MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous Programme

Bachelor of Engineering

Department Of
Information Science and Engineering

SCHEME and SYLLABUS
(2023 Admitted Batch)

Academic Year 2025-26

VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals.

MISSION OF THE INSTITUTE

1. Create conducive environment for learning and research
2. Establish industry and academia collaborations
3. Ensure professional and ethical values in all institutional endeavors

VISION OF THE DEPARTMENT

The department will be a premier centre focusing on knowledge dissemination and generation to address the emerging needs of information technology in diverse fields.

MISSION OF THE DEPARTMENT

1. To make students competent to contribute towards the development of IT field.

2. Promote learning and practice of latest tools and technologies among students and prepare them for diverse career options.

3. Collaborate with industry and institutes of higher learning for Research and Development, innovations and continuing education.

4. Developing capacity of teachers in terms of their teaching and research abilities.

5. Develop software applications to solve engineering and societal problems.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates will:

PEO1: Be successful professionals in IT industry with good design, coding and testing skills, capable of assimilating new information and solve new problems.

PEO2: Communicate proficiently and collaborate successfully with peers, colleagues and organizations.

PEO3: Be ethical and responsible members of the computing profession and society.

PEO4: Acquire necessary skills for research, higher studies, entrepreneurship and continued learning to adopt and create new applications.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

3. **Design/Development of solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **Conduct investigations of complex problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. **Modern tool usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

6. **The engineer and the world**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PROGRAM OUTCOMES (POs)

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

9. **Individual and collaborative team work**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.

10. Communication: Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

11. Project management and finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES

Upon graduation, students with a degree B.E. in Information Science & Engineering will be able to:

1. Design and Develop efficient information systems for organizational needs.
2. Ability to adopt software engineering principles and work with various standards of Computing Systems.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	10
CIE 2	10
CIE 3	10
Activities as decided by course faculty	20
SEE	50
Total	100

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20
SEE	50	20

COURSE TYPES

Basic Science Course	BSC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC

Semester-wise Credit Distribution

Curricular Component ↓ / Semester →	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	8	8	4	5	-	-	-	-	**25**
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	9	9	3	3	-	-	-	-	**24**
Professional Core Course (PCC)	-	-	12	12	12	11	8	-	**55**
Professional Elective Course (PEC)	-	-	-	-	3	3	3	3	**12**
Open Elective Course (OEC)	-	-	-	-	-	3	3	3	**9**
Project/Mini Project/Internship (PI)	-	-	-	-	1	2	4	10	**17**
Humanities and Social Sciences, Management Course (HSMC)	1	2	-	-	4	-	-	-	**7**
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	1	1	1	3	1	-	-	**9**
Universal Human Value Course (UHV)	-	-	1	1	-	-	-	-	**2**
Total Credits	**20**	**20**	**21**	**22**	**23**	**20**	**18**	**16**	**160**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
			THIRD SEMESTER								
1	BSC	23MAIS301	Mathematics for Information Science Engineering-I	3	1	2	6	50	50	100	4
2	IPCC	23IS302	Digital Design & Computer Organization	3	0	2	5	50	50	100	4
3	IPCC	23IS303	Operating Systems	3	0	2	5	50	50	100	4
4	PCC	23IS304	Data Structures and Applications	3	0	0	3	50	50	100	3
5	PCCL	23IS305	Unix Lab	0	0	2	2	50	50	100	1
6	ESC	23IS306X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
7	UHV	23SCR	Social Connect and Responsibility	0	0	2	2	100	-	100	1
8	AEC/SEC	23IS307X	Ability Enhancement Course/Skill Enhancement Course - III	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
9	MC	23NYP1	NSS,YOGA,PE	0	0	2	2	100	-	100	A
10	BSC	23BCM301	Bridge Mathematics-I (Mandate Audit Course forDiploma entry students)	3	0	0	3	100	-	100	A
			Total				**33**	650	350	1000	**21**

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Engineering Science Course (ESC/ETC/PLC)			
23IS306A	OOP with Java	23IS306C	Discrete Mathematical Structures
23IS306B	OOP with C++	23IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
23IS307A	R Programming	23IS307C	Data Visualization with Python
23IS307B	Data Analytics with Excel	23IS307D	Version Controller with GiT

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	BSC	23MAIS401	Mathematics for Information Science Engineering-II	3	1	2	6	50	50	100	4
2	IPCC	23IS402	Microprocessor and Microcontroller	3	0	2	5	50	50	100	4
3	IPCC	23IS403	Database management Systems	3	0	2	5	50	50	100	4
4	PCC	23IS404	Design and Analysis of Algorithms	3	0	0	3	50	50	100	3
5	ESC	23IS405X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
6	UHV	23UHV	Universal Human Values	0	2	0	2	50	50	100	1
7	AEC/SEC	23IS406X	Ability Enhancement Course/Skill Enhancement Course - IV	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
8	MC	23NYP2	NSS,YOGA,PE	0	0	2	2	100	-	100	A
9	BSC	23BEIS407	Biology for Engineers	0	2	0	2	50	50	100	1
10	PCCL	23IS408	Design and Analysis of Algorithms laboratory	0	0	2	2	50	50	100	1
			Total				**34**	550	450	1000	**22**
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
23IS405A	C# and .Net Technologies	23IS405C	Optimization Techniques
23IS405B	Internet of Things	23IS405D	Probability, Statistics and queuing
Ability Enhancement Course – III			
23IS406A	Green IT and Sustainability	23IS406C	Introduction to web technology
23IS406B	UI/UX laboratory	23IS406D	Technical writing using LATEX

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	23IS501	Computer Networks	3	0	2	5	50	50	100	4
2	PCC	23IS502	Theoretical Foundations of Computation	2	2	0	4	50	50	100	3
3	IPCC	23IS503	Software Engineering	3	0	2	5	50	50	100	4
4	PCCL	23IS504	Data Visualization Lab	0	0	2	2	50	50	100	1
5	HSMC	23IS505	Entrepreneurship and Management	3	0	0	3	50	50	100	3
6	HSMC	23EVS	Environmental Studies	0	2	0	2	50	50	100	1
7	PEC	23IS5XX	Professional Elective Course - I	3	0	0	3	50	50	100	3
8	MC	23NYP3	NSS,YOGA,PE	0	0	2	2	100	-	100	A
9	PI	23IS506	Mini Project	0	0	2	2	50	50	100	1
10	AEC	23RIP	Research Methodology and IPR	3	0	0	3	50	50	100	3
			Total				**31**	500	400	900	**23**

Professional Elective Course I			
23IS551	Computer vision and Image Processing	23IS553	Full Stack Development
23IS552	Robotic Process Automation	23IS554	Supply Chain Analytics

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

			SIXTH SEMESTER								
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours/Week**				**Exam Marks**			**Credits**
				L	**T**	**P**	**Total**	**CIE**	**SEE**	**Total**	
1	PCC	23IS601	Cryptography, Network Security and Cyber Law	3	0	0	3	50	50	100	3
2	IPCC	23IS602	Artificial Intelligence and Machine Learning	3	0	2	5	50	50	100	4
3	IPCC	23IS603	Cloud Computing	3	0	2	5	50	50	100	4
4	PI	23IS604	Main Project Phase - I	0	0	4	4	50	50	100	2
5	PEC	23IS6XX	Professional Elective Course - II	3	0	0	3	50	50	100	3
6	OEC	23OEIS6X	Open Elective Course - I	3	0	0	3	50	50	100	3
7	MC	23NYP4	NSS,YOGA,PE	0	0	2	2	100	-	100	A
8	AEC	23ASK	Analytical Ability and Soft Skills	0	0	2	2	50	50	100	1
			Total				**27**	450	350	800	**20**

Professional Elective Course - II			
23IS661	Storage Area Networks	23IS663	Automated Software Testing
23IS662	Big data Technologies	23IS664	Block Chain Technology

Open Elective Course - I			
23OEIS61	Responsible AI	23OEIS63	Information and Network Security
23OEIS62	Introduction to Machine Learning	23OEIS64	Data Mining and Warehousing

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	23IS701	Deep Learning	3	0	2	5	50	50	100	4
2	IPCC	23IS702	Data Science using R	3	0	2	5	50	50	100	4
3	PI	23IS703	Main Project Phase - II	0	0	8	8	50	50	100	4
4	PEC	23IS7XX	Professional Elective Course - III	3	0	0	3	50	50	100	3
5	OEC	23OEIS7X	Open Elective Course – II	3	0	0	3	50	50	100	3
			Total				**24**	250	250	500	**18**

SEVENTH SEMESTER

Professional Elective Course - III			
23IS771	Virtual Reality and Augmented Reality	23IS773	DevOps: Bridging Development and Operations
23IS772	Parallel Computing	23IS774	Generative Artificial Intelligence

Open Elective Course - II			
23OEIS71	Fundamentals of Database Management System	23OEIS73	Fundamentals of Block Chain
23OEIS72	Introduction to Big Data	23OEIS74	Introduction to Data Science

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				EIGHTH SEMESTER							
				L	T	P	Total	CIE	SEE	Total	
1	PEC	23SW01	Professional Elective (NPTEL Online Course)	3	0	0	3	-	100	100	3
2	OEC	23SW02	Open Elective (NPTEL Online course)	3	0	0	3	-	100	100	3
3	PI	23INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
			Total				**18**	100	300	400	**16**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

#	Course	Course code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Computer Networks	23IS501	√	√	√	√	√							
2	Theoretical Foundations of Computation	23IS502	√		√		√							
3	Software Engineering	23IS503	√	√	√	√	√		√	√	√	√		
4	Entrepreneurship and Management	23IS505	√	√				√					√	
5	Environmental Studies	23EVS						√	√	√	√	√		
6	Research Methodology and IPR	23RIP		√	√	√							√	√
7	Cryptography, Network Security and Cyber Law	23IS601	√	√			√			√				
8	Artificial Intelligence and Machine Learning	23IS602		√	√		√				√	√		
9	Cloud Computing	23IS603		√	√		√			√				
10	Analytical Ability and Soft Skills	23ASK		√	√					√	√	√		
	Mapping course to po's		50%	80%	70%	30%	60%	20%	20%	50%	40%	40%	20%	10%

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	Computer Networks		
Course Code	23IS501	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

Course Objective: Students will gain the basic knowledge of data communication and computer networks.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Explain the Ethernet Standard and Networking devices, Connecting devices and different protocols at the network, transport and application layers.	1	
2.	Apply suitable subnetting and IP addressing for a given Requirement. Switching techniques as per need.	1	
3.	Analyze different protocols at MAC sub-layer, Network and Transport Layers	2,5	
4.	Design networks applying Internetworking concepts and appropriate IP addressing for a given problem	3, 4,5	

MODULE-1	9 Hrs.

Introduction: Data Communications, Network Types, Network Models:, TCP/IP Protocol Suite, The OSI Model. **Introduction to Physical Layer**: Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate L limits, Performance. **Digital Transmission**: Digital-to-Digital Conversion - Line Coding, Line Coding Schemes. Transmission Media: Introduction, Guided Media, Unguided Media: Wireless. Transmission Media

MODULE-2	9 Hrs.

Switching: Introduction, Circuit-Switched Networks, Packet Switching, Structure of a Switch. Introduction to Data-Link Layer: Introduction, Link-Layer Addressing (up to ARP). **Error Detection and Correction**: Introduction, Block Coding, Cyclic Codes (up to Cyclic code encoder using Polynomials) Data Link Control: DLC Services, Data-Link Layer Protocols

MODULE-3	9 Hrs.

Introduction to Network Layer: Network Layer Services, Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPV4 Addresses – Address Space, Classful Addressing, Classless Addressing, DHCP message format Introduction. Routing Algorithms, Distance vector routing, link state routing, Path vector routing. **Multicast Routing**: Introduction, Multicasting Basics. **Next Generation IP**: IPV6 Addressing, The IPv6 protocol, Transition from IPv4 to IPv6

MODULE-4	9 Hrs

Transport-Layer: Introduction, Transport-Layer Services, Transport Layer Protocols - Simple Protocol**,**
TL Protocols: Introduction, User Datagram Protocol, Transmission Control Protocol – up to A TCP
Connection (Excluding: State Transition Diagram).

Introduction to Application Layer: Introduction, Client-Server Programming, Standard Client Server
Protocols: World Wide Web and HTTP

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data Communications and Networking	Behrouz A. Forouzan	6th	Tata McGraw-Hill	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Communication Networks - Fundamental Concepts and Key Architectures"	Alberto Leon-Garcia and Indra Widjaja,	2nd	Tata McGraw-Hill	2004
2	Data and Computer Communication	William Stallings	9th	Pearson Education	2014

E Books:

1. https://dpvipracollege.in/wp-content/uploads/2023/01/Data-Communications-and-Networking-By-Behrouz-A.Forouzan.pdf

MOOC Course:

1. https://www.my-mooc.com/en/mooc/computer-networking--ud436
2. https://onlinecourses.nptel.ac.in/noc23_cs35/pre   view

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Lab Conduction	20
Total		**50**

Laboratory Plan:

Sl.No	Program Details
1	Write and execute a program for distance vector algorithm to find the suitable path for transmission between sender and receiver.
2	Write and execute a program to find 16-bit and 32-bit checksum Fletcher and Adler checksum methods
3	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
4	Suppose Alice wants her friends to encrypt email messages before sending them to her. Write a program to help her friends to encrypt and decrypt the data. (RSA algorithm).
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.
6	Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
7	Simulate the transmission of ping messages over a network topology consisting of 6 nodes
8	Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare throughput.
9	Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
10	Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	Po12	PSO1	PSO2
CO1	3													
CO2	3													
CO3		2			2									
CO4			3	2	3									

Course Title	Theoretical Foundations of Computation			
Course Code	23IS502	(L-T-P)C	(2-2-0) 3	
Exam	3 Hrs	Hours/Week	4	
SEE	50 Marks	Total Hours	40	

Course Objective: The course provides a basic understanding of theory of computation and students will be able to design various kinds of automata, formal languages and grammars as a first step towards learning advanced topics such as compiler design.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Identify and differentiate key models of computation such as DFA, NFA, Epsilon-Transitions and regular expressions.	1	-
2.	Examine and evaluate the equivalence, minimization, and ambiguity of automata and grammars in formal language theory.	3	-
3.	Design and implement PDA, and Turing Machines to recognize and process formal languages.	3	-
4.	Construct and simulate computational models to solve language recognition and decision problems in theoretical computer science.	5	-

MODULE – 1	10 Hrs.

Introduction to Finite Automata: The Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Epsilon-Transitions, Equivalence of NFA and DFA. **Regular Expressions and Languages:** Regular Expressions, Finite Automata and Regular Expressions

MODULE – 2	10 Hrs.

Regular Expressions and Languages (Contd.): Pumping lemma for regular languages, Applications of Regular Expressions, Equivalence and Minimization of Automata.
Context-Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications of Context Free Grammars, Ambiguity in Grammars.

MODULE -3	10 Hrs.

Pushdown Automata: Introduction and construction of Pushdown Automata, Acceptance by final state and empty stack , Equivalence of PDA's and CFG's, Chomsky Normal Forms for Context-Free Grammars
Turing Machines: Introduction to Turing Machine, Construction of Turing Machine.

MODULE -4	10 Hrs.

Turing Machines (contd.): Programming Techniques for Turing Machines, Restricted Turing machines, Turing Machines and Computers, The Universal Turing Machine, Introduction to undecidable problems, Post's Correspondence Problem.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Automata Theory, Languages and Computation	John E. Hop croft, Rajeev Motwani, Jeffrey D. Ullman: education	3rd	Pearson Education	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Languages and Theory of Computation	John Martin	4th	Tata McGraw- Hill	2007
2	An Introduction to Formal Languages and Automata	Peter Linz	5th	Narosa publishing house	2012

MOOC Course:

1. https://freecomputerbooks.com/compscCategory.html

E-Book:

1. https://onlinecourses.nptel.ac.in/noc25_cs70/preview?utm_source=chatgpt.com
2. https://onlinecourses.nptel.ac.in/noc21_cs19/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Details of activities to be conducted 1) Demonstration using JFLAP tool – 5 marks 2) Problem solving test – 10 marks 3) Concept/problem presentation – 5 marks	20
	Total	**50**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2			3											
CO3			3											
CO4					3									

Course Title	SOFTWARE ENGINEERING		
Course Code	23IS503	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50(36L+14P)

Course Objective: Use software engineering principles for application development.
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Analyze a system for identifying the software requirements	2	2
2	Differentiate process models to judge which process model has to be adopted for the given scenarios.	3	2
3	Apply different approaches of verifying and validating a software product and analyze the agile methodology.	1,4,5	2
4	Illustrate the role of project planning and quality management in software development.	3,7,8,9,10	2

MODULE-1	09 Hrs.

Introduction: Professional Software Development, Software Engineering Ethics. Case studies **Software Processes:** Software Processes models, Process activities, coping with change, The Rational Unified Process. **Agile Software Development:** Agile Methods, Plan-driven and Agile Development, Extreme programming. Agile Project Management. Scaling Agile Methods. Case Studies- A patient information system for mental health care, A wilderness weather station

MODULE -2	09 Hrs.

Requirements Engineering: Functional and non-functional requirements. The software Requirements Document. Requirements Specification, Requirements Engineering Processes. Requirements Elicitation and Analysis. Requirements validation. Requirements Management. **System Models:** Context models. Interaction models. Structural models. Behavioural models. Model-driven engineering.

MODULE -3	09 Hrs.

Design and Implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open source development. **Software Testing:** Development testing, Test-driven development, Release testing, User testing. **Software Evolution**: Evolution processes, Program evolution dynamics. Software maintenance, Legacy system management. Designing UML diagrams

MODULE -4	09 Hrs.

Software Project Management: Software Project Management Complexities, Responsibilities of software project Manager, Project Planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, Scheduling, Organization and Team Structures, Staffing, Risk Management. COCOMO, ISO9000, SEI Capability Maturity Model, Six Sigma.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Software Engineering"	Ian Sommerville	10th	Pearson Education	2017
2	Fundamentals of Software Engineering	Rajib Mall	4th	Prentice-Hall Of India Pvt. Ltd., ISBN(Chapters: 3)	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Software Engineering - A Practitioners Approach"	Roger S. Pressman	7th	McGraw-Hill,	2009
2	Software Engineering Principles and Practice	Waman S. Jawadekar	4th	Tata McGraw-Hill	2004
3	A Concise introduction to Software Engineering	Pankaj Jalot	3rd	Springer	2008

E Books:

1.   https://dpvipracollege.in/wp-content/uploads/2023/01/Ian-Sommerville-Software-Engineering-9th-Edition.pdf

MOOC Course:

1. https://nptel.ac.in/courses/106/105/106105182/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Practical	Laboratory CIE conduction	20
Total		**50**

Laboratory Plan:

Sl.No	Program Details
1	Discuss success and failure stories of software , software ethical practices and Laws for IT industry in India.
2	Case study to understand the SDLC on video doorbell.
3	Create JIRA (similar tool) account and learn interface
4	Organize role play for requirement activities for Zomato and Identify a problem and prepare requirement document or Epics and user stories.
5	Configure JIRA for managing the project to solve the identified problem.
6	Draw UML diagram for given use case using Draw.io tool
7	Create Git(Similar tool) account and configure repository.
8	Create Sitemap and Wireframe for the user stories. (Using Figma tool)

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2												2
CO2			3											2
CO3	2			2	2									2
CO4			2				2	3	2	3				2

Course Title	Data Visualization Lab		
Course Code	**23IS504**	**(L-T-P)C**	**(0-0-2) 1**
Exam	**2 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**14**

Course Objective: The course aims to equip students with fundamental skills in data visualization using Python, utilizing libraries such as Matplotlib, Seaborn, Bokeh, and Plotly. Students will develop the ability to create various visualizations, analyze and interpret data, and apply these skills to support decision-making processes.

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

#	Course Outcomes	Mapping to PO's	Map to PSO's
1.	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications	5	-
2.	Utilize Python libraries (Matplotlib, Seaborn, Bokeh, and Plotly) to create a variety of visualizations, analyze and interpret data to derive meaningful insights, and support decision-making.	2,3,5	1
3.	Use Python programming constructs to develop programs for solving real- world problems.	3	-

	Experiments
1.	a. Write a python program to find the best of two test average marks out of three test's marks accepted from the user. b. Develop a Python program to check whether a given number is palindrome or not and count the number of occurrences of each digit in the input number.
2.	a. Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N (where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. b. Develop a python program to convert binary to decimal, octal to hexadecimal using functions.
3.	a. Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. b. Write a Python program to find the string similarity between two given strings
4.	a. Write a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib. b. Write a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib.

5.	a. Write a Python program to demonstrate how to draw a Histogram Plot using Matplotlib. b. Write a Python program to demonstrate how to draw a Pie Chart using Matplotlib.
6.	a. Write a Python program to illustrate Linear Plotting using Matplotlib. b. Write a Python program to illustrate liner plotting with line formatting using Matplotlib.
7.	Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions.
8.	a. Write a Python program to explain working with bokeh line graph using Annotations and Legends. b. Write a Python program for plotting different types of plots using Bokeh.
9	a. Write a Python program to draw 3D Plots using Plotly Libraries.
10.	a. Write a Python program to draw Time Series using Plotly Libraries. b. Write a Python program for creating Maps using Plotly Libraries.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Lab Test	Two tests are conducted, with a 60% weightage for experiment and 40% for viva-voce, averaged and scaled to 20 marks.	20
Continuous Evaluation	Each experiment is evaluated for conduction, observation, and write-up, with neatness and timely submission considered. The record is evaluated out of 10 marks per experiment, scaled to 30 marks.	30
Total		**50**

MOOC Course:

1. https://www.coursera.org/learn/python-plotting?utm_medium=institutions&utm_source=umich&utm_campaign=adwords-india-applied-data-science-with-python-applied- plotting&utm_term=python%20data%20visualization%20course&gad_source=1

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3									
CO2		3	3		2								2	
CO3			3											

Course Title	Entrepreneurship and Management		
Course Code	23IS505	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Students will Analyze various concepts of different styles of motivation, company leadership, power and patent aspects.

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Describe the functions of management activities such as planning, Organization and staffing, directing and controlling.	1,2,11	-
2	Identify and appreciate the ethical issues in management decision areas.	2.11	-
3	Examine the importance of entrepreneurship and entrepreneurial Process.	2, 11	-
4	Prepare a project report for a given business requirement.	6	-

MODULE-1	10 Hrs.

Management: Introduction - Meaning - Nature and Functions of Management, Importance & Definition of Management, Management Functions, Roles of a Manager, Levels of Management, Managerial Skills, Management & Administration, Management as a Science, Actor Profession–Development of Management Thought-Early Management Approaches, Modern Management Approaches Planning: Nature, Importance and Forms of Planning, Types of Plans, Steps in Planning, Limitations of Planning, Making Planning Effective–Decision Making–Meaning, Types of Decisions, Steps in Decision Making, Common Difficulties in Decision – Making.

MODULE-2	10 Hrs.

Organization and Staffing: Meaning and Process of Organizing - Principles of Organizing - Types of Organization - Departmentalization - Committees. Centralization Vs Decentralization of Authority and Responsibility, Nature and Importance of Staffing - Process of Selection & Recruitment (in brief).

Directing Controlling: Requirements of Effective Direction, Motivation Theories, Communication–Importance, Purpose- Leadership Styles, Meaning and Steps in Controlling, Need for Control, Essentials of Effective Control System.

MODULE-3	10 Hrs.

Motivation: Concept, types of motivation, theories of motivation, Leadership definition, principles, leadership styles, Communication: meaning ,nature, communication process, types of communication, barriers to communication

MODULE-4	10 Hrs.
Entrepreneur: Meaning of Entrepreneur: Importance of an Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Concept of Entrepreneur, Concept of Entrepreneurship – Evolution Entrepreneurship Development of Entrepreneurship, Stages in Entrepreneurial Process, Role of Entrepreneurs in Economic Development, Entrepreneurship in India, Entrepreneurship-Its Barriers **Institutional support:** Introduction, Institutional Finance, Different Schemes–SSIDC, DIC.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Management	P. C. Tripathi, P.N. Reddy	7th	Tata McGraw H	2021
2	Dynamics of Entrepreneurial Development & Management	Vasant Desai	6th	Himalaya Publishing House	2011

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Entrepreneurship development and management	Dr R K Singal	2nd	S S Kataria	2013
2	Principles and practice of management	RSN Pillai	3rd	s chand	2012

E Books:

1. https://www.scribd.com/document/438914396/principles-of-management-p-c-tripathi-p-n-reddy-pdf-By-EasyEngineering-net-pdf

MOOC Course:

1. https://onlinecourses.swayam2.ac.in/cec 23_mg11/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT (Visiting Start up industry)	1) Group of 3/4 visit the industry/Start up industry - 10M 2) Preparartion of the report-5M 3) Presentation – 5M	20
Total		**50**

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3									3			
CO2		2									2			
CO3		2									2			
CO4						2								

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	Computer Vision and Image Processing			
Course Code	23IS551	(L-T-P)C	(3-0-0) 3	
Exam	3 Hrs.	Hours/Week	3	
SEE	50 Marks	Total Hours	40	

Course Objective: To understand the fundamentals of computer vision and image processing.
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply suitable techniques to process and analyse images.	1	-
2.	Analyse appropriate operations for a given scenario.	2	-
3.	Compare the different image restoration and segmentation techniques.	3,5	-
4.	Implement various segmentation, compression and morphological algorithms.	3,5,9,10	-

MODULE-1	10 Hrs.

Introduction: Image representation, Image digitization, Digital image properties, Color images. **Image pre-processing:** Pixel   brightness transformations, Geometric transformations, local pre-processing. **Segmentation:** Thresholding, Edge- based segmentation, Region based segmentation, Matching.

MODULE-2	10 Hrs.

Image understanding: Image understanding control strategies, SIFT, RANSAC, Point distribution models, Active appearance models, Pattern recognition methods in image understanding, Boosted cascade of classifiers, Image understanding using random forests , Scene labelling and constraint propagation, Semantic image segmentation and understanding, Hidden Markov models, Gaussian mixture models and expectation maximization, Basics of projective geometry, A single
perspective camera, Scene reconstruction from multiple views.

MODULE-3	10 Hrs.

Image data compression and motion analysis: Image data properties, Discrete image transforms in image data compression, Predictive compression methods, Vector quantization, Hierarchical and progressive compression methods, Comparison of compression methods, JPEG and MPEG image compression, Statistical Texture description, Syntactic texture description methods, Hybrid texture description methods, Differential motion analysis methods, Optical Flow, Analysis based on correspondence of interest points, Detection of specific motion patterns, video tracking, motion models to aid tracking.

MODULE-4	10 Hrs

Shape representation and morphology: Region identification, Contour- based shape representation and description, Region based shape representation and description, Shape classes, Morphology concepts and principles, Binary dilation and erosion, Gray- scale dilation and erosion, Skeletons and object marking, Granulometry, Morphology segmentation and watersheds.

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Image Processing, Analysis and Machine Vision	Milan Sonka, Vaclav Hlavac, Roger Boyle	4th	Cengage learning	2013

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Computer Vision – A Modern Approach	Forsyth, Ponce	2nd	Prentice Hall	2011
2	Digital Image Processing	Rafael C. Gonzalez, Richard E. Woods	3rd	Pearson Education	2009

Ebooks:

1. https://szeliski.org/Book

MOOC/Online Course:

1. https://www.udemy.com/course/ image-processing-and-computer- vision-with-python-opencv
2. https://archive.nptel.ac.in/ courses/108/103/108103174/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals :	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity :	Students have to develop a simple application using scaling, rotation, shifting, transformation and reflection using Open CV. (10M) They are required to present their application + report (5+5=10M)	20
Total		**50**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3			3		2									
CO4			3		2				2	2				

Course Title	Robotic Process Automation		
Course Code	23IS552	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Students will be able to Deploy and control Bots with UiPath Orchestrator.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand RPA and Learn UiPath programming techniques to deploy robot configurations and explore data extraction techniques	1	-
2	Describe the different types of variables, Control Flow and data manipulation techniques	2	-
3	Use about integrations with various popular applications such as SAP and MS Office	3,4	
4	Debug a programmed robot including logging and exception handling ,Maintain code version and source control	3,5,9	2

MODULE-1	10 Hrs.

What is Robotic Process Automation? What is Robotic Process Automation? Scope and techniques of automation Robotic process automation, About UiPath, The future of automation. Record and Play: Record and Play, UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio.

MODULE-2	10 Hrs.

Sequence, Flowchart, and Control Flow: Sequence, Flowchart, and Control Flow, Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example, using Sequence and Control flow.

Data Manipulation: Data Manipulation, Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example.

MODULE-3	10 Hrs.

Taking Control of the Controls: Taking Control of the Controls, Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping,

Tame that Application with Plugins and Extensions: Tame that Application with Plugins and Extensions, Terminal plugin, SAP automation, Java plugin.

MODULE-4	10 Hrs
Handling User Events and Assistant Bots: Handling User Events and Assistant Bots, What are assistant bots? Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event. **Exception Handling, Debugging, and Logging:** Exception Handling, Debugging, and Logging, Exception handling **Managing and Maintaining the Code:** Managing and Maintaining the Code, Project organization	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – Ui Path	AlokMani Tripathi,	-	Packtpub	March 2018.

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Learning Service Now	Tim Woodruff	-	Packtpub	2017

E Books:

1. https://www.ebooks.com/en-in/book/96159153/learning-robotic-process-automation/alok-mani-tripathi/?srsltid=AfmBOoq3RU9R2vwgLFZFfflu

MOOC/Online Course:

1. https://www.uipath.com/rpa/academy

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	An automation project by students in a group of 2-4 students.	20
Total		**50**

Course articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2		3												
CO3			3	3										
CO4			3		3				3					3

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	FULLSTACK DEVELOPMENT		
Course Code	23IS553	(L-T-P)C	(2-2-0) 3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40

Course Objective: The primary objective of this course is to equip students with comprehensive skills in full stack web development using the Django framework. Students will learn the Model-View-Template (MVT) architecture, design models and forms, and utilize Django's template system and generic views. The course also aims to teach students to generate various content types and manage user authentication, enabling them to create dynamic and scalable web applications.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the working of MVT-based full stack web development using Django and Visual Studio Code.	1,5,11	-
2.	Design Django models and forms for the rapid development of dynamic web pages.	3,5,11	1
3.	Analyze the role of template inheritance and generic views in building scalable full stack applications.	1,2,5,11	2
4.	Apply Django libraries to render non-HTML content such as CSV and PDF documents	1,3,5,11	2

MODULE-1	9 Hrs.

Fundamentals of Web: A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators **XHTML:** Origins and Evolution of HTML and XHTML, Basic Syntax, Standard XHTML Document Structure, Basic Text Markup.

MODULE-2	9 Hrs.

MVC based Web Designing: Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS.

MODULE-3	9 Hrs.

Django Templates and Models: Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution.

MODULE-4	9 Hrs

Django Admin Interfaces and Model Forms: Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Programming the World Wide Web	Robert W. Sebesta	8th	Pearson Education.	2014
2	The Definitive Guide to Django: Web Development Done Right	Adrian Holovaty, Jacob Kaplan Moss	2nd	Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers	2009

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Django Java Script Integration: AJAX and jQuery	Jonathan Hayward	1st	Pack Publishing	2011
2	Django 3 Web Development Cookbook	Aidas Bendroraitis, Jake Kronika	4th	Packt Publishing	2020

MOOC/Online Course:

1. https://www.mooc-list.com/tags/full-stack#google_vignette
2. https://nptel.ac.in/courses/106106222

EBooks:

1. https://books.google.com.jm/books?id=h2tR8p-4a9QC&printsec=copyright#v=onepage&q&f=false

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30

AAT	**Mini Project:**
	As part of the course, students must design and implement a mini project using Django. This activity is aimed at reinforcing practical knowledge and end-to-end application development skills.
	• Students will develop a full-stack web application using Django as the backend framework and appropriate frontend technologies (HTML, CSS, Bootstrap, JavaScript, etc.).
	• The project should demonstrate integration of models, views, templates, forms, and database operations.
	• Each student/team must:
	    ○ Identify a problem statement
	    ○ Design the database schema and architecture
	    ○ Develop and test the application
	    ○ Present a live demonstration
	    ○ Submit a detailed project report (including system design, code snippets, screenshots, challenges, and future scope)
	• The mini project will carry weightage in internal assessment and is a mandatory component of the course.
		20

Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2						2			
CO2			3		2						2		3	
CO3	2	2			2						1			2
CO4	3		2		3						1			2

Course Title	SUPPLY CHAIN ANALYTICS		
Course Code	23IS554	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Apply the principles of Supply Chain Analytics for solving real time problems.
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe various importance of Supply chain Analytics process in the flows involving material, money, information and ownership	1,2,7,11	1
2.	Apply various Decision Domains in Supply Chain analytics for effective decision making.	1,2,3	1
3.	Develop effective Network Planning and Design of Logistics Network using Heuristics/optimization.	1,2,3,5	2
4.	Analyze case studies to assess the impact of data-driven decision-making in supply chain operations and strategy.	1,2,3	1

MODULE-1	10 Hrs.

Context of today's supply chains (SC) analytics, Understanding and defining the supply chain analytics (SCA) Revisions of Basic Lessons of Supply Chain Management, Why is Analytics Important in a supply chain?, Relating Operations Management with Supply chain concepts with SC Analytics, The importance of supply chain analytics in the flows involving material, money, information and ownership.

MODULE-2	10 Hrs.

Supply chain analytics, Key issues in supply chain analytics, What involves in supply chain analytics, Concept of Descriptive Analytics in a Supply Chain, Discussion on a Few Supply Chains Analytics applications in India (students participation is expected), Decision Domains in supply chain analytics.

MODULE-3	10 Hrs.

Foundation of Business Analytics (BA), E2: Introduction to Modeling, Approaches for Optimization and Simulation, Modeling software, Supply Chain (SC), Decisions that requires mathematical or interpretative modeling Understanding of Data and its role in Analytics, Analytics of a Transportation problem in a Supply Chain, Managerial implication of results of analytics, A case study of supply chain analytics..

MODULE-4	10 Hrs

Foundation of prescriptive analytics in network planning in a supply chain, Network Planning in a Supply Chain, Importance of Network Planning, Design of Logistics Network using Heuristics/optimization (Exercise 3.4 Levi (2008)), Concept of 3PL/4PL in a Supply Chain, Case Study: GATI, Foundation of Modeling Coordination Decisions in Supply Chain Management, Foundation of performance management in supply chain management, it enablement of supply chains, role of ICT in supply chains

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Supply chain management by Sunil Chopra	Sunil Chopra and Peter Meindl,	5th Edition	Pearson Education	2012

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Modeling the supply Chain	Jeremy F. Shapiro	2nd Edition	Duxbury Thomson Learning	2006
2	Business Analytics	Rahul Saxena Anand Srinivasan.	-	Springer New York	2012

E-Books:

1. https:// ebooks/link.springer.com/book/10.1007/978-3-030-92224-5?utm_source.
2. https://locus.sh/resources/

MOOC/Online Course:

1. https://upesonline.ac.in/online

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals :	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity : Simulate a Supply Chain with Any Logic or SCM Games	• Use a simulation tool (Any Logic or online SCM simulators) • Assign roles (supplier, manufacturer, retailer) • Analyze how forecasting errors and delays affect the supply chain **Tools**: Any Logic, MIT Beer Game (online), SCM Globe, Forio simulations	20
Total		**50**

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					2				2		3	
CO2	3	3	2										3	
CO3	3	3	3		2									3
CO4	3	3	2										3	

Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	23RIP	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To give an overview of technical research activities and patenting methodology.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Carry out Literature Review and write technical paper	2,3,4,11,12	-
2.	Describe the fundamentals of patent laws and the patent drafting Procedure.	4, 11,12	-
3.	Elucidate the copyright laws and subject matters of copyright	4, 11,12	-

MODULE-1	10 Hrs.

Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research. **Ethics in Engineering Research**: Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **Literature Review and Technical Reading**, New and Existing Knowledge, Analysis and Synthesis of Prior Art , Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward, Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading.

MODULE-2	10 Hrs.

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. **Technical Writing and Publishing** : Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper?—The Choice, Writing, Journal Paper: Structure and Approach: Title, Abstract, and Introduction, Methods, Results, and Discussions, Table, Figures, Acknowledgments, and Closures.

MODULE-3	10 Hrs.

Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP, Major Amendments in IP Laws and Acts in India. **Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-PatentableMatters. Patent Infringements. **Process of Patenting**: Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.

MODULE-4	10 Hrs

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'IndianWork'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC).

Trademarks: Eligibility Criteria. Who Can Apply for a Trademark? Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration.

Self-study: Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, IP Organizations In India.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Research Methodology	Dipankar Deb, Rajeeb Dey, Valentina E, Balas	-	Springer	2019
2	Intellectual Property	Prof. Rupinder Tewari Ms. Mamta Bhardwa	8th	Professor Gurpal Singh Sandhu Honorary Director	2021

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Research Methods for Engineers	David V. Thiel	-	Cambridge University Press	2014
2	Intellectual Property Rights	N.K.Acharya	8th	Asia Law House	2021

E Books:

1. https://download.e-bookshelf.de/download/0012/0144/90/L-G-0012014490-0035363481.pdf

MOOC/Oline Course:

1. https://onlinecourses.swayam2.ac.in/ ntr24_ed08/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**Po12**	**PSO1**	**PSO2**
CO1		3	3	3							3	3		
CO2				3							3	3		
CO3				3							3	3		

Course Title	Environmental Studies		
Course Code	23EVS	(L-T-P)C	(0-2-0) 1
Exam	3 Hrs	Hours/Week	2
SEE	50 Marks	Total Hours	28

Course Objective: The students will be able to develop a sense of responsibility about the environment, natural resources, their conservation and Understand the concept, structure and function of different ecosystems and the ill effects of environmental pollution and other environmental issues like population growth, Acid rain, global warming etc.,.

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

#	Course Outcomes	Mapping to PO's
1.	Acquire an awareness of and sensitivity to the total environment and its allied problems	7, 10
2.	Develop strong feelings of concern, sense of ethical responsibility for the environment and the motivation to act in protecting and improving it.	6,8
3.	Analyze and evaluate environmental measures in real world situations in terms of ecological, political, economical, societal and aesthetic factors.	6, 8, 9

MODULE-1	4 Hrs.

Environment: Definition, about the Earth, Earth's Structure I.e. Atmosphere and its parts, Hydrosphere, Lithosphere and Biosphere, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.

MODULE-2	8 Hrs.

Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources - Forest Resources - Material Cycles - Carbon, Nitrogen and Sulphur Cycles.

MODULE-3	7 Hrs.

Pollution: Effects of pollution - Water pollution - Air pollution Land pollution - Noise pollution.

MODULE-4	7 Hrs.

Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection - Legal aspects. Water Act and Air Act.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Studies	Dr. D.L Manjunath	-	Pearson Education	2006
2.	Environmental Studies	Dr. S. M. Prakash	-	Elite Publishers	2006

Reference Books:

Sl.No	Book Title	Authors	Publisher	Year
1	Environmental Studies	Benny Joseph	Tata McGraw ill	2005
2	Principles of Environmental Science and Engineering	P. Venugopala Rao	Prentice Hall of India.	-
3	Environmental Science and Engineering	Meenakshi	Prentice Hall India	-

E Books:

1. https://archive.org/details/envir onmentalstu0000manj/page/4/m ode/2up

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Two tests conducted for 20 marks each	40
Activity 1	MCQ	10
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							3			3				
CO2						3		3						
CO3						3		3	3					

Course Title	Mini Project		
Course Code	23IS506	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28

Course Objective: Students should form batches of 3-4 members and develop applications using any technology or domain.

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify a real-life or engineering problem, and conduct challenge to investigate and solve.	1,2	1
2.	Utilize software engineering principles to plan and design a solution for the selected problem.	1,2,3	2
3.	Develop and test the designed solution using appropriate methods, resources, and modern tools.	3,5	1
4.	Collaborate effectively with team members and mentors, deliver presentations, and prepare comprehensive technical documentation.	9,10,11,12	1
5.	Adhere to ethical standards in all project-related activities.	8	1

Performance Indicators	Low	Medium	High
Literature Survey and Problem Definition (5 Marks)	Literature Survey not pertaining to the title of the project (2 M)	Incomplete literature survey and improper problem definition (3-4 M)	Extensive literature survey with clear state of the art problem definition (5M)
Effective Formulation of Design strategies (10 Marks)	Has no coherent strategies for problem solving (2 - 4 M)	Has some strategies for problem -solving, but does not apply them consistently (5-7 M)	Formulates strategies for solving problems (8-10 M)

Implementation Techniques (10 Marks)	No proper technique for implementation (2 - 4 M)	Has some techniques but does not apply them consistently (5-7 M)	Uses well defined implementation techniques (8-10 M)
Verification of the results (5 Marks)	No attempt at checking the incorrect solution. (2 M)	The solution is correct, but not visualized efficiently (3-4 M)	The solution is correct and visualized in an efficient way(5M)
Presentation/ communication (10 Marks)	Disorganized and ineffective presentation (2 - 4 M)	Organized, but ineffective presentation (5-7 M)	Effective organized presentation (8-10 M)
Report Preparation (10 Marks)	Disorganized and contents not sufficient (2 - 4 M)	Organized but not good content wise (5-7 M)	Effectively organized And well framed contents (8-10 M)

The Open ended Project work is to be carried out in three phases:

- **Project Phase I** - Students in consultation with the guides shall carry out literature survey to finalize the topic of the project. Evaluation of the project and its feasibility is done at the end of two weeks.
- **Project Phase II** - Students are expected to present the system analysis, Requirements Specification, design carried out/ algorithms developed and intermediate results at the end of six weeks.
- **Project Phase III** - Final internal evaluation shall be taken up during this phase. This includes presentation, project demonstration and report
- **The continuous evaluation of the project phases** – I, II, and III shall be carried out by the Committee consisting of Head of the department, Guide and other faculty.

Course Articulation Matrix

Course Outcomes COs	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3											3	
CO2	3	3	3											3
CO3			3		3								3	
CO4									3	3		3	3	
CO5								3					3	

Course Title	National Service Scheme (NSS)		
Course Code	**23NYP3**	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his / her responsibilities towards society	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3, 6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3, 6	-
4	Implement government or self-driven projects effectively in the field.	11	-
5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.	11	-

MODULE - 1	8 Hrs.

Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India.
For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.

MODULE - 2	8 Hrs.

Spreading public awareness under rural outreach programs.(minimum5 programs).

MODULE - 3	8 Hrs.

Social connect and responsibilities.

Suggested Learning Resources:

Books :

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

Course Title	Physical Education (PE)			
Course Code	23NYP3	(L-T-P) C		(0-0-2)
Exam	-	Hours/Week		2
SEE	-	Total Hours		24

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
12.	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9, 10, 12	-
13.	Familiarization of health-related Exercises, Sports for overall growth and development	9, 12	-
14.	Create a foundation for the professionals in Physical Education and Sports	12	-
15.	Participate in the competition at regional/state / national / international levels.	9, 10, 12	-
16.	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9, 10, 12	-

MODULE - 1	4 Hrs.

Orientation - Fitness, Food & Nutrition

MODULE - 2	4 Hrs.

General Fitness & Components of Fitness - Agility – Shuttle Run, Flexibility – Sit and Reach, Cardiovascular Endurance – Harvard step Test

MODULE - 3	16 Hrs.

Specific games (Any one to be selected by the student)
1. Badminton (Fore hand low/high service, back hand service, smash, drop)
2. Basketball (Dribbling, passing, shooting etc.)
3. Athletics (Field events – Throws)

Course Title	Yoga			
Course Code	23NYP3	(L-T-P) C		(0-0-2)
Exam	-	Hours/Week		2
SEE	-	Total Hours		24

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the Philosophical and Scientific Basis of Yoga	12	-
2	Demonstrate Proficiency in Basic Yoga Practices	9	-
3	Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7, 12	-
4	Apply Yoga Principles for Personal and Professional Growth	10, 12	-

MODULE - 1	8 Hrs.

Ashtanga Yoga
Asana , Pranayama , Pratyahara

MODULE - 2	8 Hrs.

Different types of Asanas
2. Sitting l. Ardha lJshtrasana 2. Vakrasana 3. Yogamudra in Padmasana
3. Standing 1. I.JrdhvaHastothanasana 2. Hastapadasana 3 . ParivrittaTrikonasana 4.Utkatasana
4. Supine line l. Sarvangasana 2. Chakraasana 3. Pavanamuktasana

MODULE - 3	8 Hrs.

Pranayama
Meaning, Need, importance of Pranayama, Different types, Meaning by name, technique, precautionary measures and benefits of each Pranayama, Ujjayi, Sheetali, Sheektari

Course Title	Cryptography, Network Security and Cyber Law		
Course Code	23IS601	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To impart the fundamentals of cryptographic techniques and various algorithms that enables providing network security services.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe the basics of cryptographic techniques, principles & practices, Cyber security and cyber law	1,2	-
2.	Apply cryptographic techniques to secure the data in transit	2,5	-
3.	Analyze different cryptographic techniques to handle security threats	2,5	-
4.	Understand and adopt Cyber security and Cyber law	8	-

MODULE-1	10 Hrs.

Overview: Computer Security Concepts. The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms. A Model for Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.
Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES, Block Cipher Design Principles.

MODULE-2	10 Hrs.

Asymmetric Ciphers: Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, the RSA Algorithm, Diffie Hellman Key Exchange. **Digital Signatures**: Digital Signatures, NIST Digital Signature Algorithm. **Key Management and Distribution**: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates.

MODULE-3	10 Hrs.

User Authentication: Kerberos, Federated Identity Management, Personal Identity Verification.
Network and Internet Security: Network Access Control and Cloud Security: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control.

MODULE-4	10 Hrs

Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH). **Cyber Law:** IT act aim and objectives, Scope of the act, Major Concepts, Important Provisions, Attribution, acknowledgement, and dispatch of electronic records. Regulation of certifying authorities, Penalties and adjudication, the cyber regulations appellate tribunal.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Cryptography and Network Security	William Stallings	7th	Pearson Education	2018
2	Cryptography, Network Security and Cyber Laws	Bernard Menezes	3rd	Cengage Learning	2010

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Network Security: Private Communication in a Public World	Charlie Kaufman, Radia Perlman, Mike Speciner	2nd	Pearson Education	2016
2	Cryptography and Network Security	Atul Kahate	3rd	Tata McGraw-Hill	2011

E-Books and online course materials:
1) http://williamstallings.com/Crypto3e

MOOC Course / Online Courses and Video Lectures:
2) https://nptel.ac.in/courses/106/105/106105031

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	1) Implementation of cryptographic algorithm – 10 marks 2) Problem Solving test – 10 marks	20
Total		**50**

AAT - Implementation of cryptographic algorithm
Students are supposed to develop a Cryptographic algorithm/Digital Signature without using libraries or built-in functions. Code demonstration along with a report has to be submitted. Example: Implementation of classical encryption techniques, RSA Digital Signature algorithm, Elgamal Digital Signature, Diffie Hellman Signature, and Modified RSA algorithm for practical purpose, Public key encryption schemes and Hybrid encryption schemes.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2		3			2									
CO3		3			2									
CO4								3						

Course Title	Artificial intelligence and Machine learning		
Course Code	23IS602	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	(36L+14P) 50

Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge based systems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Elucidate different types of intelligent agents, search strategies, logic and examples of learning.	1	1
2.	Analyze and formulate the problems using Artificial Intelligence And Machine Learning approaches that involve problem solving, knowledge representation, automated reasoning and learning.	2	1
3.	Develop a solution for the given problem using different Intelligent agents.	3,5,9,10,12	1
4.	Apply preprocessing, modeling, evaluation, and both supervised and unsupervised machine learning algorithms to solve given Problems.	2, 3	1

MODULE-1	**9 Hrs.**

Introduction, Intelligent agents, Searching: Definition of AI, Intelligent Agents: Agents and environment; Rationality; the nature of environments; the structure of agents, Agentic AI. **Problem-solving:** Problem-solving agents; Searching for solution; Uninformed search strategies; Informed search strategies. **Local Search Algorithms and Optimization Problems**: Hill-climbing search, Simulated annealing.

MODULE-2	**9 Hrs.**

Adversarial Search, Constraint Satisfaction Problems, Logical agents, First-order logic : Games, Optimal decision in games, Alpha-Beta Pruning, Defining Constraint satisfaction problems; Backtracking search for CSPs; Knowledge-based agents; The Wumpus world as an example world; Logic; propositional logic; Propositional theorem proving; Syntax and semantics of first-order logic; Using first-order logic.

MODULE-3	**9 Hrs.**

Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Pre-processing. **Modeling and Evaluation:** Introduction, Selecting a model, training a model, model representation and Interpretability, Evaluating performance of a model.

Learning Problems and Concept Learning: Well Posed learning problems, Designing a Learning Systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm, Inductive bias.

MODULE-4	9 Hrs
Supervised Learning: Introduction, example, classification model, classification learning steps, and Common algorithms –KNN, decision tree and Random forest model. **Unsupervised Learning:** Supervised Vs Unsupervised, Application, clustering, Finding pattern using Association rule. **Basics of Neural Networks:** Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Back propagation algorithm.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence - A Modern Approach	Stuart Russell and Peter Norvig	3rd	Pearson Education	2022
2	Machine Learning	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	2nd	Pearson	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence	Elaine Rich, Kevin Knight and Shivashankar B Nair	3rd	Tata McGraw-Hill	2015
2	Introduction to Artificial Intelligence and Expert Systems	Dan W Patterson	2nd	Pearson	2015
3	Hands-on machine learning with scikit-learn and tensorflow, Concepts, Tools, and Techniques to Build Intelligent Systems.	O'Reilly media, Aurélien Géron	2nd	Tata McGraw-Hill	2019

E-Books and online course materials:
1. http://repo.darmajaya.ac.id/5272/1/Artificial%20Intelligence-20Modern%20Approach%20%283rd%20Edition%29%20%28%20PDFDrive%20%29.pdf

MOOC Course / Online Courses and Video Lectures:
1. https://www.udacity.com/course/intro-to-   artificial-intelligence--cs271
2. https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x
3. https://nptel.ac.in/courses/106106139/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Lab Conduction	20
Total		**50**

Lab Experiments:

1.	Demonstrate data Analysis using the **"numpy"** module.
2.	Demonstrate Exploratory Data Analysis using the **"pandas"** module.
3.	Demonstrate Data Visualization using the **"matplotlib"** module.
4.	Implement and demonstrate the **FIND-S** algorithm for finding the most specific hypothesis Based on a given set of training data samples.
5.	Implement and demonstrate the **Candidate Elimination** algorithm for finding the most Specific hypothesis based on a given set of training data samples.
6.	Consider the given dataset, which demonstrates the salary distribution table of a company "ABC" based on years of experience. Using the given data implement the ML algorithm (**Linear Regression**) to predict the salary of a new employee with 5 years of experience. Create a visualization to represent training data and regression line.
7.	Consider the Iris dataset from the sklearn datasets module and implement the ML Algorithm (**k-nearest neighbors**) to classify the Iris flowers among three species (Setosa, Virginica and Versicolor) from measurements of sepal and petal.
8.	Apply **K-Means clustering** to segment a customer dataset based on various attributes such as age, amount spent, satisfaction, and brand loyalty.
9.	Consider the given Iris dataset and implement the ML algorithm to classify the Iris flowers among three species (Setosa, Virginica and Versicolor) from measurements of sepal, petal Length and width. **(using Decision Tree Algorithm)**
10.	Implement an Artificial Neural Network (ANN) using Tensor Flow to predict customer Churn based on bank customer data.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	
CO2		3											3	
CO3			3		3				3	3		3	3	
CO4		3	3										3	

Course Title	Cloud Computing		
Course Code	23IS603	(L-T-P) C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	(36L+14P) 50

Course Objective: Students will be able to understand cloud infrastructure, virtualization, storage, networking, and resource provisioning.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Comprehend the fundamental concepts of cloud computing, including service and deployment models.	2	-
2.	Describe the architecture and working of various cloud platforms and technologies.	2	-
3.	Identify different cloud storage options and resource provisioning techniques.	3,5	2
4.	Apply principles of best practice in cloud application design and Management.	3,5,8	2

MODULE – 1	9 Hrs.

Cloud computing basics: Cloud computing overview, deployment models applications, intranets and the Cloud first movers in the cloud. Your organization and cloud computing: when you can use cloud Computing, benefits limitations, security concerns, regulatory issues.

MODULE – 2	9 Hrs.

Cloud computing with the titans: Google, Microsoft, Amazon, salesforce.com the business case or Going to the cloud: cloud computing services, how those applications help your business, deleting your datacentre, Thomson's routers. Cloud computing technology: hardware and infrastructure clients, Security, network, services.

MODULE -3	9 Hrs.

Cloud storage: overview, cloud storage providers, standards: application, client, infrastructure, service Cloud computing at work: software as a service: overview, driving forces, company offerings, industries Software plus services: overview, mobile device integration, providers, Microsoft online.

MODULE -4	9 Hrs.

Software plus services Developing applications: Google, Microsoft, troubleshooting, Application management. Local clouds and thin clients: virtualization in your organization, server solutions, thin clients, case study. Migrating to the cloud: cloud services for individuals, cloud services aimed at mid Market, enterprise class cloud offerings, migration.

Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Cloud Computing: A practical approach	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter	3rd	McGraw Hill publication	2010

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Cloud Computing: Theory and Practice Dan C Ma	Dan C Marinescue	1st	MK publishers	2017
2	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi	5th	McGraw Hill publication	2021

E-Books and online course materials:
1. https://archive.org/details/cloudcomputingpr0000velt

2. https://archive.org/details/cloudcomputingth0000mari

MOOC Course / Online Course and Video Lecture:
1. https://onlinecourses.nptel.ac.in/noc24_cs17

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Details of activities to be conducted 1) Program Execution 2) Mini Project	20
	Total	**50**

Laboratory Plan:

Sl. No	Program Details
1.	Use Google App Engine launcher to launch the web applications.
2.	Install Google App Engine. Create a hello world app and other simple web applications using python/java.
3.	Find a procedure to transfer the files from one virtual machine to another virtual machine.
4.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs such as file storage, file sharing.
5.	Use Firebase for Hosting a static website.
6.	Create a web app that stores and displays notes using Firebase Firestore.
7.	To build and deploy a cloud-based contact management application using Salesforce.com.

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2												
CO2		2												
CO3			2		2									2
CO4			2		2			2						2

Course Title	Main Project Phase 1			
Course Code	**23IS604**	**(L-T-P) C**		**(0-0-4)2**
Exam	**3Hrs**	**Hours/Week**		**4**
SEE	**50 Marks**	**Total Hours**		**40**

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

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify a problem, through Extensive literature Survey leading to publication of a survey paper.	1,2	-
2.	Plan & design the solution to the chosen problem	3,5	2
3.	Make oral presentation and documentation of the work carried out	9,10,11,12	-

During VI semester, Candidates in consultation with the guides shall carry out literature survey to finalize the topic of the project. Students are expected to present the project synopsis, system analysis, Requirements Specification and should publish a technical paper on Literature Survey.

- **Project Phase 1 – Team Formation , Topic Selection & Guide allotment**
- **Project Phase 2 – Extensive Literature Survey , Problem Definition**
- **Project Phase 3 – System Design, Report Preparation and Publication**

The evaluation of the project phases shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department.

The topic chosen during Mini Project 3 will be continued & implemented during eighth semester

Performance Indicators	Low	Medium	High
Literature Survey and Problem Definition (15 Marks)	Literature Survey not pertaining to the title of the project (1-4)	Incomplete literature survey and improper problem definition (5-9)	Extensive literature survey with clear state of the art problem definition(10-15)
Design (10 Marks)	Has no coherent strategies for problem Solving (1-3)	Has some strategies for problem –solving, but does not apply them consistently (4-6)	Formulates strategies for solving problems (7-10)
Presentation/ Communication (5 Marks)	Disorganized and Ineffective presentation (1-2)	Organized, but ineffective presentation (3)	Effective organized presentation (4-5)
Report Preparation (5 Marks)	Disorganized and contents not sufficient (1-2)	Organized but not good content wise (3)	Effectively organized and well framed contents (4-5)

Paper Publication (10Marks)	Paper submitted & awaiting results (1-3)	National conference International Conference (4-6)	Journal (7-10)
Punctuality(Project Dairy Maintenance) (5 marks)	Not meeting the guide regularly (1-2)	Meeting regularly but doesn't document details of every session (3)	Up to date dairy maintenance (4-5)

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3												
CO2			3		3									2
CO3									3	3	3	3		

Course Title	Storage Area Networks		
Course Code	23IS661	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Acquire the knowledge, skills and tools to manage big data

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamentals of data storage technologies and the architecture of Storage Area Networks (SANs).	1	-
2.	Describe different types of storage systems such as DAS, NAS, and SAN, and compare their features and use cases.	1	-
3.	Analyze various SAN components including host bus adapters, switches, storage arrays, and protocols like iSCSI and Fibre Channel.	2	1
4.	Demonstrate the configuration and management of SAN environments using tools and techniques commonly used in industry.	3,5	1

Module - 1	10 Hrs

Storage System: Introduction to evolution of storage architecture, key data centre Elements, virtualization, and cloud computing. Key data centre elements – Host (or compute), connectivity, storage, and application in both classic and virtual Environments. RAID implementations, techniques, and levels along with the Impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system Implementations.

Module - 2	10 Hrs

Storage Networking Technologies and Virtualization Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism „zoning", FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP(Fibre Channel over IP) protocols for storage access over IP network, Converged protocol FCoE and its components, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

Module - 3	10 Hrs

Backup, Archive, and Replication: This unit focuses on information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized .

environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.	
Module - 4	**10 Hrs**
Cloud Computing Characteristics and benefits This unit focuses on the business drivers, definition, essential characteristics, and phases of journey to the Cloud. ,Business drivers for Cloud computing, Definition of Cloud computing, Characteristics of Cloud computing, Steps involved in transitioning from Classic data center to Cloud computing environment Services and deployment models, Cloud infrastructure components, Cloud migration considerations.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Information Storage and Management	EMC Education Services	2nd	Wiley ISBN: 9781118094839	2017
2.	Storage Virtualization	Clark Tom	2nd	John Wiley & Sons, Inc	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Designing Storage Area Networks	Tom Clark	2nd	Cisco Press	2014
2	EMC Education Services: Information Storage and Management	EMC Corporation, Hopkinton	3rd	John Wiley & Sons, Inc	2012

E-Books and online course materials:

1. https://www.google.co.in/books/edition/Storage_Area_Networks_For_Dummies/cIRghD4X2uMC?hl=en&gbpv=1&pg=PA3&printsec=frontcover

MOOC Course / Online Course and Video Lecture:

1. https://www.udemy.com/topic/storage-area-network/?srsltid=AfmBOopCfCjPjwjgXqVKmk4fNoChQe6YVuQ_fBqvZ370NQJk4P_8Veqc

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Mini Project	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		3												
CO2		3												
CO3			2		2									2
CO4			2		2									2

Course Title	Big Data Technologies		
Course Code	23IS662	(L-T-P)C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Acquire the knowledge, skills and tools to manage big data

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe big data concepts, database models and big data techniques.	1	-
2.	Describe architectural elements of HDFS, Map Reduce, YARN, Spark and Storm.	1	-
3.	Apply big data concepts and techniques to address issues in a given scenario.	3,5	1
4.	Design Map reduce solution or Hbase query for a given Problem.	2	1

Module - 1	10 Hrs

Introducing Hadoop and Seeing What It's Good for – Big Data and the Need for Hadoop, The Origin and Design of Hadoop, Examining the Various Hadoop Offerings. **Use Cases for Big Data in Hadoop** – The Keys to Successfully Adopting Hadoop, Log Data Analysis, Data Warehouse Modernization, Fraud detection, Risk modeling, Social Sentiment Analysis, Image Classification, Graph Analysis, To Infinity and Beyond. **Storing Data in Hadoop: The Hadoop Distributed System –** Data Storage in HDFS, Sketching Out the HDFS Architecture, HDFS Federation, And HDFS High Availability.

Module - 2	10 Hrs

MapReduce Programming – Thinking in Parallel, Seeing the Importance of MapReduce, Doing Things in Parallel: Breaking Big Problems into Many Bite-Size Pieces, Writing MapReduce Applications, Getting Your Feet Wet: Writing a Simple MapReduce Application.

Frameworks for Processing Data in Hadoop: YARN and MapReduce – Running Application Before Hadoop 2, Seeing a World Beyond MapReduce, Real-time and Streaming Applications. **Statistical Analysis in Hadoop –** Pumping Up Your Statistical Analysis, Machine Learning with Mahout, R on Hadoop.

Module - 3	10 Hrs

Hadoop and the Data Warehouse: Friends or Foes? – Comparing and Contrasting Hadoop with Relational Databases, Modernizing the Warehouse with Hadoop.

Extremely Big Tables: Storing Data in HBase – Say Hello to HBase, Understanding the HBase Data Model, Understanding the HBase Architecture, Taking HBase for a Test Run, Getting Things Done with HBase, HBase and the RDBMS world.	
Module - 4	**10 Hrs**
Introducing Spark: Spark's Background and History, Common Use Cases for Spark, Understanding How Spark Processes Information, How Spark Benefits the Entire Organization, Core Spark Technology Components, Comparing Hadoop/MapReduce and Spark, Spark's Open-Source Challenges. **How Spark, Hadoop and MapReduce Work Together:** Choosing the Optimal Big Data Solution, Big Data in Action. Storm – What is storm? Storm architecture, Why Storm? Industry Use cases of storm (refer online material for storm).	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons, Inc	2017
2.	Robert D. Schneider and Jeff Karmiol	Spark for Dummies	2nd	John Wiley & Sons, Inc	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Big data and Analytics	Seema Acharya, Subhashini Chellappan	3rd	Wiley publications	2014
2	Hadoop Operations other text for spark and stormtex	Eric Sammer	1st	O'Reilley,	2012

E-Books and online course materials:
   1. https://public.dhe.ibm.com/software/de/pdf/Hadoop_for_dummies.pdf

MOOC Course / Online Course and Video Lecture:

   1. https://nptel.ac.in/courses/106104189

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Mini Project	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3												
CO2		3												
CO3			2		2									2
CO4			2		2									2

Course Title		Automated Software Testing	
Course Code	**23IS663**	**(L-T-P) C**	**(3-0-0) 3**
Exam	**3 Hrs.**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: This course enables students to identify the requirements and develop the appropriate functional testing strategies for a given problem.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply the concepts of software testing to assess the most appropriate testing method.	1,3	**-**
2.	Analyze the Testing tool for various applications.	3,5	1
3.	Design test-cases and automate testing using testing tool for a real-time application.	3	1
4.	Evaluate the effectiveness of automated testing in improving software quality and reducing testing effort.	3,4,5	-

MODULE-1	10 Hrs.

Introduction to Software Testing, Types of Testing, SDLC and STLC in Software Testing, different types of Software Testing Techniques. What is Automation Testing? When we Switch to Automation Testing? Why Automation testing? Advantages & Disadvantages of Automation Testing Tools.

MODULE-2	10 Hrs.

What is Selenium? Advantages of Selenium Selenium Architecture, Basic Selenium Program, Locators path, its Types and cases, Web Element, Functions, check points, Handling Multiple Elements, Handling Synchronization, Implicit Explicit Custom wait, Blind wait, Handling Dropdown (static and dynamic) Handling Keyboard and Mouse Actions, Taking Screenshot, Performing Scroll down Action, Handling Popups (web-based and Window-based), Handling Frames, Handling New Windows/New Tabs Encapsulation in Selenium.

MODULE-3	10 Hrs.

Analyze the selenium tool and its usage in various application. Consider a Bank application and study its system specifications and report the various bugs. Derive different test cases, execute these test cases and discuss the test results. Design Test Case for Inventory Management system.

MODULE-4	10 Hrs.

Automation Framework: Stages and Types of Frameworks, POM (Page Object Model), Handling Excel, Pytest, Assertion, Grouping, GitHub, Jenkins, Hybrid Framework, Designing, Framework, Hybrid Framework Architecture, Framework implementation, Framework execution.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Software Testing: A Craftsman's Approach.	Paul C. Jorgensen, Byron De Vries	5th	Auerbach	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Foundations of Software Testing	Aditya P Mathur	2nd	Pearson Education	2013
2	The Craft of Software Testing: Subsystems Testing Including Object-Based and Object-Oriented Testing	Brian Marrick.	2nd	Pearson Education	2007

E-Books and online course materials:

1. https://books.google.co.in/books?id=UhTSBQAAQBAJ&printsec=copyright#v=onepage&q&f=false

MOOC Course / Online Course and Video Lecture:

1. https://nptel.ac.in/courses/106/105/106105150
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. https://www.javatpoint.com/selenium-tutorial

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals :	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity : PowerPoint presentation on case studies	**1.Relevance of topic(4 marks) :** How relevant and appropriate the topic is in relation to the case studies **2.Presentation(12 marks)** Quality of the PowerPoint presentation including clarity, design, and delivery **3.Report (4 marks) :** Quality and comprehensiveness of the accompanying report	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3											
CO2			3		3									2
CO3			3		2									2
CO4			3	3	3									

Course Title	Blockchain Technology		
Course Code	22IS664	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: The course provides the fundamentals, models and technologies of Block chain
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the types, benefits and limitations of blockchain and bitcoin.	1	1
2	Explore the blockchain decentralization, cryptography concepts and smart contracts.	1,5	1,2
3	Comprehend the blockchain applications outside of currencies.	1,6	1,2
4	Demonstrate topics and participate in quizzes to assess knowledge.	8,9,11	2

MODULE – 1	10 Hrs.

Blockchain 101: Distributed systems, History of blockchain: Introduction to Blockchain, Types of blockchain, Tiers of blockchain technology, CAP theorem and blockchain, Benefits and limitations of blockchain.

MODULE – 2	10 Hrs.

Centralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Platforms for decentralization. **Symmetric Cryptography:** Cryptographic primitives-Symmetric cryptography, Asymmetric cryptography .

MODULE -3	10 Hrs.

Introducing Bitcoin: Bitcoin definition, Transactions, Blockchain, The bitcoin network, Wallets, Bitcoin Payments. **Alternative Coins:** Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin **Smart Contracts:** Definition, Ricardian contracts.

MODULE -4	10 Hrs.

Ethereum 101: Introduction, Ethereum block chain, Etherium Network**,** Components of the Ethereum blockchain The Ethereum Virtual Machine (EVM) **Blockchain-Outside of Currencies:** Internet of Things, Government, Health, Finance, and Media.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain – Distributed ledgers, Decentralization and smart contracts explained	Imran Bashir	3rd	Packt Publishing Ltd	2017
2	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction.	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark.,	2nd	Princeton University Press	2016

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Blockchain Basics:Anon- Technical Introduction in 25 Steps,	Daniel Drescher	First Edition	Apress	2017
2	Mastering Bitcoin: Unlocking Digital Cryptocurrencies	Andreas M. Antonopoulos	First Edition	O'Reilly Media	2014

E-Books and online course materials:

1. https://unglueit-files.s3.amazonaws.com/ebf/05db7df4f31840f0a873d6ea14dcc28d.pdf

MOOC Course / Online Course and Video Lecture:

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview

2. https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20marks each and reduced to 10 marks	30
AAT	Presentation on course related topic-10Marks, Quiz- 10 Marks	20
Total		**50**

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	
CO2	3				3								2	2
CO3	3					3							2	2
CO4				3				3			3			3

Course Title	Responsible Artificial Intelligence		
Course Code	23OEIS61	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	36L

Course Objective: The objective of the course is to know about the responsibility of artificial intelligence (AI) to make AI more useful for society and humanity. The course will also teach principles and practices to perform responsible AI.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	To be able to state aspects of responsible AI such as fairness, accountability, bias, privacy etc.	2,3	-
2.	To be able to assess the fairness and ethics of AI modules	3	1
3.	To be able to enforce fairness in models and remove bias in data.	3	1
4.	To be able to preserve the privacy of individuals while learning from them.	3,5	1

MODULE-1	10 Hrs.

Artificial Intelligence Fundamentals, Introduction to responsible AI. (3 hours), Need for ethics in AI. AI for Society and Humanity, Fairness and Bias (9 hours): Sources of Biases, Exploratory data analysis, limitation of a dataset, Preprocessing, in processing and post processing to remove bias, Group fairness and Individual fairness, Counterfactual fairness

MODULE-2	10 Hrs.

Interpretability and explain ability: - Interpretability through simplification and visualization, Intrinsic interpretable methods, Post Hoc interpretability, Explain ability through causality, Model agnostic Interpretation.

MODULE-3	10 Hrs.

Ethics and Accountability : Auditing AI models, fairness assessment, Principles for ethical practices, Privacy preservation , Attack models, Privacy-preserving Learning

MODULE-4	10 Hrs.

Privacy preservation: Differential privacy, Federated learning, Case study: Recommendation systems, medical diagnosis, Hiring/ Education, Computer Vision, Natural Language Processing.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way	Virginia Dignum	2nd	University of Cambridge	2019
2	Interpretable Machine Learning	Christoph Molnar	1st		2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: A Guide for Thinking Humans.	Melanie Mitchell	1st	Farrar, Straus and Giroux	2019
2	Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy	Cathy O'Neil	1st	Crown Publishing Group	2016
3	Artificial Unintelligence: How Computers Misunderstand the World	Meredith Broussard	1st	MIT Press	2018

E-Books and online course materials:

1. https://www.mlmi.eng.cam.ac.uk/files/tam_final_reduced.pdf

MOOC Course / Online Course and Video Lecture:

1. https://swayam.gov.in/nd1_noc19_cs52/preview
2. https://www.coursera.org/learn/machine-learning/
3. https://nptel.ac.in/courses/106106139/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity	Demonstration	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	3											
CO2			3										2	
CO3			3										2	
CO4			3		3								3	

Course Title		Introduction to Machine learning		
Course Code	23OEIS62	(L-T-P) C		(3-0-0) 3
Exam	3 Hrs.	Hours/Week		3
SEE	50 Marks	Total Hours		40L

Course Objective: To apply the techniques of machine learning for real time problems.

Course Outcomes (COs) : Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe and Apply preprocessing, Modeling, Evaluation and concept learning for the given problem.	2,3	-
2.	Depict and Apply supervised and unsupervised machine learning Algorithms for solving the given problem.	3	1
3.	Illustrate and utilize the Neural networks, Bayesian learning and other forms learning for the given problem.	3	1
4.	Conduct experiments for demonstrating machine learning algorithms and data visualization methods.	3,5	1

MODULE-1	10 Hrs.

Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Pre-processing.

Modelling and Evaluation: Introduction, Selecting a model, training a model, model representation and Interpretability, Evaluating performance of a model.

MODULE-2	10 Hrs.

Learning Problems and Concept Learning: Well Posed learning problems, Designing a Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm

Supervised Learning: Introduction, example, classification model, classification learning steps, Common algorithms –KNN, decision tree.

MODULE-3	10 Hrs.

Supervised Learning: Random forest model, SVM, Regression-Simple linear regression, Multiple linear regressions, **Unsupervised Learning:** Supervised Vs Unsupervised, Application, clustering, Finding pattern using Association rule.

MODULE-4	10 Hrs.

Basics of Neural Networks: Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Back propagation algorithm.

Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, **Other types of Learning –** Representation learning, Active Learning, Instance based Learning, Ensemble learning.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Machine Learning,	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	2nd	Pearson	2019
2	Machine Learning	Tom M. Mitchell McGraw-Hill Education	2nd	McGraw-Hill	2013

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hands-on machine learning with scikit-learn and tensorflow, Concepts, Tools, and Techniques toBuild Intelligent Systems.	O'Reilly Media, Aurélien Géron,	2nd	Tata McGraw-Hill	2019
2	Introduction to Machine Learning	Peter Linz	2nd	PHI Learning Pvt. Ltd	2013
3	The Elements of Statistical Learning	T. Hastie, R. Tibshirani, J. H. Friedman	1st	Springer	2001

E-Books and online course materials:

1. http://14.139.161.31/OddSem-0822-1122/Hands-On_Machine_Learning_with_Scikit-Learn-Keras-and-TensorFlow-2nd-Edition-Aurelien-Geron.pdf

MOOC Course / Online Course and Video Lecture:

4. https://swayam.gov.in/nd1_noc19_cs52/preview
5. https://www.coursera.org/learn/machine-learning/
6. https://nptel.ac.in/courses/106106139/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity	Demonstration	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	3											
CO2			3										3	
CO3			3										3	
CO4			3		3								3	

Course Title	Information and Network Security		
Course Code	23OEIS63	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Apply the principles of data science for solving real time problems.
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Utilize secure communication protocols to safeguard data during transmission.	1,3,5	2
2.	Examine network security challenges and identify potential risks and vulnerabilities.	1,3,4,8	2
3.	Apply various cryptographic techniques (symmetric, asymmetric encryption, hashing, and digital signatures) to ensure data security.	1,2,3	2
4.	Analyze network security architectures and protocols (such as SSL/TLS, IP sec, and VPNs) and evaluate their effectiveness.	1,3,4,8	2

MODULE-1	10 Hrs.

Introduction to Information Security: Components of information security, Balancing information security and Access, the Security systems Development Life Cycle. Legal, Ethical and professional issues in Information Security: Law and Ethics in Information Security, Ethics and Information Security Planning for Security: Information Security Planning and Governance, Information Security Policy, Standards and Practices Risk Management: Introduction, An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control, Quantitative Versus Qualitative Risk Management.

MODULE-2	10 Hrs.

Vulnerability Analysis Vulnerability Analysis, Penetration Testing, Layering of tests, Vulnerability Classification, Frameworks, The RISOS Study, Protection Analysis Model, Aslam's Model, Comparison and Analysis, Standards, Common Vulnerabilities and Exposures (CVE), Common Weaknesses and Exposures (CWE), Gupta and Gligor's Theory of Penetration Analysis Tool.

MODULE-3	10 Hrs.

Transport-Level Security: Web Security Considerations Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload

MODULE-4	10 Hrs.

Malicious Software: Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation-Infected Content-Viruses, Propagation: Vulnerability Exploit, Social Engineering, Payload: System Corruption, Payload: Attack Agent, Information Theft, Stealthing, Countermeasures, Distributed Denial of Service Attacks

Prescribed Text Books:

Sl .No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Information Security	Michael E. Whitman, Herbert J. Mattord	6th	Cengage Learning	2021
2	Network Security Essentials: Applications and Standards	Williams Stallings	6th	Pearson 2	2021
3	Computer Security Arts and Science	Matt Bishop	7th	Addison Wesley	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Cryptography: Theory and Practice	Stinson. D.	8th	Chapman & Hall/CRC	2021
2	A Guide to Computer Network Security	Joseph Migga Kizza	7th	Springer International Edition	2022

E-Books and online course materials:
1. https://almuhammadi.com/sultan/crypto_books/Stinson.3ed.pdf

MOOC Course / Online Course and Video Lecture:

1. http://nptel.ac.in/cou rses/106105031/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2									2
CO2	3		3	2				2						2
CO3	2	2	3											2
CO4	2		3	3				2						3

Course Title	Data Mining and Data Warehousing		
Course Code	**23OEIS64**	(L-T-P)C	**(3-0-0)3**
Exam	**3 Hrs.**	Hours/Week	**4**
SEE	**50 Marks**	Total Hours	**40**

Course Objective: Students will be able to select appropriate data mining techniques to extract useful pattern.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Discuss the knowledge on data quality and data pre-processing	1	-
2	Describe the process of data mining , Classification and Association Analysis	2,3	-
3	Apply the knowledge of Data Warehouse design , Modelling and usage	3	-
4	Analyze the cluster analysis and highlights the application of data mining	2	2

MODULE – 1	10 Hrs.

Introduction: Data: Why Data Mining? What is Data Mining? What kinds of data can be mined?, What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining.
Getting to know your data: Data objects and attribute types, Basic statistical description of data: measuring the central tendency, Measuring the dispersion of data, measuring data similarity and dissimilarity.

MODULE – 2	10 Hrs.

Data Pre-processing: Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, wavelet transforms, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization.
Data Warehouse and online Analytical processing: Data Warehouse: Basic Concepts ,Data Warehouse modelling : Data cube and OLAP , Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process, Data warehouse usage for information processing.

MODULE -3	10 Hrs.

Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification, K- Nearest-neighbour Classifier.Mining frequent patterns
Association and correlations: Basic Concepts and Methods:Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets, Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.

MODULE -4	10 Hrs.

Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN**.** Data Mining Trends and research frontiers: Data Mining Applications, Data mining and society, Data mining trends.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Mining – Concepts and Techniques	Jiawei Han and Micheline Kamber	4th	Morgan Kaufmann Publisher, Elsevier	2022
2.	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Vipin Kumar	2nd	Pearson Education	2020

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Insight into Data Mining– Theory and Practice	V. Ajay	4th	PHL	2006
2.	Data Ware Housing Fundamentals	Pualraj Ponnaiah	3rd	Pearson Education	2020

E-Books and online course materials:
1. https://shop.elsevier.com/books/data-mining/han/978-0-12-811760-6

MOOC Course /Online Courses and Video Lectures:
1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Seminar-10marks 2) Poster Presentation-10marks	20
	TOTAL	**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes[PO's]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3	2											
CO3			2											
CO4		3												2

Course Title	Analytical Ability and Soft Skills		
Course Code	23ASK	(L-T-P) C	(0-1-0) 1
Exam	1 Hr.	Hours/Week	2
SEE	50 Marks	Total Hours	30

Course Objective: Students will be able to select appropriate data mining techniques to extract useful pattern.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply methods to solve numerical and reasoning problems	2,3	-
2	Lead a team in corporate offices	8,9	-
3	Communicate effectively in professional ambience	10	-

MODULE – 1	40 Hrs.

Hard Skills: Speed/Distance, Probability, Permutations/Combinations, Profit/Loss, Simple Interest/Compound Interest, Number theories, Number/Letter series, Coding/Decoding, Blood relations, Directions, Clock, Calendar. Logical reasoning problems

MODULE – 2	15 Hrs.

Soft Skills: Basic grammar, Spotting errors, Sentence formation, Email writing, Public speaking, Client communication, Leadership, Managerial skills, Stress management, Presentation Skills

MODULE -3	15 Hrs.

Technical Skills: Review of C programming, Simple coding, Syntax rules, MCQs on C language.

MODULE -4	14 Hrs.

Activities: GD, JAM, Mock Interview, Pick and speak, Presentation

Course articulation matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	3											
CO2								3	3					
CO3										3				

Course Title	National Service Scheme (NSS)			
Course Code	23NYP4	(L-T-P) C	(0-0-2)	
Exam	-	Hours/Week	2	
SEE	-	Total Hours	24	

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his / her responsibilities towards society	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3, 6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3, 6	-
4	Implement government or self-driven projects effectively in the Field.	11	-
5	Develop capacity to meet emergencies and natural disasters & Practice national integration and social harmony in general.	11	-

MODULE - 1	8 Hrs.

Plantation and adoption of plants. Know your plants.

MODULE - 2	8 Hrs.

Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).

MODULE - 3	8 Hrs.

Govt. school Rejuvenation and helping them to achieve good infrastructure.

Suggested Learning Resources:

Books :

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

Course Title	Physical Education (PE)		
Course Code	23NYP4	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

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

	Course Outcomes	Mapping to PO's	Mappin to PSO's
1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9, 10, 12	-
2	Familiarization of health-related Exercises, Sports for overall growth and development	9, 12	-
3	Create a foundation for the professionals in Physical Education and Sports	12	-
4	Participate in the competition at regional/state / national / international levels.	9, 10, 12	-
5	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9, 10, 12	-

MODULE - 1	4 Hrs.

Orientation - Postural deformities, Stress management

MODULE - 2	16 Hrs.

Specific games (Any one to be selected by the student)
1. Throw ball
2. Table Tennis
3. Athletics (Field Events- Jumps) – Any event as per availability of Ground.

MODULE - 3	4 Hrs.

Aerobics

Course Title	Yoga			
Course Code	**23NYP4**	(L-T-P) C		(0-0-2)
Exam	-	Hours/Week		2
SEE	-	Total Hours		24

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the Philosophical and Scientific Basis of Yoga	12	-
2	Demonstrate Proficiency in Basic Yoga Practices	9	-
3	Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7, 12	-
4	Apply Yoga Principles for Personal and Professional Growth	10, 12	-

MODULE - 1	8 Hrs.

Ashtanga Yoga
1. Dharana
2. Dhyana (Meditation)
3. Samadhi

MODULE - 2	8 Hrs.

Different types of Asanas
a. Sitting 1. Bakasana 2. Hanumanasana 3. Ekapada Rajakapotasana 4. Yogarnudra in Vajrasana
b. Standing 1. Vatayanasana 2. Garudasana
c. Balancing 1. Veerabhadrasana 2. Sheershasana

MODULE - 3	8 Hrs.

Pranayama
1. Bhastrika
2. Bhramari