NAGARJUNA
COLLEGE OF ENGINEERING & TECHNOLOGY

Nagarjuna College of Engineering & Technology, Bengaluru
An Autonomous Institute, Affiliated to VTU Belagavi

Department of Information Science and Engineering

Curriculum Scheme & Structure

5th Semester Syllabus

As per the NEP 2020 Guidelines

w.e.f.

Academic Year 2024-2025

NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU
B.E. in Information Science and Engineering
Scheme of Teaching and Examinations 2022
Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2024-25)

V SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lectur	Tutorial	Practical	SDA	Duration in	CIE Marks	SEE Marks	Total Mark	
					L	T	P	S					
1	AEC	22IST51	Machine Learning	CSEB	3	0	0		03	50	50	100	3
2	IPCC	22ISI52	Computer Networks	CSEB	3	0	2		03	50	50	100	4
3	PCC	22IST53	Operating Systems	CSEB	3	2	0		03	50	50	100	4
4	PCCL	22ISL54	Machine Learning Lab	CSEB	0	0	2		03	50	50	100	1
5	PEC	22IST55X	Professional Elective Course	CSEB	3	0	0		03	50	50	100	3
6	PROJ	22ISP56	Mini Project	CSEB	0	0	4		03	100	---	100	2
7	HSMS	22IST57	Research Methodology and IPR	HSM/CSEB	2	2	0		02	50	50	100	3
9	MC	22NSK58	National Service Scheme (NSS)	NSS coordinator	0	0	2		---	100	---	100	0
		22PEK58	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YOK58	Yoga	Yoga Teacher									
									Total	**500**	**300**	**800**	**20**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course

Professional Elective Course (PEC)			
22IST55A	Open-Source Platforms and Transformations	22IST55D	Startup Eco System
22IST55B	File Structures	22IST55E	Digital Marketing
22IST55C	Management and Entrepreneurship	22IST55F	Data Mining and Web Mining

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P : S) can be considered as (3 : 0 : 2 : 0) or (2 : 2 : 2 : 0). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more
details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

MACHINE LEARNING

Course Code	22IST51	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Credits	03	Total Marks	100

Prerequisites:

- Basic programming skills in python
- Basics of probability and Statistics

Course objectives:

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

- Explain the basic theory underlying machine learning.
- Apply machine learning algorithms to solve problems of moderate complexity
- Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
- Evaluate hypothesis and investigate instant based learning and reinforced learning
- Perform statistical analysis of machine learning techniques.

Syllabus

MODULE-1

Introduction: Introduction to Machine Learning, Components of learning, Learning Models-Logical Models, Geometric Model, Probabilistic Model

Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, (Chapters:1.1, 1.2 , 2.1, 2.2) Prentice Hall of India, 3rd Edition2014

Concept learning: : Concept learning task, Find-S algorithm, Version space, Represenatation Candidate Elimination algorithm, Representation,

Tom M. Mitchell, "Machine Learning", (Chapters:2.1,2.2, 2.3 2.4, -2.5, 2.7), India Edition, 2013, McGraw Hill Education 08 Hours

MODULE-2

Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm,Which attribute is the best classifier, an illustrative example. Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Tom M. Mitchell, "Machine Learning", (Chapters:3.1,3.2-3.2.1,3.2.2, 3.3, 3.4.1,3.4.2, 3.5,3.6.1, 3.6.2,, 3.7), India Edition, 2013, McGraw Hill Education

08 Hour

MODULE-3

Artificial Neural Networks: Introduction, Neural Network representation, Perceptron's Back Propagation Algorithm

Tom M. Mitchell, "Machine Learning", (Chapters:4.1,4.2,4.3, 4.4), India Edition, 2013, McGraw Hill Education

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LSerror hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm. .

Tom M. Mitchell, "Machine Learning", (Chapters:6.1, 6.2, 6.3, 6.4,6.11, 6.13), India Edition, 2013, McGraw Hill Education

08 Hours

MODULE-4

Instance Based Learning: Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case Based Reasoning

Tom M. Mitchell, "Machine Learning", (Chapters:8.1,8.2-8.2.1, 8.2.2, 8.3-8.3.1,8.3.2), India Edition, 2013, McGraw Hill Education

Motivation, Genetic Algorithms: Genetic Algorithms Representing hypothesis, Genetic operators, Fitness function and selection

Tom M. Mitchell, "Machine Learning", (Chapters:9.1,9.2.1, 9.2.2, 9.2.3), India Edition, 2013, McGraw Hill Education

08 Hours

MODULE-5

Evaluating Hypotheses: Estimating Hypothesis Accuracy, Basis of Sampling Theory, A General Approach for Deriving Confidence Intervals, Difference in Error of Two Hypotheses.

Chapters:(5.1,5.2.1, 5.2.2, 5.3-5.3.1,5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.4, 5.5), India Edition, 2013, McGraw Hill Education

Reinforcement Learning: Introduction, learning Task, Q learning

Tom M. Mitchell, "Machine Learning", Chapters:(13.1, 13.2, 13.3), India Edition, 2013, McGraw Hill Education

08 Hours

Course outcomes (Course Skill Set):

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

CO1: Demonstrate a comprehensive understanding of machine learning fundamentals.

CO2: Apply knowledge to distinguish between supervised, unsupervised, and reinforcement learning approaches.

CO3: Analyze learning and decision trees to solve classification and regression problems.

CO4: Design and implement hypothesis evaluation frameworks for learning and Bayesian algorithms.

CO5: Develop and apply statistical analysis skills to evaluate machine learning algorithms.

Text Books:

1. Tom M. Mitchell, "Machine Learning", India Edition, 2013, McGraw Hill Education.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, Second Indian Reprint 2015.

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer series in statistics.

2. Ethem Alpaydın, "Introduction to Machine Learning", 2nd Edition, MIT press.

3. Course material available on Swayam platform and NPTEL, for the course on Introduction to Machine Learning, conducted by Prof. Sudeshna Sarkar, IIT Kharagpur.

4. Ethem Alpaydın, Introduction to Machine Learning, MIT press 4th edition ISBN: 9780262043793.

5. C Agarwal, Machine Learning for Text, Pearson Education - 2006 (2 & 4). ISBN –15:34519801

Reference Online Resources:

1. https://www.geeksforgeeks.org/machine-learning/
2. https://www.javatpoint.com/machine-learning

COs, POs and PSOs Mapping:

POs, COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1	2	2						3	1	2		2
CO2	3	3	2	2	1						2	1		3	3
CO3	3	3	3	2	2						2	1		3	3
CO4	3	3	2	2	3						2	1	2		2
CO5	2	2	2	2	3					3	3	1		3	2

COMPUTER NETWORKS

Course Code	**22ISI52**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	**Credits (3:0:1:0)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40 T + 20 P**	**Total Marks**	**100**
Credits	**04**	**Exam Hours**	**03**

Course Learning Objectives:

CLO1. To explain the basics principles and standards for data Communication, Network types, topologies and protocols.

CLO2. To analyze the data link design issues and various data link protocols used for data transmission.

CLO3. To explain the working and implementation of Internet protocols and routing protocols responsible for network layer communication.

CLO4. To configure and simulate the working of different application and network layer protocols.

CLO5. To design and configure the different categories of the classful and classless IP addresses and subnets.

Module-1

Introduction: Data Communications: Components, Data representations, Data flow, Networks: Distributed Processing, Network Criteria, and Physical structures, Network models, Categories of Networks [LAN, WAN, MAN], Protocols and Standards. [1.1,1.2,1.3] -T1

Network Models: The OSI Model: layered architecture, Peer to peer processes, and encapsulation, Layers in the OSI Model: [Brief description of all seven layers], TCP / IP Protocol Suite, Addressing: physical, logical and port addresses and specific address. [2.1,2.2,2.3] -T1

08 Hours

Module-2

Data Link Layer: Introduction, Block Coding, Error detection and correction, Linear Block Codes: Simple Parity Check code, Hamming codes, Cyclic codes: Cyclic, Redundancy Check, Checksum, Data link control: Framing, Flow and Error control. [10.1,10.2,10.3,10.4] -T1

Multiple Access: Channelization: FDMA, TDMA, CDMA. [11.1,11.2] -T1

08 Hours

Module-3

Network Layer: Logical Addressing: IPv4 Addresses: Address Space, Notation, Classfull Addressing, Classless Addressing, IPv6 Addresses: Structure, Internet Protocol: IPv4 Datagram, IPv6, Transition from IPv4 to IPv6. [19.1,19.2, 20.1, 20.2,20.3,20.4]- T2

Network Layer: Address Mapping, Error Reporting: ARP, RARP, BOOTP and DHCP. [21.1]-T2 **Delivery, Forwarding & Routing:** Delivery, Forwarding: Routing Table, Unicast Routing Protocols: Distance Vector Routing. [22.1,22.2.22.3] –T2

08 Hours

Module-4

Transport Layer: Process to Process Delivery: UDP: TCP: TCP services, TCP features, Segment, A TCP connection. SCTP: SCTP services, SCTP features, Packet format. [23.1,23.2,23.3,23.4]-T2

Congestion Control and Quality of Service: Congestion control: Open loop congestion control and closed loop congestion control. [24.2,24.3] -T2

Quality of Service: Flow Characteristics, Flow Classes, Techniques to improve QoS: Scheduling and Traffic Shaping, QoS in ATM. [24.5,24.6] -T2 **08 Hours**

Module-5

Application Layer: Domain Name System: Name Space, Domain Name Space, DNS In The Internet, Resolution, DNS Messages, Types of Records. [25.1, 25.2, 25.3, 25.4, 25.5, 25.6, 25.7]-T2

Remote Logging, Electronic Mail and File Transfer: Remote logging: Telnet, Electronic mail: Architecture, User Agent, MIME, SMTP POP and IMAP. File Transfer: FTP. [26.1, 26.2] -T2

08 Hours

Teaching-Learning Process	Chalk & board, Active Learning, MOOC, Problem based learning, Laboratory Demonstration.

Laboratory Assignments

Laboratory Component:

1. Implement the following data link layer framing methods.
    a. Character count
    b. Character stuffing
    c. Bit stuffing
2. Design and develop a program to compute checksum for the given frame 1101011011 using CRC-CCITT 16bits. Display the actual bit string transmitted. Suppose any bit is inverted during transmission. Show that this error is detected at the receiver's end.
3. Implement distance vector routing algorithm to find suitable path for transmission that computes the shortest path from Source to Destination in the network.
4. Using TCP/IP sockets, write a client server program to make the client send the file name to make server sent the back the contents of the requested file if present.
5. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped using NS2.
6. Build a LAN with Hubs and Switches and perform Simulation of LAN using packet Tracer.
7. Build a Multi-LAN with Router Configuration and perform Simulation of Multi-LAN using packet Tracer.
8. Implement transmission of ping messages/trace route over a network topology consisting of 6nodes and

find the number of packets dropped due to congestion using NS2.

Course Outcomes:

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

CO1: Apply the basic knowledge of mathematical fundamentals for finding errors in transmission, optimal paths in a network and subnet addressing.

CO2: Analyze various problems associated with congestions, network topologies, physical media and protocols.

CO3: Explain the working of reference model layers, domain name servers and different components of the networking.

CO4:Design and development of network based solution by imbibing ethical principles and network standards

CO5: Demonstrate the working of components and protocols by simulating modern network Simulator

Suggested Learning Resources:

Text Book:

1. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 5th Edition, 2013.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 4th Edition, 2013.

Reference Books:

1. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson, 7th Edition, 2017.
2. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2015.

Weblinks and Video Lectures (e-Resources):

1. https://archive.org/details/Data.Communications.and.Networking.5th.Edition
2. https://www.cisco.com/c/en/us/solutions/smallbusiness/resourcecenter/networking/networking- basics.html.
3. http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages/9780133814743.pdf

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	--	--	--	--	--	--	--	--	--	--	--	2	--	--
CO2	2	3	--	--	2	--	--	--	--	--	--	--	3	--	--
CO3	--	--	3	--	--	--	--	--	--	--	--	--	2	--	--
CO4	--	--	2	3	2	--	--	--	2	--	--	--	--	2	2
CO5	--	--	--	1	3	--	--	--	2	2	1	1	--	1	2

OPERATING SYSTEMS

Course Code	22IST53	CIE Marks	50
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	Credits (3:2:0:0)	SEE Marks	50
Total Hours of Pedagogy	40 Hours Theory + 20 Hours Tutorial	Total Marks	100
Credits	04	Exam Hours	03

Course Learning Objectives:

1) Gain a comprehensive understanding of fundamental operating system concepts
2) Develop the ability to implement and analyze process synchronization mechanisms
3) Acquire the skills to evaluate and implement various CPU scheduling algorithms.
4) Explore and apply different memory management techniques to efficiently manage memory.
5) Develop an understanding of file system structures and storage management.

Module-1

Introduction to Operating Systems: Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components,

Operating System operations: Process management; Memory management; Storage management; Protection and Security; Operating System services, Distributed system, Reentrant Kernels, Monolithic and Microkernel Systems**.**

System calls; Types of system calls; Operating System generation; System boot.

08 Hours

Module-2

Process Management: Process concept Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Threads and their management: Multithreading models, Thread Libraries.

Process Scheduling: Scheduling Concepts, Scheduling Criteria, Scheduling Algorithms, Multiprocessor Scheduling. Inter Process Communication models and Schemes

08 Hours

Module-3

Process Synchronization: Concurrent Processes, Principle of Concurrency, Critical Section Problem: Peterson's solution, Mutual Exclusion, Semaphores, Test and Set operation;

Classical Problem in Concurrency- Dining Philosopher Problem, Producer / Consumer Problem; **Deadlock**: System Model, Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock

avoidance: Resource Allocation Graph, Bankers algorithm; Deadlock detection and recovery from deadlock.

08 Hours

Module-4

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Paging; Structure of page table; Segmentation, Segmentation with paging

Virtual Memory Management: Demand paging; Copy-on-write; Page replacement algorithms: Least Recently used (LRU) Optimal (OPT), Second Chance (SC), First in First Out (FIFO), Locality of reference, Thrashing

08 Hours

Module-5

File System: File concept; File Operations, File Access methods; File system mounting; File sharing; Implementing File system: File system structure;
File system implementation; Directory implementation; Allocation methods; Free space management, File system protection and security.
Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk scheduling and Algorithms; RAID.
Case Study: The Linux Operating System: Linux history; Design principles; comparison with Windows operating systems

08 Hours

Teaching-Learning Process

Teachers can use the following strategies to accelerate the attainment of the various course outcomes.

1. Lecturer methods (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
5. Demonstrate the installation of any one Linux OS on VMware/Virtual Box

Suggested Learning Resources:

Textbooks

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2015

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Weblinks and Video Lectures (e-Resources):

1. https://youtu.be/mXw9ruZaxzQ
2. https://youtu.be/vBURTt97EkA
3. https://www.youtube.com/watch?v=jciGIvn7UfM&list=PLyqSpQzTE6M9SYI5RqwFYtFYab94gJp Wk

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Assessment Methods Practical Implementation of CPU Scheduling algorithms. Case Study on Linux Based Systems.

Assessment Details (both CIE and SEE)

TheoryCourses: 3Credits or2Credits

EvaluationType		**Component**	**Max Marks**	**Marks Reduced to**	**Min. Marks**	**Evaluation Details**
Theory Component	Internal Assessment Tests(IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25marks
		IAT-2	25			
	Comprehensive Continuous Evaluations(C C E)	CCE-1	25	25		Any two Assessment methods as per 22OB4.2of regulations. Average of two CCEs, scaled down to 25 marks
		CCE-2	25			
	Total CIE -Theory			**50**	**20**	Scale down marks of IATand CCE to 25
SEE			100	**50**	**18**	Conducted for 100 marks and scaled down to 50.
CIE + SEE				**100**	**40**	

COURSE OUTCOMES:

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

CO1 Apply operating system concepts to solve real-world computing problems and optimize system performance.

CO2 Analyze and troubleshoot issues related to resource management, including problem handling and inter-process communication in the computer systems.

CO3 Design efficient algorithms and assess their performance under various system loads.

CO4 Conduct and develop strategies to improve system utilization and reduce latency.

CO5 Demonstrate effectively to explore Case studies of Operating Systems .

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	--	--	--	--	--	--	--	--	--	--	--	3	2	1
CO2	--	3	--	--	--	--	--	--	--	--	--	--	3	2	3
CO3	--	--	3	--	--	--	--	--	--	--	--	--	3	--	3
CO4	--	--	--	3	--	--	--	--	--	--	--	--	3	--	1
CO5	--	--	--	--	--	--	--	--	3	1	--	--	--	--	2

CO-PO Mapping Justification

CO1: Apply operating system concepts to solve real-world computing problems and optimize system performance.

- PO 1 (Engineering Knowledge): Mapping strength 3. Understanding and applying OS concepts is a key part of engineering knowledge, as it directly involves solving computing problems and optimizing system performance.
- PSO 1 (Professional Skills): Mapping strength 3. Applying OS concepts is fundamental to developing IT solutions and applications.
- PSO 2 (Problem-Solving Skills): Mapping strength 2. Optimizing system performance involves critical problem-solving skills.
- PSO 3 (Mathematical Foundations): Mapping strength 1. Optimization problems in OS often have underlying mathematical principles, though with lesser emphasis in this CO.

CO2: Analyze and troubleshoot issues related to resource management, including problem handling and inter-process communication in the computer systems.

- PO 2 (Problem Analysis): Mapping strength 3. Analyzing and troubleshooting resource management issues is directly aligned with PO 2, which focuses on problem analysis.
- PSO 1 (Professional Skills): Mapping strength 3. Resource management and inter-process communication are core areas of operating systems, requiring professional technical knowledge.
- PSO 2 (Problem-Solving Skills): Mapping strength 2. Effective troubleshooting helps in solving real-world system issues.
- PSO 3 (Mathematical Foundations): Mapping strength 3. Understanding resource management in OS often involves mathematical concepts like scheduling, memory management, and process synchronization.

CO3: Design efficient algorithms and assess their performance under various system loads.

- PO 3 (Design/Development of Solutions): Mapping strength 3. Designing efficient algorithms and assessing their performance is directly aligned with PO 3, as it focuses on developing optimized solutions for system operations.
- PSO 1 (Professional Skills): Mapping strength 3. Designing algorithms for resource management or scheduling contributes to IT skills development.
- PSO 3 (Mathematical Foundations): Mapping strength 3. Designing and analyzing the performance of algorithms requires a solid mathematical foundation in areas such as complexity theory and

resource allocation.

CO4: Conduct and develop strategies to improve system utilization and reduce latency.

- PO 4 (Investigation of Complex Problems): Mapping strength 3. Improving system utilization and reducing latency often involve investigating and analyzing complex problems within the system.
- PSO 1 (Professional Skills): Mapping strength 3. Developing strategies to enhance system utilization is a critical professional skill in IT-related fields.
- PSO 3 (Mathematical Foundations): Mapping strength 1. Reducing latency and optimizing system resources involve certain mathematical principles, though the focus here is more practical.

CO5: Demonstrate effectively to explore case studies of Operating Systems.

- PO 9 (Individual and Teamwork): Mapping strength 3. Exploring case studies often requires teamwork and collaboration, aligning with PO 9.
- PO 10 (Communication): Mapping strength 1. Effective demonstration of case studies requires communication skills, though it is less emphasized here.
- PSO 3 (Mathematical Foundations): Mapping strength 2. Case studies can often involve analyzing systems with underlying mathematical principles.

Machine Learning Lab

Course Code	22ISL54	CIE Marks	50
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	50L+50L	Total Marks	100
Credits	03	Exam Hours	3

Course objectives: This course will enable students to

CLO1. Explain the concept learning algorithms

CLO2. Illustrate the supervised and unsupervised learning techniques

CLO3. Explain clustering and classification algorithms for predictions and evaluating.

COURSE OUTCOMES

CO1. Describe the role and significance of various supervised, unsupervised, and reinforcement machine learning techniques in solving real-world problems.

CO2. Analyze and illustrate the fundamental principles underlying concept learning algorithms, including the Find-S algorithm and the Candidate Elimination algorithm.

CO3. Apply and examine various supervised learning techniques such as Decision trees, Artificial Neural Networks (ANN), Naive Bayes, K-Nearest Neighbors (KNN), and Bayesian belief networks

CO4. Apply unsupervised learning techniques such as K-means clustering and hierarchical clustering to make predictions and validate hypotheses in diverse datasets.

CO5. Analyze the concepts of regression and classification algorithm techniques like the non-parametric locally weighted regression algorithm and support vector machine.

Lab Programs:

1. Illustrate and Demonstrate the working model and principles of the Find-S algorithm
2. Demonstrate the working model and principles of the candidate elimination algorithm.
3. To employ supervised learning principles to build a decision tree model that effectively learns from the training dataset.
4. To understand the working principle of Artificial Neural network with feed forward and feed backward principle.
5. Demonstrate the classifier using Naïve bayes classifier algorithm.
6. Demonstrate and analyze the results obtained from the Bayesian belief network principle.

7. Implement and demonstrate the working model of the K-means clustering algorithm with the Expectation Maximization Concept.
8. Demonstrate and analyse the results of classification based on the KNN algorithm
9. Understand and analyse the concept of regression algorithm techniques.
10. Implement and demonstrate a classification algorithm using a support vector machine algorithm

COs, POs and PSOs Mapping:

POs, COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3				2			2		2	1	2	2		2
CO2	3	3			3			3		3	2	2		3	3
CO3	3	3	3		3			3		3	-	1		3	3
CO4	-	-	2	2	3			3		3	-	1	2		2
CO5	-	-	2	2	3			3		3	3	3		3	2

OPEN-SOURCE PLATFORMS AND TRANSFORMATIONS

Course Code	22IST55A	CIE Marks	50
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	Credits (3:2:0:0)	SEE Marks	50
Total Hours of Pedagogy	40 Hours Theory + 20 Hours Tutorial	Total Marks	100
Credits	04	Exam Hours	03

Course Objectives:

CLO1. To understand the significance and benefits of open-source platforms in software development.

CLO2. To explore various open-source software, tools, and platforms.

CLO3. To learn about the contribution, community engagement, and licensing in the open-source ecosystem.

CLO4. To develop the ability to leverage open-source tools for digital transformation in different domains.

CLO5. To foster skills in managing open-source projects and contributing effectively to the open- source community.

Module-1

Unit I: Introduction to Open Source

- History and Evolution of Open Source
- Open-Source Philosophy and Ethics
- Licensing in Open Source (GPL, MIT, Apache, etc.)
- Open Source vs Proprietary Software
- Advantages and Challenges of Open Source Software

Practical: Installation and basic configuration of a popular open-source operating system (e.g., Ubuntu, Fedora).

08 Hours

Module-2

Unit II: Open-Source Software Development

- Version Control Systems: Git and GitHub/GitLab
- Collaborative Development Practices
- Continuous Integration and Deployment (CI/CD)
- Open Source Project Management and Issue Tracking
- Contribution Guidelines and Best Practices

Practical:

- Contributing to an open-source project on GitHub.
- Setting up a CI/CD pipeline using Jenkins, Travis CI, or GitHub Actions

08 Hours

Module-3

Unit III: Open-Source Tools and Platforms

- Web Development: LAMP Stack (Linux, Apache, MySQL, PHP/Python)
- Big Data: Hadoop, Spark
- Data Science: Jupyter, R, TensorFlow
- Cloud Platforms: OpenStack, Kubernetes
- Database Systems: PostgreSQL, MongoDB

Practical:

- Setting up and deploying a basic web application using the LAMP stack.
- Running a simple big data job using Hadoop.

08 Hours

Module-4

Unit IV: Open-Source for Digital Transformation

- Open-Source Solutions for Enterprise: ERPNext, Odoo
- Open-Source in Internet of Things (IoT): ThingsBoard, Home Assistant
- Open-Source in Artificial Intelligence and Machine Learning
- Case Studies: Digital Transformation in Enterprises using Open Source
- Future Trends in Open Source: AI, Blockchain, Edge Computing

Practical:

- Implementing a basic IoT solution using open-source platforms.
- Developing a simple AI/ML model using TensorFlow or PyTorch.

08 Hours

Module-5

Unit V: Community Engagement and Open-Source Contribution

- Understanding Open-Source Communities
- How to Contribute: Bug Reporting, Feature Requests, Code Contribution
- Participating in Open-Source Events and Competitions
- Building a Portfolio with Open-Source Contributions
- Career Opportunities in Open Source

Practical:

- Participating in an open-source project or event.
- Building a portfolio of contributions to showcase on GitHub.

08 Hours

Course Outcomes:

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

CO1. Demonstrate an understanding of open-source principles and their application in real-world projects.

CO2. Identify and work with key open-source platforms and tools.
CO3. Participate in open-source communities and contribute to open-source projects.
CO4. Implement digital transformation solutions using open-source technologies.

CO5. Develop and showcase a portfolio of open-source contributions.

Suggested Learning Resources:

Textbooks

Textbooks and Reference Materials:

1. **"The Cathedral & the Bazaar: Musings on Linux and Open Source by an Accidental Revoluti**
   by Eric S. Raymond
2. **"Pro Git"** by Scott Chacon and Ben Straub
3. **"The Art of Community: Building the New Age of Participation"** by Jono Bacon
4. **"Open Source Intelligence Techniques"** by Michael Bazzell
5. **"Open Source Software: Implementation and Management"** by Paul Kavanagh

Assessment Methods

Evaluation Type	Component	Max Marks	Marks Reduced to	Min. Marks	Evaluation Details

Theory Component	Internal Assessment Tests(IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25marks
		IAT-2	25			
	Comprehensive Continuous Evaluations(CCE)	CCE-1	25	25		Any two Assessment methods as per 22OB4.2of regulations. Average of two CCEs, scaled down to 25 marks
		CCE-2	25			
	Total CIE -Theory			**50**	**20**	Scale down marks of IAT and CCE to 25
SEE			100	**50**	**18**	Conducted for 100 marks and scaled down to 50.
CIE + SEE				**100**	**40**	

COs, POs and PSOs Mapping:

POs, COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	3			2							2	2		2
CO2	2	3			3							2	3		3
CO3	3	3	3		3							1	3	1	3
CO4	-	-	2		3							1	2		2
CO5	-	-	2		3							3		3	2

File Structures

Course Code	22IST55B	CIE Marks	50
Teaching Hours/Week (L:T: P: S)(3:0:0:0)	Credits (3:0:0:0)	SEE Marks	50
Total	40 hours	Total Marks	100
Credits	03	Exam Hours	03

Course objectives:

This course will enable students to:

CLO1. Discuss the basics of working with files and different types of storage devices.

CLO2. Introducing fundamental concepts of file structure.

CLO3. Explains the most essential tools for high-level file structures, including indexing, co-sequential processing, B trees.

CLO4. Analyzing the techniques in the design of C++ programs to address a variety of file management issues.

CLO5. Understanding various Hashing techniques in organization of file structures.

Teaching-Learning Process (General Instructions)

Teaching-Learning Process (General Instructions) The sample strategies, which the teacher can use to accelerate the attainment of the various course outcomes are listed in the following:

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the evolution of communication technologies.
3. Encourage collaborative (Group) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction: File Structures: The Heart of the file structure Design, A Short History of File Structure Design, A Conceptual Toolkit;

Fundamental File Processing Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters in Files, The Unix Directory Structure, Physical Devices

and Logical Files.

Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape, Introduction to CD-ROM, Physical Organization of CD-ROM, CD-ROM Strengths and Weaknesses; Storage as a Hierarchy, A Journey of a Byte, Buffer Management, I/O in UNIX.

Text book 1: Chapter 1, Chapter 2, Chapter 3 (3.1-3.10)

08Hours

Module-2

Fundamental File Structure Concepts: Field and Record Organization, Using Classes to manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length and Fixed Field Buffers.

An Object-Oriented Class for Record Files: Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization.

Text book 1: Chapter 4, Chapter 5,

08 Hours

Module-3

Organization of Files for Performance: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Key sorting.

Indexing: What is an Index? A Simple Index for Entry -Sequenced Files of Data objects, indexes that are too large to hold in memory.

Multilevel Indexing and B-Trees: Introduction: The Invention of B-Tree, Statement of the Problem, Indexing with Binary Search Trees, Multilevel Indexing, a Better Approach to Tree Indexes,

B-trees: Working up from the Bottom, Example of Creating a B-Tree, B-Tree Methods Search, Insert and Others. Formal definition of B tree properties

Text book 1: Chapter 7, Chapter 9

08 Hours

Module-4

Co-sequential Processing: An Object-Oriented Model for Implementing Consequential Processes, A Model for Implementing Co-sequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Muti way Merging, A Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk.

Indexed Sequential File Access and Prefix B+ Trees: Indexed Sequential Access, maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree, Simple Prefix B+ Tree Maintenance.

Text book 1: Chapter8, Chapter 10

08 Hours

Module-5

Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distributions, How Much Extra Memory Should Be Used? Collision Resolution by Progressive Overflow, Storing More Than One Record per Address: Buckets, Making Deletions, Other Collision Resolution Techniques, Patterns of Record Access.

Text Book 1: Chapter 11

08 Hours

Teaching-Learning Process for all modules	**Chalk**

Course Outcomes (Course Skill Set):

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

CO1. Comprehend the essential ideas behind file operations and storage architectures.

CO2. Apply e the principles of object orientation to perform record manipulations

CO3. Explain file-management techniques such as sorting and merging

CO4. Analyze sequential and indexing file accessing methods using the relevant data structures.

CO5. Demonstrate how hashing techniques are used to organize file structures.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details
Internal Assessment Test (IAT)	IAT 1	25	**25**	**20**	Average of two IATs, Scaled down to 25 Marks
	IAT 2	25			
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	**25**		Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25			
Total CIE		-	**50**	**20**	Scaled down Marks of IAT and CCE to 25
SEE		**100**	**50**	**18**	Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	**100**	**40**	

Suggested Learning Resources:

Text Books:

1. Michael J. Folk, Bill Zoellick, Greg Riccardi: File Structures-An Object Oriented Approach with C++, 3rd Edition, Pearson Education, 1998

Reference Books:

1. K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj: File Structures Using C++, Tata McGraw-Hill, 2008.
2. Scot Robert Ladd: C++ Components and Algorithms, BPB Publications, 1993.
3. Raghu Ramakrishan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw Hill, 2003.

Web links and Video Lectures (e-Resources):

1. https://www.slideshare.net/shyamujaco/file-structures
2. https://isenotes.weebly.com/file-structures.html
3. https://www.vssut.ac.in/lecture_notes/lecture1428550942.pdf
4. https://www.azdocuments.in/2021/05/file-structures-18is61.html

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

a. Quizzes

b. Assignments

c. Seminars/Expert Lectures

CO- PO Mapping:

POS / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	1	-	-	-	-	-	-	-	-	3		1
CO2	3	2	2	1	1	-	-	-	-	-	1	-	2		
CO3	3	3	3	2	1	-	-	-	1	-	1	1		2	2
CO4	3	3	3	2	1	-	-	-	1	-	1	1	2		
CO5	3	3	3	1	1	-	-	-	-	-	-	1			3

MANAGEMENT AND ENTREPRENEURSHIP

Course Code	**22IST55C**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives

This course will enable students to:

CLO1. To have insight into the fundamentals of management and entrepreneurship that includes the different types, roles and functions played by the managers / entrepreneurs at different levels etc.

CLO2. To have proficiency in managing the activities effectively and efficiently and to be a successful entrepreneur.

Module – I

Management: Introduction - Meaning - nature and characteristics of Management, Scope and Functional areas of management - Management as art or science, art or profession - Management & Administration - Roles of Management, Levels of Management, Development of Management Thought - early management approaches - Modem management approaches

Planning: Nature, importance and purpose of planning process objectives - Types of plans (meaning only) - Decision making, Importance of planning - steps in planning & planning premises - Hierarchy of plans

8 Hours

Module – II

Organizing and staffing: Nature and purpose of organization, Principles of organization – Typesof organization-Departmentation Committees-Centralization Vs Decentralization of authority and responsibility - Span of control - MBO and MBE Nature and importance of staffing-- :Process of Selection & Recruitment

Directing: Meaning and nature of directing Leadership styles, Motivation, Theories, Communication - Meaning and importance - coordination, meaning and importance and Techniques of coordination. Controlling: Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control

8 Hours

Module – III

Entrepreneur: Meaning of Entrepreneur; Evolution of .the Concept; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging. Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development. Entrepreneurship in India; Entrepreneurship - its Barriers

Industrial ownership: Definition and meaning of Partnership, Characteristics of Partnership, Kinds of Partners, Partnership Agreement or Partnership Deed, Registration of Partnership Firm, Rights, Duties and Liabilities of Partners, Advantages and Disadvantages of Partnership, Sole proprietorship, Features, Scope Advantages and Disadvantages of Sole Proprietorship

08 Hours

Module – IV

Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of report, contents, formulation, guidelines by planning commission for project report Enterprise Resource Planning: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation and Case Study.

08 Hours

Module – V

Small scale industries: Definition; Characteristics; Need and rationale; Objectives; Scope; roleof SSI in Economic Development. Advantages of SSI, Steps to start and SSI - Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans

Impact of Liberalization, Privatization, Globalization on SSI: Effect of WTO/GA TT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry Institutional support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC SingleWindow Agency; SISI; NSIC; SIDBI; KSFC

08 Hours

Course outcomes:

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

CO1. Explain the different levels of management along with the different types of managers, their roles and functions etc.

CO2. Plan and organize the activities required to complete the project.

CO3. Create, motivate and manage groups/committees to carry out the assigned tasks.

CO4. Explain the fundamentals of entrepreneurship and its development process.

CO5. Establish Small Scale Industries using various types of supporting agencies and financing available for an entrepreneur.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details
internal assessment (IAT)	IAT 1	25	**25**	**20**	Average of two IATs Scaled down to 25 Marks
	IAT 2	25			
Comprehensive Continuous valuation CE)	CCE-1	25	**25**		Minimum of down to 25
	CCE-2	25			
Total CIE		**-**	**50**	**20**	Scaled down Marks of IAT and CCE to 25
CIE		**100**	**50**	**18**	Conducted for 100 Mark and Scaled down to 50
CIE + SEE		**-**	**100**	**40**	

Suggested Learning Resources:

Text books

1. Principles of management- P.C Tripathi, P.N Reddy-tata MCGraw Hill.
2. Dynamics of Entrepreneurial development and management- vasant desai himalaya publishing house.
3. Entrepreneurship development -Poornima.M Charantimath, small businesses enterprises -pearson education- 2006(2&4).

References:

1. Management fundamentals - concepts, applications skill development- roberslusier, thomson .
2. Enterpreneurship development-S,S khanka, S, chand and co.new delhi.

Management- stephen robbins, pearson education / PHI 17th edition 2003.

CO –PO Mapping:

Course Outcomes	Program Outcomes												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**0**	**1**	**2**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3		2					2	2		1	**2**		**2**
CO 2	2	2	3	2	3				2	2		1	**2**		**2**
CO 3	2		2	3	3				3	3		2	**2**		**2**
CO 4	1	2		2	3	2	2	2	3	3	3	3	**2**		**2**
CO 5	3	3	2	3	3	2	2			2	3	2		**3**	**2**

STARTUP ECO SYSTEM

Course Code	**22IST55E**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	**Credits (1: 0: 0: 0)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40 Hours Theory + 20 Hours Tutorial**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Objectives:

Course Objective:

CLO1. To enable the students to develop perspective and an appropriate understanding of startups in the Indian context.

CLO2. To expose the students to the startup ecosystem and its impact on start-ups. **CLO3.** To enable the students to understand the process of new startup venture creation. **CLO4.** To expose the students to various startup funding opportunities.

To impart knowledge about the startup failures and the sustainability.

Module-1

Module 1: Introduction to Startups

Definition and meaning of startups, characteristics, role, importance and present status in Indian economy, Start-up lifecycle, Factors influencing their emergence, Government Pol- icies and initiatives for startups in India, Problems and Challenges. **08 Hours**

Module-2

Module 2: The Startup Ecosystem

Entrepreneurship Ecosystem Approaches: Ecosystem Perspectives, Daniel Isenberg's Domains of the Entrepreneurship Ecosystem, Components of entrepreneurial ecosystem pillars by World Economic Forum, Trilevel Cycle Business Ecosystem, The Rise of the startup economy - The Six Forces of Change- the Start-up equation. **08 Hours**

Module-3

Module 3: Process of New Venture

Registration and Licensing, bank and other statutory formalities, Resource mobilization, Organizing the basic infrastructure such as premises, water, power, transport etc., pro- curement of machinery & equipment, mobilization of human and material resources, trial run, Constructing a Process Map - Positioning the venture in the value chain - Launch strategy to reduce risks, Intellectual Property Rights.

08 Hours

Module-4

Module 4: Start-up Funding

Funding Needs, Stage-wise Sources of Finance for Startups, Steps to Startup Fund Rais- ing, Methods of Financing to Startups: Bootstrapping, Crowd funding, Angel Financing, Small Business Credit Cards, 3 F's, Venture Capital, Funding From Business Incubators and Accelerators, Bank Loans, Funds by Winning Contests, Loans from Microfinance Providers or NBFCs, Government's Assistance, Product Pre-sale, Credit Cards, Alterna- tive Investment Funds: SIDBI Fund of Funds Scheme, Startup India Seed Fund Scheme.

09 Hours

Module-5

Module5: Planning for Harvest and Exit

Reasons for startup failure and sustainability of startups, Dealing with Failure: Bankrupt- cy, Exit Strategies-Sellingthebusiness-Cashingoutbutstayingin-beingacquired-Going Pub- lic (IPO)– Liquidation.

07Hours

Course Outcomes:

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

CO1. Comprehend the need for startups for the development of an economy.

CO2. Appreciate the importance of startup ecosystem.

CO3. Develop a start-up enterprise.

CO4. Analyze start-up capital requirements and the sources of funding.

CO5. Interpret startup failures and the need for sustainability.

Suggested Learning Resources:

Textbooks

References

1. Launching New Ventures- An Entrepreneurial Approach, Kathleen R Allen, Cengage Learning, 2016.
2. Managing New Ventures- Concepts and Cases, Anjan Raichaudhuri, Prentice Hall Interna- tional 2010
3. Entrepreneurship, R. Bhowmik & M. Bhowmik S, New Age International, 2007.
4. The Startup Equation: A Visual Guidebook for Building Your Startup, Steven Fisher, Janae' Duane, Indian Edition, McGraw Hill Education India Pvt .Ltd 2016
5. New Venture Management: The Entrepreneur's Road Map, Donald F Kuratko, Jeffrey S.Hornsby, 2e, Routledge, 2017.
6. Corporate Entrepreneurship, VijaySathe,1e,Cambridge, 2009.
7. The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company by Steve Blank & Bob Dorf

8. Start with Why by Simon Sinek

9. Raising Eyebrows by Dal LaMagna

10. The $100 Startup: Reinvent the Way You Make a Living, Do What You Love, and Create a New Future by Chris Guillebeau

11. Lean Startup by Eric Ries

Co-Po Mapping:

Course Outcomes	PROGRAMOUTCOMES(POs)								PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2
CO1	2	1	1	2	1	2	1	2	1	2
CO2	2	1		2	1	1	1		2	
CO3	2	1	2	2	1	2	2	2	1	1
CO4	1	2		2	1	2	2	2	2	1
CO5	1	2	1	2	1	1	1	1	1	1

DIGITAL MARKETING

Course Code	**22IST55E**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	**Credits (3:0:0:0)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40 Hours Theory + 20 Hours Tutorial**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Objectives:

1. To make students understand the concepts related to digital marketing

2. To make students learn the use of display advertising

3. To acquaint the students with the knowledge of search engine optimization.

4. To make students aware of social media marketing

5. To make students understand how mobile marketing works

Module-1

Module 1: Introduction to Digital Marketing

Introduction to Digital Marketing, Concept of Digital Marketing, Origin, traditional versus Digital Marketing, Digital Marketing Strategy- The P-O-E-M Framework, Segmenting and customizing Messages, Digital Landscape, Digital advertising Market in India, Skills required in Digital Marketing, Digital Marketing Plan.

08 Hours

Module-2

Module 2: Display Advertisement

Display Advertising: Concept of Display Advertising, Types of display ads, Buying models, Display plan Targeting, Contextual targeting, Placement targeting, Remarketing, Interest categories, Geographic and language tagging, Demographics, Mobile and other targeting methods, Programmatic digital advertising, YouTube Advertising.

08 Hours

Module-3

Module 3: Search Engine Optimization

Search Engine Advertising- Understanding Ad Placement, Understanding Ad Ranks, Creating First Ad Campaign, Performance Reports. Search Engine Optimization: How search engines work, concept of search engine optimization (SEO), On Page Optimization, Off Page Optimization, Social media out

Reach, Maintenance- SEO tactics, Google Search Engine, Web Analytics- Key Metrics- concepts only.

08 Hours

Module-4

Module 4: Social Media Marketing

Social Media Marketing: Building a successful Strategy, Facebook Marketing: Facebook for business & Facebook insights; LinkedIn Marketing: LinkedIn Strategy, LinkedIn Analytics; Twitter Marketing: Building Content Strategy, Twitter usage, Twitter Analytics Instagram and Snapchat: Objectives of Instagram, Hashtags, Digital Public Relations.

08 Hours

Module-5

Module 5: Mobile Marketing

Mobile Marketing, Mobile Usage, Mobile Advertising, Mobile Advertising Models, Ad- vantages of Mobile advertising, Mobile Marketing Toolkit, Mobile Marketing features, Location based services, Social marketing on mobile, QR Codes, Augmented Reality, Gamification, Tracking mobile campaigns.

08 Hours

Course outcomes:

Students will be able to:

CO1. Analyze the effectiveness of digital marketing campaigns using relevant metrics.

CO2. Apply SEO principles improve website visibility and organic search rankings.

CO3. Develop and implement effective digital marketing strategies aligned with business objectives.

CO4. Demonstrate comprehensive understanding of core digital marketing concepts, frameworks and best practices.

CO5. Design Mobile Marketing for business.

Suggested Learning Resources:

Textbooks

References

1. Digital Marketing, Seema Gupta, McGraw Hill Education, 2017.
2. Marketing 4.0: Moving from Traditional to Digital, Philip Kotler, Hermawan, Kartajaya, Iwan Setiawan, Wiley, 2017.
3. Fundamentals of Digital Marketing, Puneet Bhatia, Pearson, Second Edition.
4. Digital Marketing, Swaminathan T N, Karthik Kumar, Cengage Learning India Pvt. Ltd

2019.

5. Social Media Marketing, Tracy L Tuten, Michael R Solomon, SAGE, Second Edition.

6. Digital Marketing, Ian Dodson, Wiley, 2016.

CO-PO MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	2	-	-	-	-	-	-	1	-	2	-	-
CO2	-	2	-	2	2	2	-	-	-	-	-	-	-	-	3
CO3	1	-	3	-	-	-	-	2	2	2	-	-	2	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
C05	-	-	-	-	-	-	-	2	1	2	1	-	-	-	2
AVG	**1.2**	**1.2**	**0.6**	**0.8**	**0.4**	**0.4**	**-**	**0.8**	**0.6**	**0.8**	**0.4**	**-**	**-**	**-**	**-**

Data Mining and Web Mining

Course Code	22IST55F	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P:S) (3:0:2:0)	**Credits (3:0:0:0)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40 Hours Theory + 20 Hours Tutorial**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives: This course(22IST55F) will enable students to:

CO1. Understand and apply key concepts and techniques in data mining.

CO2. Understand and apply association rule mining techniques.

CO3. Understand and apply key techniques in classification and clustering, including classification and prediction concepts

CO4. Become familiar with classic and recent developments in Web search and data mining, acquire statistical techniques to analyse complex information and social networks;

CO5. Study several models to interpret emergent features such as the structure and evolution of the Web graph, its traffic patterns, and the spread of information

Module – 1

Data Mining: Types of Data, Data Mining Functionalities– Interestingness Patterns, Classification of Data Mining systems, Data mining Task primitives, Integration of Data mining system with a Data warehouse, Major issues in Data Mining–Data Preprocessing. **8 Hours**

Module – 2

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods, Mining Various kinds of Association Rules, Correlation Analysis–Constraint based Association mining. Graph Pattern Mining, SPM. **8 Hours**

Module – 3

Classification: Classification and Prediction–Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis, Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods, Density based Methods, Grid based Methods, Outlier Analysis. **8 Hours**

Module – 4

Information Search: Web crawling, Indexing, Web search and retrieval **Classification and recommendation :** Text analysis and classification, Link analysis, Ranking algorithms, Clustering/community algorithms, Topical locality. **8 Hours**

Module – 5

Dynamics of Web processes : Web growth models, Web traffic models, Social tagging, Social networks and social media, Information diffusion

8 Hours

Course Outcomes: The students should be able to:

CO1.Apply data mining techniques and methodologies to extract meaningful insights from various data sources.

CO2. Design comprehensive data mining solutions by integrating techniques for classification, association rule mining, clustering, and information retrieval.

CO3.Analyze data mining processes and techniques to evaluate patterns, classifications, clustering methods, web dynamics and social media on data-driven decision-making.

CO4. Develop data mining & web mining applications to solve real-world problems using python programming.

CO5.Demonstrate the ability to apply data mining techniques, including classification, association rule mining, and clustering web dynamics and social networks

Question Paper Pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer 5full questions, selecting one full question from each module.

Text Books:

1. Data Mining – Concepts and Techniques– Jiawei Han& Micheline Kamber, 3rdEdition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, Pearson Education 2003.
3. Mining the Web - Discovering Knowledge from Hypertext Data - Soumen Chakrabarti, 1st Edition - October 9, 2002
4. Modern Information Retrieval - The Concepts and Technology Behind Search by Rafael Baeza- Yates and Berthier Ribeiro-Neto

Reference Books:

1. Ian H. Witten and Eibe Frank, Data Mining: Practical MachineLearning Tools and

Techniques(SecondEdition),MorganKaufmann,2005

2. Jiawei Han & Micheline Kamber, “Data Mining Concepts & Techniques”, 2011, 3rd Edition.
3. Text Mining: Classification, Clustering, and Applications by Michael W. Berry and Malin Axelrod

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3											3	3		2
CO2		3											2		
CO3		3			2							3		2	
CO4		3	3										2		1
CO5		2	2		3							2		1	2

RESEARCH METHODOLOGY AND IPR

Course Code	**22RMP57**	CIE Marks	**50**
Teaching Hours/Week (L:T:P:S)	**3:0:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course objectives:

1. To provide an overview of Engineering research and its methodology
2. To describe the techniques for defining a research problem.
3. To give exposure to various resources supporting the literature survey, statistical tools and plagiarism check.
4. To learn the basics of intellectual property, copy right and Trade mark rights.
5. To educate about developing technical reports and presentations. This shall serve the project work course.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's, Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps to improve the students' understanding.

Module – I

Introduction: Meaning of Research, Objectives, and Motivation in Engineering Research, Criteria for Good Research, Types of Engineering Research, Research Process, Research Problem, Selection and Components of the Research Problem, Techniques Involved in Defining a Problem.

Ethics in Engineering Research- Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **08 Hours**

Module – II

Reviewing the literature: Importance of the Literature Review, new and existing knowledge, Steps Involved in the Literature Review, Bibliography databases and Search Engines for Research Papers: Web of Science and Google search. Developing a Theoretical and Conceptual Framework, Sample Outline of a Literature Review.

Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions.

08 Hours

Module – III

Interpretation and Report Writing- Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report writing, Different steps in writing report, Layout of the research report, Types of reports, Oral presentation, Mechanics of writing a research report, Precautions for writing research reports.

Technical Writing and Publishing - Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper, The Choice, Writing Strategies, Journal Paper: Structure and Approach, Language Skills, Writing Style, and Editing, Rules of Mathematical Writing, Publish Articles to Get Cited.

08 Hours

Module – IV

Patent application preparation - Preparing patent applications, Obtaining invention disclosures from Inventors, identifying patentable inventions, Understanding the invention (core inventive concept), Inventorship. Typical parts of the patent Application - Request, Description, Claims, Drawings, Abstract, and Application format.

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements.

Trademarks: Eligibility Criteria. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration and validity of a Trademark. Process for Trademarks Registration. Prior Art Search. Types of Trademark Registered in India.

Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

08 Hours

Module – V

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Non-Protectable Industrial Designs India. Procedure for Registration of Industrial Designs. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Classification of Industrial Designs. International Treaties.

Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India and their Identification. Classes of GI.

08 Hours

Teaching-Learning Process for all modules	**Chalk and board, Active Learning, PPT Based presentation, Video**

Assessment for IAT and CCE:

Evaluation Type		**Component**	**Max Marks**	**Marks Reduced to**	**Min. Marks**	**Evaluation Details**
Theory Component	Internal Assessment Tests (IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25 marks
		IAT-2	25			
	Comprehensive Continuous Evaluations (CCE)	CCE-1	25	25		Any two Assessment methods as per 22OB4.2 of regulations. Average of two CCEs, scaled down to 25 marks
		CCE-2	25			
	Total CIE -Theory			50	20	
SEE			100	50	18	Conducted for 100 marks And scaled down to 50.
CIE + SEE				**100**	**40**	

Text Book

1. Dr. Santosh M Nejakar, Dr. Harish Bendigeri "Research Methodology and Intellectual Property Rights", ISBN 978-93-5987-928-4, Edition: 2023-24.
2. C. R. Kothari, Gaurav Garg, "Research Methodology: Methods and Techniques" New Age International, 4th Edition, 2019.

Reference Book

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4
2. Intellectual Property Rights by N.K. Acharya Asia Law House 6th Edition. ISBN: 978-93.
3. Research Methodology by Ranjit Kumar, sage publication 3rd Edition

Course Outcomes:

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

1. **Apply** research concepts and techniques to effectively address research problems.
2. **Analyse** literature reviews and databases critically, ensuring proper citation and acknowledgment.
3. **Design** and structure internship reports, technical writing, and oral presentations with effective interpretation.
4. **Identify** and **discuss** key aspects of intellectual property rights (IPR), emphasizing their importance and processes.
5. **Evaluate** case studies and **demonstrate** applying IP laws and ethical standards to real-world engineering and innovation challenges.

CO-PO-PSO Mapping:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	--	--	--	--	--	--	--	--	--	--	--	3	--	--
CO2	--	3	--	--	--	--	--	--	--	--	1	--	--	--	3
CO3	--	--	2	--	--	--	1	--	--	--	2	--	2	--	--
CO4	--	--	--	--	--	--	1	--	--	--	1	--	--	--	2
CO5	--	--	--	--	2	2	3	3	--	--	1	--	2	--	--