <https://www.nttel.ac.in>

Course Title: Full Stack Development

Semester: VIII

Term: Even

Course Code: 24CSPEC8024B

Teaching Scheme

Evaluation Scheme

Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE2	ESE	CA	Oral/Pract / Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives:

1. To build a strong foundation in Java programming, emphasizing object-oriented principles and robust software solutions.
2. To develop essential web development skills for creating structured, responsive web pages using HTML5, CSS3, and Bootstrap.
3. To master MySQL for data management, covering SQL commands, query optimization, and advanced data manipulation.
4. To understand data persistence with JPA, focusing on entity classes, lifecycle management, and querying techniques.
5. To gain expertise in the Spring framework, including IoC, DI, Spring Boot, Spring Data JPA, REST, and Spring Security.
6. To develop dynamic and secure web applications using Angular, with a focus on components, forms, routing, and authentication.

Course Outcomes:

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

1. Develop efficient, maintainable, and tested Java applications using object-oriented principles, memory management, and exception handling.
2. Build structured and responsive web pages using HTML5, CSS3, and Bootstrap for modern web design.
3. Manage and analyze databases effectively using advanced SQL commands, joins, and query optimization in MySQL.
4. Implement data persistence in Java applications using JPA for entity management, querying, and relationship handling.
5. Create secure and scalable Java applications using Spring Core, Spring Boot, Spring Data JPA, REST, and Spring Security.
6. Develop dynamic, secure web applications with Angular, focusing on components, routing, forms, and authentication.

Module	Content	Hours	COs
I	Core Java Recap	5	CO1
	Java Foundations & Code Conventions: Identifiers, Legal Naming, Java Code Practices, Class Declarations, Modifiers, Interface Constants. Access Control & Object Behavior: Access Modifiers, Constructors, Static Elements, Overloading, Polymorphism, Interface Implementation. Core Object-Oriented Principles: Encapsulation, Inheritance, Method Overriding, Cohesion, and Casting. Memory, Assignments & Operations: Variable Assignments, Operators (Arithmetic, Relational, Logical), Arrays, Wrapper Classes, Autoboxing, and Garbage Collection. Flow, Exceptions & Testing: Control Flow (if, switch, Loops), Exception Handling. Self-Learning Topics: Concurrency & Threading: Learn how to create and manage threads, synchronize code, handle thread states, and avoid deadlocks for efficient multi-threaded programming. Generics & Collections: Master the use of generics for type safety and explore core Java collections (List, Set, Map, Queue) for managing data structures effectively. Design Patterns: Study key design patterns like Singleton, Factory, and Observer to create scalable and reusable software solutions. Lambda Expressions & Stream API: Learn how to use lambda expressions for functional programming and explore Stream API for handling data in a declarative way.		
II	HTML 5, CSS 3 with Bootstrap Recap	5	CO2
	HTML Basics & Structure: Learn HTML5 structure, semantic elements, character effects, document spacing, and working with tables, lists, and hyperlinks. Image Handling & Forms: Understand image roles, adding images to web pages, using images as links, and handling user input through various form elements (text fields, checkboxes, radio buttons, etc.). CSS3 Fundamentals: Explore CSS syntax, selectors, text formatting, fonts, colors, borders, and advanced features like CSS Grid. Bootstrap Introduction & Components: Get started with Bootstrap, utilizing grid systems and essential components like headers, dropdowns, and navigation bars. Self-Learning Topics: Responsive Web Design: Learn to build websites that adapt to different screen sizes and devices using media queries, flexible layouts, and mobile-first design principles. JavaScript DOM Manipulation: Gain proficiency in manipulating HTML elements with JavaScript to dynamically change content, styles, and handle events, enhancing interactivity. CSS Flexbox: Master the Flexbox layout system to create responsive and well-aligned page structures with minimal code, making layouts easier to build and maintain. Version Control with Git: Learn Git for tracking code changes, collaborating on projects, managing branches, and using GitHub or GitLab to streamline		

	development and teamwork.		
III	MySQL Database Recap	5	CO3
	Mastering MySQL Fundamentals: Dive into data types, core SQL commands, and filtering with advanced WHERE clauses. Advanced Data Manipulation: Harness aggregate functions, string/date operations, and optimize joins with aliases and constraints. Shaping and Aggregating Results: Refine your queries with ORDER BY, GROUP BY, HAVING, and dynamic aggregation techniques. Self-Learning Topics: Optimizing Performance & Advanced Techniques: Unlock performance with indexing, stored procedures, triggers, and explore complex SQL, normalization, and backup strategies.		
IV	Entity Management and ORM with JPA	8	CO4
	Data Persistence & ORM Tools: Overview of data persistence, introduction to ORM tools, and understanding JPA specifications. Entity Classes & Persistence: Requirements for entity classes, persistent fields and properties, collections in entities, primary keys, and validation of fields. Managing Entities: EntityManager interface, container-managed and application-managed entities, lifecycle management, and synchronizing entity data. Querying Entities: Java Persistence Query Language (JPQL), Criteria API for querying entities. Entity Relationships & Cascade Operations: Direction in relationships, bidirectional and unidirectional relationships, cascade operations, and relationship queries. Self-Learning Topics: JPA Annotations: Understanding the essential JPA annotations (@Entity, @Id, @OneToMany, @ManyToOne, etc.) for mapping Java objects to database tables and defining relationships. Lazy vs Eager Loading: Mastering the concepts of lazy and eager loading to optimize performance when fetching data in entity relationships. JPQL Advanced Queries: Learning how to write advanced JPQL queries using joins, subqueries, grouping, and aggregation functions to retrieve data efficiently. Transactions in JPA: Understanding how to manage transactions with @Transactional and ensure data consistency and isolation during operations. Optimizing JPA Performance: Exploring techniques like batch processing, caching, and fetch strategies to improve the performance of JPA in large-scale applications.		
V	Mastering Spring Framework	12	CO5

	Spring Core Unveiled: Mastering Loose Coupling, IoC, and DI with Bean Configuration Spring Boot Essentials: Fast-Track Your Development with Auto-Configuration and Embedded Servers Spring Data JPA Deep Dive: Harnessing Repositories, Named Queries, and Transaction Management Spring Data REST Integration: Exposing REST APIs with Seamless Repository Management Spring Security & Microservices: Building Scalable, Secure APIs with Real-World Demos. Self-Learning Topics: Advanced Dependency Injection Techniques: Exploring scope, lifecycle, @Scope, @Lazy, and custom scopes. Spring AOP (Aspect-Oriented Programming): Implementing logging, security, and transactions using AOP. Spring Cloud: Understanding microservices architecture and tools like Config Server and Eureka. Spring Reactive Programming: Building non-blocking, event-driven applications using Spring WebFlux. Spring Security OAuth2: Implementing OAuth2 for secure authentication and authorization in applications		
VI	Angular Framework	10	CO6
	Angular Framework Essentials: Introduction to Angular, setting up the environment with Angular CLI, project setup, bootstrapping the app, building components, and understanding app structure. Angular Components and Data Binding: Creating and nesting components, setting up templates, handling property/event binding, two-way data binding, and managing input/output properties. Directives and Styles in Angular: Working with built-in directives, creating custom attribute directives using Renderer and HostListener, applying styles, and using View Encapsulation with Bootstrap integration. Forms, Pipes, and Dependency Injection: Understanding template-driven vs reactive forms, built-in and custom validators, creating services, using dependency injection, and implementing pipes. Routing, HTTP Requests, and Authentication: Implementing routing with navigation, child routes, passing parameters, making HTTP requests, using observables, and securing routes with JWT and route guards. Self-Learning Topics: Advanced Routing Techniques: Learn how to handle lazy loading, preloading strategies, and advanced route guards to optimize your Angular application's navigation. State Management with NgRx: Understand state management using NgRx, including Actions, Reducers, and Store for managing the application's state in a reactive way.		

	Optimizing Angular Performance: Explore techniques for improving performance in Angular apps, such as change detection strategies, Ahead-of-Time (AOT) compilation, and lazy loading of modules. Angular Testing Best Practices: Learn how to write unit and integration tests using Jasmine, Karma, and Angular testing utilities. Understand mocking services, testing components, and coverage tools. Angular Animations: Discover how to implement animations in Angular applications using the Angular Animation API for transitions, triggers, and complex sequences.		
Total		45	

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

The End Semester Mettl examination of 100 Marks will be conducted based on the entire syllabus.

Reference Books:

1. Spring in Action by Craig Walls
2. Java Persistence with Hibernate by Christian Bauer, Gavin King, and Gary Gregory
3. Spring Boot in Action by Craig Walls
4. Full Stack Development with Spring Boot and Angular by Ranga Karanam

Useful Links:

1. <https://docs.spring.io/spring-framework/reference/>
2. <https://docs.oracle.com/javaee/7/api/javax/persistence/package-summary.html>
3. <https://hibernate.org/orm/documentation/>
4. <https://angular.io/docs>
5. <https://www.journaldev.com/22728/spring-boot-angular>
6. <https://github.com/in28minutes/full-stack-with-angular-and-spring-boot>

Course Title: Project Management													
Semester: VIII			Term: Even				Course Code: 24ILO8021B						
Teaching Scheme							Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract	Total	
Th	Tu	Pr	Th	Tu	Pr								
03	-	-	03	-	-	03	20	20	60	-	-	100	

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. Understanding the Foundations of Project Management
2. Developing Leadership and Interpersonal Skills
3. Mastering Project Planning and Risk Management
4. Enhancing Monitoring, Evaluation, and Software Proficiency

Course Outcomes:

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

1. Demonstrate an understanding of project management principles and models
2. Exhibit leadership and interpersonal skills
3. Plan and execute projects effectively
4. Utilize advanced scheduling and resource management techniques
5. Implement project monitoring and control mechanisms
6. Leverage software and simulation tools

Module	Content	Hours	COs
I	Introduction to project management:	6	CO1
	Introduction to project management - I, introduction to project management - II, agile project management, project selection models, examples of project selection models		
II	Role of the Project Manager:	8	CO2
	Project manager, attributes of effective project manager, managing for stakeholders, resolving conflicts, negotiation, project in the organization structure, human factors and the project team		
III	Comprehensive Project Planning and Risk Management:	8	CO3
	Traditional project activity planning, agile project planning, project charter, coordination through integration management, project feasibility analysis, estimating project budgets project risk management, quantitative risk assessment methodologies, critical path method (CPM)		
IV	Advanced Scheduling and Resource Optimization Techniques in Project Management:	9	CO4
	Programme evaluation and review technique (PERT), risk analysis with simulation for scheduling, Gantt chart, scheduling with scrum, crashing a project, resource loading, resource levelling Goldratt's critical chain		
V	Project Monitoring, Control, and Closure: Insights and Case Studies:	9	CO5
	Planning-monitoring-controlling cycle, earned value analysis, agile tools for tracking project, three types of project-controlling, control of change scope and scope creep, project audit, essentials of an audit/evaluation, when to close a project, benefits realisation, case study on the success of Chandrayan-3.		
VI	Leveraging Software Tools for Effective Project Management:	5	CO6
	Software for project management, demo on project management software, simulations software for project management Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics, Risk response strategies for positive and negative risks, Project Contracting Project procurement management, contracting and outsourcing, Managing without authority.		



	Self-Learning Topics: PM knowledge areas as per Project Management Institute (PMI), Project proposal,		
Total		45	

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three course outcomes (COs), and IAE 2 will cover the remaining three course outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Book:

1. Project Management (A Strategic Managerial Approach) by Meredith

Online Reference:

1. https://onlinecourses.nptel.ac.in/noc25_mg71/preview

Course Title: Finance Management												
Semester: VIII			Term: Even				Course Code: 24ILO8022B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract	Total
Th	Tu	P r	Th	T u	Pr							
03	-	-	03	-	-	03	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. To understand financial and cost accounting principles, corporate finance concepts and financial statements. and the preparation and interpretation of financial statements
2. To understand cash flow and analysis of financial statements.
3. To understand and define break even analysis and budgeting.
4. To describe capital structure, risk-return analysis, time value of money, valuation methods for bonds and stocks, compute WCC, evaluate capital investments and analyze dividend policies.

Course Outcomes:

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

1. Explain the concepts related to financial and cost accounting, corporate finance and financial statements.
2. Prepare, interpret and analyze financial and cash flow statements.
3. Apply cost accounting techniques to prepare cost sheets and optimize resource allocation.
4. Explain cost accounting and Allocation and Apportionment of Overheads, prepare a
5. Analyze financial decisions, evaluate risks, and apply valuation techniques for bonds and stocks.
6. Compute WACC, evaluate capital investments, and analyze dividend policies in real-world scenarios.

Module	Content	Hours	COs
I	Introduction to Financial and Cost Accounting:	7	CO1
	Distinctions Between Financial and Cost/Management Accounting, Processes of Recording Business Transactions, Users of Financial and Cost/Management Accounting Information, Decision-Making Through Cost/Management Accounting Introduction to Corporate Finance: Meaning and Functions of Corporate Finance, Fundamentals of the Time Value of Money Financial Statements Basics: Recording, Classifying, and Summarizing Transactions, Income Statement and Balance Sheet Concepts, Dual Effect Concept (Double-Entry Bookkeeping), Accrual and Entity Concepts in Accounting		
II	Preparation of Financial Statements:	9	CO2
	Classification of Items (Assets, Liabilities, Equity, Revenue, Expenses), Applications of Double-Entry System, Accruals, Depreciation, and Adjustments (Prepaid Expenses, Accrued Interest) Cash Flow Statements: Direct and Indirect Methods, Cash Flow from Operating, Investing, and Financing Activities, Analysis of Cash Flow with Income Statement and Balance Sheet Financial Statement Analysis: Ratio Analysis: Liquidity, Profitability, Efficiency, Dividend Ratios, Working Capital Management		
III	Introduction to Cost Accounting:	9	CO3
	Cost, Costing, and Cost Accounting: Definitions and Purposes, Classification of Costs: Fixed, Variable, Direct, Indirect, Opportunity Costs Preparation of Cost Sheets: Prime Cost, Conversion Cost, and Total Cost, Classification of Manufacturing and Non-Manufacturing Costs Allocation and Apportionment of Overheads: Primary and Secondary Distribution, Activity-Based Costing (ABC): Concepts, Drivers, and Applications		
IV	Break-Even Analysis:	7	CO4
	Contribution Analysis, Cost-Volume-Profit Analysis, Margin of Safety and Operating Leverage Decision-Making Examples: Keep or Drop Products, Make or Buy Decisions, Incremental Costs and Relevant Costs Budgeting: Types of Budgets: Self-Imposed, Master, and Cash Budgets, Flexible Budget and Variance Analysis		
V	Capital Structure and Valuation Basics:	6	CO5
	Structure of Finance Function, Capital Structure Decisions, Risk and Return Concepts: Beta, Sharpe Ratio, Jensen's Alpha Time Value of Money and Valuation: Present Value and Future Value (Single and Multi-Period Cases), Perpetuity, Growing Perpetuity, and Annuity Bond and Stock Valuation: Bond Pricing, Yield to Maturity, and Zero-Coupon Bonds, Stock Valuation: Zero Growth, Constant Growth, Differential Growth		

VI	Cost of Capital and WACC:	7	CO6
	Capital Asset Pricing Model (CAPM) and Dividend Discount Model (DDM), Cost of Debt, Equity, and Preferred Stock, Weighted Average Cost of Capital (WACC) Capital Investment Decisions: Techniques: NPV, IRR, Payback Period, Comparisons Between Techniques Dividend and Payout Policies: Types of Payout: Regular Dividend, Stock Dividend, Stock Splits, Dividend Signaling and Real-World Implications		
Total		45	

Self-Learning Topics : Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges, Continuous Compounding and Continuous Discounting., Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis, Management of Receivables; and Management of Cash and Marketable Securities, Concept of Optimal Capital Structure, Walter's Approach, and Modigliani Miller Approach

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three course outcomes (COs), and IAE 2 will cover the remaining three course outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. Accounting: Text and Cases; Robert N Anthony, David F Hawkins and Kenneth A Merchant, McGraw Hill Education.
2. Cost Accounting; Horngren, Foster & Dattar; PHI Publication
3. Corporate Finance by Ross, Westerfield, Jaffe, Jordan and Kakani, McGraw Hill Education.

Online Reference:

1. https://onlinecourses.nptel.ac.in/noc25_ec02/preview

Course Title: Entrepreneurship Development and Management												
Semester: VIII			Term: Even				Course Code: 24ILO8023B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract	Total
Th	Tu	P r	Th	Tu	Pr							
03	-	-	03	-	-	03	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. To introduce the fundamental concepts of entrepreneurship, including its types, team building, and innovation processes.
2. To provide exposure to case studies and real-world examples, emphasizing the transition from design to entrepreneurship.
3. To enable students to develop entrepreneurial skills through frameworks such as Business Model Canvas and Lean Canvas.
4. To guide students from ideation to proof of concept, fostering creativity and technology-led entrepreneurship.

Course Outcomes:

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

1. Understand the principles of entrepreneurship and its significance in driving innovation and business growth.
2. Analyze different types of entrepreneurship and their applications in fields like bio-med innovation and technology.
3. Develop cohesive and effective entrepreneurial teams and apply creativity to generate viable product ideas.
4. Utilize frameworks like Business Model Canvas and Lean Canvas to create structured business plans and pitches.
5. Transition from a product idea to a proof of concept, demonstrating practical entrepreneurial skills.
6. Evaluate successful start-up stories and apply their lessons to develop and pitch innovative business models.

Module	Content	Hours	COs
I	Overview Of Entrepreneurship:	7	CO1
	Introduction to Entrepreneurship, What is Entrepreneurship GDC Program, Hand holding for Entrepreneurship GDC start-up stories		
II	Business Plans And Importance Of Capital To Entrepreneurship:	9	CO2
	Entrepreneurship Types, Team Building, Innovation and Entrepreneurship, Solar Oven case-study Paradigm shift from Design to Entrepreneurship		
III	Women's Entrepreneurship Development:	9	CO3
	Bio- Med Innovation and Entrepreneurship, New-age Entrepreneurship		
IV	Indian Environment for Entrepreneurship:	7	CO4
	Business Model Canvas, Technology led Entrepreneurship		
V	Effective Management of Business:	6	CO5
	Entrepreneurship as Academic Program - IITH case study, Creativity and Generating Product Ideas, From Idea to Proof of Concept, Network Entrepreneurship		
VI	Achieving Success in The Small Business:	7	CO6
	Learning from examples Start-up PITCHES - Using Lean Canvas Model Part 1, Learning from examples Start-up PITCHES - Using Lean Canvas Model Part 2		
Total		45	

Self-Learning Topics : Contribution of Government Agencies in Sourcing information for Entrepreneurship, Business Growth and the Entrepreneur Law and its Relevance to Business Operations, EDP cell, Responsibilities of various government organisations, departments, banks etc., Supply chain management, linkage with large industries), exercises, e-Marketing, Critical Success factors of small business.

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three course outcomes (COs), and IAE 2 will cover the remaining three course outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.



Reference Books:

1. Disciplined Entrepreneurship: 24 Steps to a Successful Startup by Bill Aulet
2. The Essence of Medical Device Innovation by B Ravi
3. THE FORTUNE AT BOTTOM OF PYRAMID: Eradicating Poverty Through Profits by C. K. Prahalad Stay Hungry
4. Stay Foolish by Rashmi Bansal
5. The Entrepreneurial Connection: East Meets West in the Silicon Valley by Gurmeet Naroola
6. Innovation By Design: Lessons from Post Box Design & Development by B. K. Chakravarthy , Janaki Krishnamoorthi

Online Reference:

1. https://onlinecourses.nptel.ac.in/noc25_de07/preview

Course Title: Human Resource Management												
Semester: VIII			Term: Even				Course Code: 24ILO8024B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
3	--	--	3	--	--	3	20	20	60	--	--	100
IAE: Internal Assessment Examination ESE: End Semester Examination CA: Continuous Assessment Course Objectives: 1. To introduce the students with basic concepts, techniques and practices of the human resource management 2. To provide opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations 3. To familiarize the students about the latest developments, trends & different aspects of HRM 4. To acquaint the student with the importance of inter-personal & inter-group behavioural skills in an organizational setting required for future stable engineers, leaders and managers Course Outcomes: Learner will be able to... 1. Evaluate the concept, scope, and importance of Human Resource Management (HRM) within organizations. 2. Evaluate the impact of personality traits and perceptions on individual decision-making and behavior within organizations. 3. Create a framework for designing an effective organizational structure that aligns with the organization's goals and strategy. 4. Develop a framework for designing an effective organizational structure that aligns with the organization's goals and strategy. 5. Identify the causes of diversity within organizations and evaluate the impact of diversity on employee motivation and performance. 6. Critically evaluate the key concepts and principles of Human Resource Management (HRM), including its scope, importance, and interdisciplinary nature.												

Module	Content	Hours	COs
I	Introduction to HR	8	CO1
	Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring. Self-Learning: Rightsizing, Empowerment, TQM, Managing ethical issues		
II	Organizational Behaviour (OB)	8	CO2
	Introduction to OB Origin, Nature and Scope of Organizational Behaviour, Relevance to Organizational Effectiveness and Contemporary issues Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness Perception: Attitude and Value, Effect of perception on Individual Decision- making, Attitude and Behaviour Motivation: Theories of Motivation and their Applications for Behavioural Change (Maslow, Herzberg, McGregor); Group Behaviour and Group Dynamics: Work groups formal and informal groups and stages of group development, Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. Self-Learning: Case study		
III	Organizational Structure & Design	8	CO3
	Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and stress. Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. Power and Politics: Sources and uses of power; Politics at workplace, Self-Learning: Tactics and strategies.		
IV	Human resource Planning	7	CO4
	Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale Performance Appraisal Systems: Traditional & modern methods, Performance Counselling, Career Planning Self-Learning: Training & Development: Identification of Training Needs, Training Methods		
V	Emerging Trends in HR	7	CO5
	Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, managing processes & transformation in HR. Organizational Change, Culture, Environment Cross Cultural Leadership and Decision Making: Cross Cultural		

	Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and ageing people Self-Learning: Intra company cultural difference in employee motivation		
VI	HR & MIS	7	CO6
	Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries) Strategic HRM: Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals Labor Laws & Self-Learning: Industrial Relations: Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act		
	Total	45	

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. Stephen Robbins, Organizational Behavior, 16th Ed, 2013
2. V S P Rao, Human Resource Management, 3rd Ed, 2010, Excel publishing
3. Aswathapa, Human resource management: Text & cases, 6th edition, 2011
4. C. B. Mamoria and S V Gankar, Dynamics of Industrial Relations in India, 15th Ed, 2015, Himalaya Publishing, 15th edition, 2015

Text Books:

1. P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5th Ed, 2013, Himalaya Publishing
2. Laurie Mullins, Management & Organizational Behavior, Latest Ed, 2016, Pearson Publications

Links for online NPTEL/SWAYAM courses:

<https://archive.nptel.ac.in/courses/110/105/110105069/>

Course Title: Professional Ethics and CSR												
Semester: VIII			Term: Even				Course Code: 24ILO8025B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
03	--	--	03	--	--	03	20	20	60	--	--	100
IAE: Internal Assessment Examination ESE: End Semester Examination CA: Continuous Assessment												
Course Objectives: 1. To understand professional ethics in business 2. To recognized corporate social responsibility												
Course Outcomes: Learner will be able to... 1. Understand rights and duties of business 2. Understand professional ethics in the marketplace 3. Demonstrate professional ethics of consumer protection 4. Understand legal aspects of corporate social responsibility 5. Understand Public-Private Partnership in India 6. Analyze Corporate Social Responsibility in Globalizing India												

Module	Content	Hours	COs
I	Professional Ethics and Business:	8	CO1
	The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights Self-Learning: Duties of Business		
II	Professional Ethics in the Marketplace:	8	CO2
	Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy Professional Ethics and the Environment: Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control. Self-Learning Ethics of Conserving Depletable Resources		
III	Professional Ethics of Consumer Protection:	8	CO3
	Markets and Consumer Protection; Contract View of Business Firm's Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer Privacy Professional Ethics of Job Discrimination: Nature of Job Discrimination; Extent of Discrimination; Self-Learning: Reservation of Jobs.		
IV	Introduction to Corporate Social Responsibility:	7	CO4
	Potential Business Benefits—Triple bottom line, Human resources, Risk management, Supplier relations; Criticisms and concerns—Nature of business; Motives; Misdirection. Self-Learning: Trajectory of Corporate Social Responsibility in India		
V	Corporate Social Responsibility:	7	CO5
	Articulation of Gandhian Trusteeship Corporate Social Responsibility and Small and Medium Enterprises (SMEs) in India, Corporate Social Responsibility. Self-Learning: Public-Private Partnership (PPP) in India		
VI	Corporate Social Responsibility in Globalizing India:	7	CO6
	Corporate Social Responsibility Voluntary Guidelines, 2009 issued by the Ministry of Corporate Affairs, Government of India. Self-Learning: Legal Aspects of Corporate Social Responsibility—Companies Act, 2013.		
Total		45	



Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. Business Ethics: Texts and Cases from the Indian Perspective (2013) by Ananda Das Gupta; Publisher: Springer.
2. Corporate Social Responsibility: Readings and Cases in a Global Context (2007) by Andrew Crane, Dirk Matten, Laura Spence; Publisher: Routledge.

Text Books:

1. Business Ethics: Concepts and Cases, 7th Edition (2011) by Manuel G. Velasquez; Publisher: Pearson, New Delhi.
2. Corporate Social Responsibility in India (2015) by Bidyut Chakrabarty, Routledge, New Delhi.

Links for online NPTEL/SWAYAM courses:

https://onlinecourses.nptel.ac.in/noc21_mg54/preview

Course Title: Research Methodology												
Semester: VIII			Term: Even				Course Code: 24ILO8026B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract	Total
Th	Tu	Pr	Th	Tu	Pr							
3	-	-	3	-	-	3	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives

1. To provide an understanding of the fundamentals of research, including literature surveys, experimental skills, and data analysis.
2. To equip students with the skills for effective technical writing and presentations, emphasizing clarity and precision.
3. To foster creativity and ethical awareness in the design and execution of research projects.
4. To introduce students to intellectual property concepts and department-specific research methodologies.

Course Outcomes:

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

1. Conduct comprehensive literature surveys and analyze data to identify research gaps and trends.
2. Develop and execute experimental designs effectively while adhering to ethical principles.
3. Apply technical writing techniques to prepare research papers, case studies, and project reports.
4. Deliver impactful technical presentations showcasing research findings.
5. Demonstrate creativity in problem-solving and innovation within research contexts.
6. Understand and apply principles of intellectual property in protecting and commercializing research outcomes.

Module	Content	Hours	COs
I	Introduction and Basic Research Concepts:	8	CO1
	A group discussion on what is research; overview of research, literature survey, experimental skills		
II	Research Design	8	CO2
	Data analysis, modelling skills; technical writing; technical presentations; creativity in research		
III	Sample Design	8	CO3
	Creativity in research; group discussion on ethics in research, design of experiments		
IV	Research Methodology	7	CO4
	Intellectual property		
V	Formulating Research Problem	7	CO5
	Department-specific research discussions		
VI	Outcome of Research	7	CO6
	Case study/Research paper writing		
Total		45	

Self-Learning Topics : Issues and Problems in Research Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical, Qualitative and Quantitative Approaches, Sampling methods/techniques Sampling Errors, Preparation of Research Report, Generalization and Interpretation of analysis, Suggestions and Recommendation.

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three course outcomes (COs), and IAE 2 will cover the remaining three course outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers Distributors.
2. Kothari, C.R., 1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd ed), Singapore, Pearson Education

Online Reference:

1. https://onlinecourses.nptel.ac.in/noc25_ge28/preview

Course Title: IPR and Patenting												
Semester: VIII			Term: Even				Course Code: 24ILO8027B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
3	--	--	3	--	--	3	20	20	60	--	--	100
IAE: Internal Assessment Examination ESE: End Semester Examination CA: Continuous Assessment Course Objectives: 1. To understand intellectual property rights protection system 2. To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures 3. To get acquaintance with Patent search and patent filing procedure and applications. Course Outcomes: Learner will be able to... 1. Understand to Intellectual Property Rights and its importance in modern global economic environment 2. Apply Enforcement of Intellectual Property Rights 3. Understand Emerging Issues in IPR 4. Understa 5. nd and apply basics of patenting 6. Understand patent rules and apply 7. Understand and implement Procedure for Filing a Patent												

Module	Content	Hours	COs
I	Introduction to Intellectual Property Rights (IPR):	8	CO1
	Meaning of IPR, Different category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology etc. Importance of IPR in Modern Global Economic Environment: Theories of IPR, Philosophical aspects of IPR laws, Self-Learning: Need for IPR, IPR as an instrument of development		
II	Enforcement of Intellectual Property Rights:	8	CO2
	Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in IPR enforcement. Indian Scenario of IPR: Introduction, in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc. Self-Learning: History of IPR		
III	Emerging Issues in IPR:	8	CO3
	Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge etc. Self-Learning: Cross-border IPR Enforcement		
IV	Basics of Patents:	7	CO4
	Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc), Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement. Self-Learning: Method of getting a patent		
V	Patent Rules:	7	CO5
	Indian patent act, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.) Self-Learning: European patent rules		
VI	Procedure for Filing a Patent (National and International):	7	CO6
	Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication, Time frame and cost, Patent Licensing, Patent Infringement Self-Learning: Patent databases: Important websites, Searching international databases		
Total		45	

Evaluation and Assessment Scheme:**Internal Assessment Examination (IAE):**

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. Rajkumar S. Adukia, 2007, A Handbook on Laws Relating to Intellectual Property Rights in India, The Institute of Chartered Accountants of India
2. Keayla B K, Patent system and related issues at a glance, Published by National Working Group on Patent Laws
3. T Sengupta, 2011, Intellectual Property Law in India, Kluwer Law International
4. Tzen Wong and Graham Dutfield, 2010, Intellectual Property and Human Development: Current Trends and Future Scenario, Cambridge University Press
5. Cornish, William Rodolph & Llewelyn, David. 2010, Intellectual Property: Patents, Copyrights, Trade Marks and Allied Right, 7th Edition, Sweet & Maxwell

Text Books:

1. Entrepreneurship Development and IPR Unit, BITS Pilani, 2007, A Manual on Intellectual Property Rights,
2. Mathew Y Maa, 2009, Fundamentals of Patenting and Licensing for Scientists and Engineers, World Scientific Publishing Company

Links courses:

https://onlinecourses.nptel.ac.in/noc22_hs59/preview

Course Title: Digital Business Management												
Semester: VIII			Term: Even				Course Code: 24ILO8028B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	OR/PR	Total
Th	Tu	Pr	Th	Tu	Pr							
03	--	--	03	--	--	03	20	20	60	--	--	100

IAE: Internal Assessment Examination
ESE: End Semester Examination
CA: Continuous Assessment

Course Objectives:

1. To familiarize with digital business concept
2. To acquaint with E-commerce
3. To give insights into E-business and its strategies

Course Outcomes: Learner will be able to...

1. Identify drivers of digital business
2. Illustrate various approaches and techniques for E-business and management
3. Understand Digital Business Support services
4. Understand Managing E-Business
5. Understand E-Business Strategy
6. Materializing e-business from idea to realization

Module	Content	Hours	COs
I	Introduction to Digital Business-	8	CO1
	Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy, Drivers of digital business- Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) Self-Learning: Opportunities and Challenges in Digital Business		
II	Overview of E-Commerce	8	CO2
	E-Commerce- Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals Other E-C models and applications, innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, Using Affiliate marketing to promote your e-commerce business, Launching a successful online business and EC project, Self-Learning: Legal, Ethics and Societal impacts of EC		
III	Digital Business Support services:	8	CO3
	ERP as e –business backbone, knowledge Tope Apps, Information and referral system Self-Learning: Application Development: Building Digital business Applications and Infrastructure		
IV	Managing E-Business-	7	CO4
	Managing Knowledge, Management skills for e- business, Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Self-Learning: Prominent Cryptographic Applications		
V	E-Business Strategy-	7	CO5
	E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy, Self-Learning: E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)		
VI	Materializing e-business: From Idea to Realization-	7	CO6

	Business plan preparation Self-Learning: Case Studies and presentations		
Total		45	

Evaluation and Assessment Scheme:**Internal Assessment Examination (IAE):**

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three Course Outcomes (COs) and IAE 2 will cover the remaining three Course Outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. A textbook on E-commerce, Er Arunrajan Mishra, Dr W K Sarwade, Neha Publishers & Distributors, 2011
2. E-commerce from vision to fulfilment, Elias M. Awad, PHI-Restricted, 2002
3. Digital Business and E-Commerce Management, 6th Ed, Dave Chaffey, Pearson, August 2014
4. Introduction to E-business-Management and Strategy, Colin Combe, ELSVIER, 2006

Text Books:

1. Digital Business Concepts and Strategy, Eloise Coupey, 2nd Edition, Pearson
2. Trend and Challenges in Digital Business Innovation, Vinocenzo Morabito, Springer
3. Digital Business Discourse Erika Darics, April 2015, Palgrave Macmillan

Links for online NPTEL/SWAYAM courses:

https://onlinecourses.nptel.ac.in/noc19_mg54/preview

Course Title: Environmental Management												
Semester: VIII			Term: Even				Course Code: 24ILOC8029B					
Teaching Scheme							Evaluation Scheme					
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral / Pract	Total
Th	Tu	P r	Th	Tu	Pr							
03	-	-	03	-	-	03	20	20	60	-	-	100

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment

Course Objectives:

1. To introduce Environmental Management and EIA concepts, including legal and regulatory frameworks.
2. To understand EIA procedures like scoping, screening, and baseline studies.
3. To explore EIA methodologies, tools, and techniques.
4. To highlight public involvement, impact mitigation, and EMP preparation.
5. To develop skills in EIA reporting, decision-making, and implementation through case studies.

Course Outcomes:

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

1. Explain the significance of Environmental Management and EIA in sustainability.
2. Conduct scoping, screening, and baseline assessments.
3. Apply EIA methodologies and tools effectively.
4. Propose mitigation strategies and prepare EMPs.
5. Evaluate EIA reports and ensure compliance.
6. Implement and follow up on EIA processes using case-based insights.

Module	Content	Hours	COs
I	Introduction and Definition of Environment:	7	CO1
	Introduction to Environment Management & EIA, Legal, Policy & Regulatory Framework		
II	Global Environmental concerns :	8	CO2
	EIA Procedure - Scoping & Screening and Establishing Baseline Conditions, EIA Methodologies		
III	Concepts of Ecology:	8	CO3
	Connectedness: connected spaces and subspaces, Connectedness of the real line, Intermediate value theorem, EIA Methods, Tools and Techniques		
IV	Scope of Environment Management:	8	CO4
	Public Involvement in EIA , Impact Management - Mitigation & Preparation of Environment Management Plans (EMP)		
V	Total Quality Environmental Management:	7	CO5
	EIA Reporting & Review of EIA Quality, Decision Making & Project Management		
VI	General overview of major legislations	7	CO6
	Implementation & follow up, EIA Case Examples		
Total		45	

Self-Learning Topics: The Energy scenario, Atomic/Biomedical hazards, habitats, Corporate environmental Responsibility, EMS certification, Factories Act.

Evaluation and Assessment Scheme:

Internal Assessment Examination (IAE):

Assessment consists of two class tests, each 20 marks. The IAE 1 will cover any three course outcomes (COs), and IAE 2 will cover the remaining three course outcomes (COs). Each test will have a duration of one hour.

End Semester Theory Examination (ESE):

End Semester exam of 60 Marks will be conducted based on entire syllabus.

Reference Books:

1. Wathern P., "Environmental Impact Assessment: Theory and Practice", Routledge Publishers, 1990
2. Marriott B., "Environmental Impact Assessment: A Practical Guide", McGraw-Hill Publication, 1997
3. Shrivastava A.K., Baxter Nicola, Grimm Jacob, "Environmental Impact Assessment", APH Publishers, 2003



4. Anjaneyulu Y., Manickam Valli, “Environmental Impact Assessment Methodologies”, CRC Press, 2011
5. Glasson J., Therivel Riki, Chadwick Andrew, “Introduction to Environmental Impact Assessment”, Oxford Brookes University 2012 (4th edition).

Online Reference:

1. https://onlinecourses.nptel.ac.in/noc25_ar03/preview



Course Title: Cloud Computing Lab												
Semester: VIII			Term: EVEN			Course Code: 24ITVSE802B						
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA	Oral/Pract/Tut.	Total
Th	Tu	Pr	Th	Tu	Pr							
-	-	2	-	-	1	1	-	-	-	25	25	50

CA: Continuous Assessment

Lab Objectives:

The Course aims

1. To make students familiar with key concepts of virtualization.
2. To make students familiar with various deployment models of cloud such as private, public, hybrid and community.
3. To understand the using and adopting appropriate type of cloud for their application.
4. To make students familiar with various service models such as IaaS, SaaS, PaaS, Security as a Service (SECaaS) and Database as a Service.
5. Apply the different service models for the application.
6. To make students familiar with security and privacy issues in cloud computing and how to address them.

Lab Outcomes:

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

1. Implement different types of virtualization techniques.
2. Analyze various cloud computing service models and implement them to solve the given problems.
3. Design and develop real world web applications and deploy them on commercial cloud(s).
4. Explain major security issues in the cloud and mechanisms to address them.
5. Explore various commercially available cloud services and recommend the appropriate one for the given application.
6. Implement the concept of containerization.

Module	Contents	Hours	COs
I	Overview & Virtualization. Introduction and overview of cloud computing. Hosted Virtualization using KVM. Lab1: To study and implement Hosted Virtualization using Virtual Box & KVM. Lab2: To study and Implement Bare-metal Virtualization using Xen, HyperV or VMware Esxi.	05	CO1
II	Infrastructure Services. To study the infrastructure services using different cloud platform Lab3: To study and Implement Infrastructure as a Service using AWS/Microsoft Azure/Google cloud platform	05	CO2
III	Platform Services To study the different platform services. Lab4: To study and Implement Platform as a Service using AWS Elastic Beanstalk/ Microsoft Azure App Service.	04	CO3
IV	Cloud Services IaaS, PaaS, STaaS, DbaaS, IAM and Security as a Service on AWS and Azure. Lab5: To study and Implement Security as a Service on AWS/Azure. Lab6: To study and implement Identity and Access Management (IAM) practices on AWS/Azure cloud.	05	CO4
V	Storage Services To study the storage services using Docker. Lab7: To study and Implement Storage as a Service using Own Cloud/ AWS S3, Glaciers/ Azure Storage. Lab8: To study and Implement Database as a Service on SQL/NOSQL databases like AWS RDS, AZURE SQL/MongoDB Lab/ Firebase. Lab9: To study and Implement Containerization using Docker on AWS/Azure/Google cloud platform	06	CO5
VI	Kubernetes Introduction and overview of Kubernetes. Lab10: To study and implement container orchestration using Kubernetes on AWS/Azure/Google cloud platform	05	CO6
Total		30	

Evaluation and Assessment Scheme:

Continuous Assessment (CA) :

Continuous Assessment should consist of the following

Experiments / Tutorials (8 to 10): 10 marks (All COs / LOs should be covered)

Attendance (Theory & Practical): 05 marks

Teacher Assessment Examination (TAE): 10 Marks

List of Teacher Assessment Examination (TAE):

1. Assignment
2. Case Study

3. Debate
4. Solution for Social Problems
5. Field Visit
6. Group Project
7. Flip Classroom
8. Topic Review
9. Quiz
10. Mind Mapping
11. Any other

Note: Number of activities to be conducted under TAE would be as per the subject need.

Oral & Practical Exam

Based on the entire syllabus, oral (10 marks) & practical/implementation (15 marks) examination will be conducted.

Text Books:

1. Bernard Golden, "Amazon Web Services for Dummies", John Wiley & Sons, Inc.
2. Michael Collier, Robin Shahan, "Fundamentals of Azure, Microsoft Azure Essentials", Microsoft Press.
3. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, "Mastering Cloud Computing", Tata McGraw-Hill Education.
4. Barrie Sosinsky, "Cloud Computing Bible", Wiley publishing.
5. John Paul Mueller, "AWS for Admins for Developers", John Wiley & Sons, Inc.
6. Ken Cochrane, Jeeva S. Chelladurai, Neependra Khare, "Docker Cookbook - Second Edition", Packt publication
7. Jonathan Baier, "Getting Started with Kubernetes-Second Edition", Packt Publication

Useful Links:

1. [https://phoenixnap.com/kb/ubuntu-install-kvm\](https://phoenixnap.com/kb/ubuntu-install-kvm/)
2. NIST Cloud Computing Security Reference Architecture
3. <https://docs.citrix.com/en-us/xenserver/7-1/install.html>
4. <https://docs.aws.amazon.com>
5. <https://docs.microsoft.com/en-us/azure>
6. <https://docs.docker.com/get-started/>
7. <https://kubernetes.io/docs/home/>

Course Title: Industry Certification												
Semester: VII			Term: Even				Course Code: 24ITVSE801B					
Teaching Scheme						Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE2	ESE	CA	OR/PR	Total
-	-	-	-	-	1	1	-	-	-	-	25	25

Introduction

As global competition intensifies, industries seek candidates who are not only skilled but also adaptable and ready to meet the demands of an evolving workforce. To bridge the gap between academic learning and industry expectations, SJCEM has introduced certification courses aimed at preparing students for impactful internships. These courses provide students with essential knowledge and skills, empowering them to excel in professional environments and increase their employability.

Objectives: The objectives of this course are to

1. Develop Professional Skills
2. Enhance Technical Competency
3. Cultivate Problem-Solving Abilities
4. Promote Ethical and Professional Conduct
5. Familiarize with Industry Standards and Expectations
6. Prepare for a Transition from Classroom to Workplace

Outcomes: After completion of this course, students will be able to

1. Communicate and Collaborate Effectively
2. Acquire Job-Ready Technical Skills
3. Enhanced Critical Thinking and Problem-Solving
4. Understand Ethical and Professional Standards
5. Use Industry Tools and Standards
6. Industry Integration effectively

Certification GUIDELINES:

The general procedure for organizing certification courses is as follows:

1. Identification of Industry Partners

Industries have been identified to provide in-house certification courses in various domains. Students are regularly informed and encouraged to pursue these certification courses.

2. Selection of Certification Domain

Students can choose two domains of their interest for the certification course and express their willingness to pursue the certification.

Following combination of domains are offered in the even semesters:

	Domain 1	Domain 2
Track 1	SQL	Dotnet
Track 2	CCNA	AI-IBM
Track 3	Cyber Security	AI-IBM
Track 4	Creo	Solid Works
Track 5	Data Science	Prompt Engineering and AI
Track 6	MernStack	Flutter
Track 7	Augmented Reality- Virtual Reality	Game Development
Track 8	Drone	Data Analytics
Track 9	IELTS/GRE	Certificate in Social Science
Track 10	Robotic	IOT
Track 11	Blockchain Basics	Blockchain Intelligence
Track 12	AWS	MernStack
Track 13	Microsoft Tools	AI-IBM
Track 14	Augmented Reality	Virtual Reality
Track 15	Professional Edge Training (PET)	

3. Allocation of Tracks

Each track can accommodate a maximum of 60 students or as per the availability of maximum seats. Allocation will be based on a first-come first-served basis. However, the institute reserves the right to reassign tracks as per the requirement.

4. Course Duration

Students have to complete the certification course, which has a minimum duration of 30 hours.

5. Oral & Practical Exam

Based on the entire syllabus, oral (20 marks) & practical/implementation (30 marks) examination will be conducted. Grades will be assigned as per the examination rules.

Note: A minimum of 90% attendance is required to award the certificate. If a student fails to meet this requirement, the student needs to re-register for the course internally or externally until successfully completed.

Course Title: Major Project – II

Semester: VIII			Term: EVEN				Course Code: 24ITPRJ801B						
Teaching Scheme							Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA/TW	Oral/Pract/ Tut.	Total	
Th	Tu	Pr	Th	Tu	Pr								
-	-	10	-	-	5	5	-	-	-	75	50	125	

IAE: Internal Assessment Examination

ESE: End Semester Examination

CA: Continuous Assessment, TW: Term Work

Course Objectives:

1. To acquaint with the process of identifying the needs and converting it into the problem.
2. To familiarize the process of solving the problem in a group.
3. To acquaint with the process of applying basic engineering fundamentals to attempt solutions to the problems.
4. To inculcate the process of self-learning and research.

Course Outcomes:

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

1. Identify problems based on societal /research needs.
2. Apply Knowledge and skill to solve societal problems in a group.
3. Develop interpersonal skills to work as a member of a group or leader.
4. Draw the proper inferences from available results through theoretical/ experimental/simulations.
5. Analyse the impact of solutions in societal and environmental context for sustainable development.
6. Use standard norms of engineering practices
7. Excel in written and oral communication.
8. Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
9. Demonstrate project management principles during project work

Guidelines for Major Project

- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Students should do surveys and identify needs, which shall be converted into problem statements for mini projects in consultation with faculty supervisor/head of department/internal committee of faculties.
- Students shall submit implementation plan in the form of Gantt/PERT/CPM charts, which will cover weekly activity of major project-II.
- A log book to be prepared by each group, wherein the group can record weekly work progress, the guide/supervisor can verify and record notes/comments.
- Faculty supervisors may give inputs to students during major project II activity; however, focus shall be on self-learning.
- Students in a group shall understand problems effectively, propose multiple solutions and select the best possible solution in consultation with the guide/ supervisor.
- Students shall convert the best solution into a working model using various components of their domain areas and demonstrate.

- The solution to be validated with proper justification and report to be compiled in standard format of University of Mumbai.
- With the focus on self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the Major Project, it is preferable that a single project of appropriate level and quality be carried out by all the groups of the students.
- However, based on the individual students or group capability, with the mentor's recommendations, if the proposed Major Project adhering to the qualitative aspects mentioned above gets completed in odd semester, then that group can be allowed to Scopus paper publications in Journal/Conference or motivate for Copyright or Indian Patent as an extension of the Major Project-1 with suitable improvements/modifications after testing and analysis in even semester. This policy can be adopted on case-by-case basis

Assessment:

Guidelines for Assessment of Major Project:

Term Work

- The review/ progress monitoring committee shall be constituted by head of departments of each institute. The progress of major project to be evaluated on continuous basis, minimum two reviews in each semester VII and VIII.
- In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.

Review/progress monitoring committee may consider following points for assessment based on either one-year major project as mentioned in general guidelines.

One-year project:

- In semester VII entire theoretical solution shall be ready, including components/system selection and cost analysis, building of working prototype. Two reviews will be conducted based on presentation given by students group.
 - I. First shall be for finalization of problem and proposed solution of the problem
 - II. Second shall be on readiness of working and testing of prototype to be conducted.
- In semester VIII expected work shall be procurement of testing and validation of results based on work completed in an odd semester.
 - I. First review is based on improvements in testing and validation results cum demonstration for publication to be conducted.
 - II. Second review shall be based on paper presentation in conference/journal or copyright or Indian patent in last month of the said semester.



Assessment criteria of Major Project:

Major Project shall be assessed based on following criteria;

1. Quality of survey/ need identification
2. Clarity of Problem definition based on need.
3. Innovativeness in solutions
4. Feasibility of proposed problem solutions and selection of best solution
5. Cost effectiveness
6. Societal impact
7. Innovativeness
8. Cost effectiveness and Societal impact
9. Full functioning of working model as per stated requirements
10. Effective use of skill sets
11. Effective use of standard engineering norms
12. Contribution of an individual's as member or leader
13. Clarity in written and oral communication.

- In one year, project, first semester evaluation may be based on the first six criteria's and remaining may be used for the second semester evaluation of performance of students in mini project.

Guidelines for Assessment of Major Project Practical/Oral Examination:

- Report should be prepared as per the guidelines issued by the University of Mumbai.
- Major Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and External Examiners preferably from industry or research organizations having experience of more than five years approved by head of Institution.
- Students shall be motivated to publish a paper based on the work in Scopus Conferences/Journals or copy right or Indian Patent.



Course Title: Internship III

Semester: VIII			Term: EVEN				Course Code: 24ITPRJ801B						
Teaching Scheme							Evaluation Scheme						
Contact Hrs.			Credit Allotted			Total Credit	IAE 1	IAE 2	ESE	CA/TW	Oral/Pract/ Tut.	Total	
Th	Tu	Pr	Th	Tu	Pr								
-	-	10	-	-	5	5	-	-	-	75	50	125	

Introduction

The rise in global competition has prompted organizations to devise strategies to have a talented and innovative workforce to gain a competitive edge. Developing an internship policy is an impactful strategy for creating a future talent pool for the industry. The internship (a form of experiential learning) program helps fresh pass-outs in gaining professional know-how and benefits corporate sectors. The internship also enhances the student's employability skills passing out from Technical Institutions.

Course Objectives:

1. Integration of workshop with workplace.
2. Understanding of the world of work.
3. Physical and hybrid model learning.
4. Developing research aptitude.
5. Exposure in emerging technologies
6. Enhance entrepreneurial capabilities.
7. Development of decision-making and teamwork skills.
8. Cultivate a sense of Social Imagery and Citizenship Responsibility.
9. Stimulate collaborative influence.
10. Enhancing professional competency.

Course Outcomes: After completion of this course, students will be able to

1. Get exposure to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Get possible opportunities to learn, understand and sharpen the real time technical skills required at the job(s).
3. Get possible opportunities to learn, understand and sharpen the real time managerial skills required at the job(s).
4. Gain experience in writing technical reports / projects and presentation of it.
5. Learn and gain exposure to the engineer's responsibilities and ethics.
6. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations.

INTERNSHIP GUIDELINES:

- The students should apply for internships of their choice with the permission of the Institute.
- The internship duration ranges from 4 to 6 weeks and is scheduled during the summer vacation period for students
- Industry will confirm the training slots and the number of seats allocated for internships via confirmation letter/ email.
- Students on joining Training at the concerned Industry / Organization, submit the Joining Report/Letters / Email.
- Students undergo industrial training at the concerned Industry / Organization.
- Training and placement team will visit the industry and evaluate(s) the performance of students regularly and evaluation Report of the students is submitted in department office/TPO with the consent of Industry persons/ Trainers.
- Students will submit training report after completion of internship.
- Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:
 - Regularity in maintenance of the diary.
 - Project/Case study/Completion of assigned task by industry undertaken during the internship
 - Employer feedback
- Training Certificate to be obtained from industry