DEPARTMENT OF COMPUTER SCIENCE AND ENGINNERING

PROPOSED CURRICULUM STRUCTURE FROM ACADEMIC YEAR 2023-24

Government College of Engineering, Aurangabad
(An Autonomous Institute)
Teaching and Evaluation Scheme from year 2024-25
Final Year B. Tech. Program in Computer Science and Engineering
Semester VII
(An Autonomous Institute)

Course				**Teaching Scheme**			**Continuous Evaluation in terms of Marks**					
Sr. No	**Category**	**Course Code**	**Course Name**	**TH**	**T**	**PR**	**Credits**	**ISE I**	**ISEI I**	**ISEI II**	**ESE**	**Total (100)**
1	PC	CSPC4001	Artificial Intelligence	3	-	-	3	15	15	10	60	100
2	PE3	CSPE4002-04	PE III	3	-	-	3	15	15	10	60	100
3	PE4	CSPE4005-07	PE IV	3	-	-	3	15	15	10	60	100
4	PE5	CSPE4008-10	PE V	3	-	-	3	15	15	10	60	100
5	OE	CSOE1014	Open Elective V	3	-	-	3	15	15	10	60	100
6	PC	CSPC4011	Lab Artificial Intelligence	-	-	2	1		-	25	25	50
7	PE3	CSPE4012-14	Lab PE III	-	-	2	1		-	25	25	50
8	PE4	CSPE4015-17	Lab PE IV	-	-	2	1		-	25	25	50
9	PE5	CSPE4018-20	Lab PE V	-	-	2	1		-	25	25	50
10	HSMC	CSHS0013	HSMC-IV	3	-	-	3	15	15	10	60	100
11	PR	CSPR4021	Project I			6	3		-	50	50	100
12	AC		Activity Based Personality Development I & II	-	-	-	-	-	-	-	-	-
	Total			**18**	**-**	**14**	**25**	**90**	**90**	**210**	**510**	**900**

$ Activity based activities personality development courses are to be performed from 3rd semester to 7th semester.

Professional Elective –III
1] Block Chain Technology
2] Neural Network
3] Cryptography & Network Security

Professional Elective -IV:
1] Data Analytics
2] Internet of Things
3] Natural Language Processing
Professional Elective -V:
1] Deep Learning
2] Design of Linux Operating System
3] Information Retrieval

Government College of Engineering, Aurangabad

Teaching and Evaluation Scheme from year 2024-25

Final Year B. Tech. Program in Computer Science and Engineering

Semester VIII

Course				**Teaching Scheme**			**Continuous Evaluation in terms of Marks**					
Sr No	**Category**	**Course Code**	**Course Name**	**TH**	**T**	**PR**	**Credits**	**ISE I**	**ISEI I**	**ISE III**	**ESE**	**Total (100)**
1	PR	CSPR4022	Project II	-	-	20	10	-	-	100	100	200
2	Audit Course /AC		Industrial Training	-	-	-	AC	-	-			
	Total			**-**	**-**	**20**	**10**				**100**	**300**

Government College of Engineering, Aurangabad
(An Autonomous Institute)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINNERING

Semester wise credit distribution

Semester	I	II	III	IV	V	VI	VII	VIII	Total	AICTE	Diff
BSC	8	9	3	3					23	25	-2
ESC	9	10	4	1					24	24	0
HSMC		3			3	3	3		12	12	0
PCC			11	13	13	9	4		50	48	+2
PEC					4	4	12		20	18	+2
OEC				3	3	6	3		15	18	-3
LC											
MC											
PROJ					1	2	3	10	16	15	+1
Total	18	21	18	20	24	24	25	10	160	160	

Semester VII

CSPC4001: Artificial Intelligence

Teaching Scheme			**Evaluation Scheme**	
Lectures	**3 Hrs/Week**		**ISE I**	**15 Marks**
Tutorial	**0**		**ISE II**	**15 Marks**
			ISE III	**10 Marks**
Total Credits	**3**		**ESE**	**60 Marks**

Prerequisites: Nil

Course Description: To acquaint students with the meaning, purpose, scope, stages, applications, and effects of AI. To share the basic tasks and algorithms in Machine Learning .To provide understanding of how system learns in supervised learning

Course Outcomes:

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

	Course Outcomes
CO1	Exhibit strong familiarity with a number of important AI techniques, including in particular search, knowledge representation, planning and constraint management
CO2	Interpret the modern view of AI as the study of agents that receive percept from the environment and perform actions.
CO3	Build awareness of AI facing major challenges and the complexity of typical problems within the field.
CO4	Assess critically the techniques presented and apply them to real world problems.
CO5	Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

Detailed Syllabus:

Unit 1	**Artificial Intelligence**: Introduction, Typical Applications. State Space Search: Depth Bounded DFS, Depth First Iterative Deepening. Heuristic Search: Heuristic Functions, Best First Search, Hill Climbing, Variable Neighborhood Descent, Beam Search, Tabu Search. Optimal Search: A * algorithm, Iterative Deepening A* , Recursive Best First Search, Pruning the CLOSED and OPEN Lists.
Unit 2	**Problem Decomposition**: Goal Trees, Rule Based Systems, Rule Based Expert Systems. Planning: STRIPS, Forward and Backward State Space Planning, Goal Stack Planning, Plan Space Planning, A Unified Framework For Planning. Constraint Satisfaction : N-Queens, Constraint Propagation, Scene Labeling, Higher order and Directional Consistencies, Backtracking and Look ahead Strategies.
Unit 3	**Knowledge Based Reasoning**: Agents, Facets of Knowledge. Logic and Inferences: Formal Logic, Propositional and First Order Logic, Resolution in Propositional and First Order Logic, Deductive Retrieval, Backward Chaining, Second order Logic. Knowledge

	Representation: Conceptual Dependency, Frames, Semantic nets.
Unit 4	**Adversarial Search**: Games, Optimal Decisions in Games, The minimax algorithm, Optimal decisions in multiplayer games, Alpha-- Beta Pruning, Move ordering , Imperfect Real-Time Decisions, Evaluation functions, Cutting off search, Forward pruning, Search versus lookup, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Variations on the CSP formalism, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, Alpha-beta pruning and CSP, Implementation aspects of minimax algorithm and CSP.
Unit 5	**Natural Language Processi**ng: Introduction, Stages in natural language Processing, Application of NLP in Machine Translation, Information Retrieval and Big Data Information Retrieval. Learning: Supervised, Unsupervised and Reinforcement learning. Artificial Neural Networks (ANNs): Concept, Feed forward and Feedback ANNs, Error Back Propagation, Boltzmann Machine

Text Books and References Books

1. John Paul Mueller, Luca Massaron**, "***Artificial Intelligence For Dummies second edition*", For Dummies
2. Peter Norvig and Stuart Russel, " *Artificial Intelligence- A modern approach-3rd edition*", Pearson Publication.

Web Source:- https://nptel.ac.in/courses/106102220

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1	3		
CO2	1														
CO3	2	2	1										2		
CO4	3	1	2		1				2	1			1	1	1
CO5	3	1			1				1	1		1	1	1	1

3 - High 2 – Medium1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISEI and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1) Quiz
2) Assignments
3) Question and answer
4) PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20
K3	Apply	05	05	05	30
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3**
	CO1	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

CSPE4002: Blockchain Technology

Teaching Scheme			Evaluation Scheme	
Lectures	**3 Hrs/Week**		**ISE I**	**15 Marks**
Tutorial	**0**		**ISE II**	**15 Marks**
			ISE III	**10 Marks**
Total Credits	**3**		**ESE**	**60 Marks**

Course Description: Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved. Business runs on information. The faster it's received and the more accurate it is, the better. This course gives introduction about blockchain and how blockchain works, what are its uses etc.

Course Outcomes:

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

Course Outcomes	
CO1	To incorporate the models of Blockchain- Ethereum.
CO2	To learn the models of Hyperledger Fabric.
CO3	To teach the concepts of Blockchain technologies
CO4	The primary objective of this course is to cover the technical aspects of crypto currencies, block chain technologies, and distributed consensus
CO5	To familiarize potential applications for Bit coin-like crypto currencies The course will enable an individual to learn, how these systems work and how to engineer secure software that interacts with the Bit coin network and other crypto currencies

Detailed Syllabus:

Unit 1	**INTRODUCTION:** Basic Cryptographic primitives used in Blockchain –Secure-CollisionResistant hash functions - Digital signature - Public key cryptosystems - Zeroknowledge proof systems - Need for Distributed Record Keeping - Modelling faults and adversaries- Byzantine Generals problem - Consensus algorithms and their scalability problems -Why Nakamoto Came up with Blockchain based cryptocurrency.
Unit 2	**BITCOIN:** Bitcoin -Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bit coin. Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their uses.
Unit 3	**MODELS FOR BLOCKCHAIN:** Models f-GARAY model -RLA Model -Proof of Work (PoW) as random oracle - Formal treatment of consistency- Liveness and Fairness - Proof of Stake (PoS) based Chains -Hybrid models (PoW + PoS) - Bitcoin scripting language and their use.

Unit 4	**ETHEREUM:** Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts. Ethereum and Smart Contracts- The Turing Completeness of Smart Contract Languages and verification challenges- comparing Bitcoin scripting vs. Ethereum Smart Contracts.
Unit 5	**BLOCK CHAIN-RECENT TREND:** Blockchain Implementation Challenges- Zero Knowledge proofs and protocols in Block chain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves – Zcash - attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand, and Sharding based consensus algorithms.

Text and Reference Books:

1. Melanie Swan, "*Block Chain: Blueprint for a New Economy*", O"Reilly, first edition – 2015.
2. Daniel Drescher, "*Block Chain Basics*", Apress; 1stedition, 2017
3. Anshul Kaushik, "*Block Chain and Crypto Currencies*", Khanna Publishing House, Delhi.
4. Imran Bashir, "*Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained*", Packt Publishing, first edition – 2012.
5. Ritesh Modi, "*Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain*", Packt Publishing.
6. Joseph Bonneau et al, SoK: "*Research perspectives and challenges for Bitcoin and cryptocurrency*", IEEE Symposium on security and Privacy, 2015.
7. J.A.Garay et al, "*The bitcoin backbone protocol - analysis and applications*", EUROCRYPT 2015,Volume 2.
8. R.Pass et al, "*Analysis of Blockchain protocol in Asynchronous networks*", EUROCRYPT 2017.

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	1	2								2				
CO2	1	1	2								2				
CO3	3	2	3	3										2	
CO4	3	2	3											1	
CO5	3	2	3	2				2			2		3	1	

3 - High 2 – Medium 1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1) Quiz
2) Assignments
3) Question and answer

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4) PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	00	10
K2	Understand	10	05	02	15
K3	Apply	05	05	02	15
K4	Analyze	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	02	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K1, K2	K3,K4,K5
	CO1,CO2	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	00	15
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

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Dated: 18th April 2023

CSPE4003: Neural Network

Teaching Scheme			Evaluation Scheme	
Lectures	**3 Hrs/Week**		**ISE I**	**15 Marks**
Tutorial	**0**		**ISE II**	**15 Marks**
			ISE III	**10 Marks**
Total Credits	**3**		**ESE**	**60 Marks**

Course Description: The course introduces the basic concepts and models of ANN for solving simple pattern recognition problems.

	Course Outcomes
CO1	Define what is Neural Network and model a Neuron
CO2	Analyze NN learning, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning and Boltzmann learning
CO3	Implement Simple perception, Perception learning algorithm, Modified Perception learning algorithm, and Adaptive linear combiner, Continuous perception, learning in continuous perception.
CO4	Explore the parameters for neural network.
CO5	Explore opportunities in NN applications & research area related with it.

Detailed Syllabus:

Unit 1	**Neural Networks:** History, Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error back propagation.
Unit 2	**Neural Network Structures Introduction:** Network Architecture, Threshold Logic Units (TLU) , Decision Surface.
Unit 3	**Updating Weights in Simplest Neural Network:** Simple Error Analysis Working with 1 Attributes Small Steps Extending Simplest Neural Network to Multiple Inputs Extending to Multiple Outputs Combining Multiple Input and Outputs.
Unit 4	**Recurrent networks, Modeling sequences:** A brief overview, Training RN with back propagation. A toy example of training an RNN, Why it is difficult to train an RNN?, Long short term memory, Echo state networks, Hessian free optimization, Learning to predict the next character.
Unit 5	Probabilistic neural bets, Boltzmann machines, RBMs, sigmoid belief, Generative models.

Text and Reference Books:

1. Martin T. Hagan, Howard B. Demuth, Mark H. Beale, *Neural Network Design*,
2. James A. Anderson, *An Introduction to Neural Networks*, MIT Press.

Web Resources:

1. NPTEL : https://nptel.ac.in/courses/117105084
2. NPTEL : https://archive.nptel.ac.in/courses/117/105/117105084/

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1	3		
CO2	1														
CO3	2	2	1										2		
CO4	3	1	2		1				2	1			1	1	
CO5	3	1			1				1	1		1	1	1	1

3 - High 2 – Medium1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISEI and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.
ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1) Quiz
2) Assignments
3) Question and answer
4) PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20
K3	Apply	05	05	05	30
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K1, K2	K3
	CO1	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

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Dated: 18th April 2023

CSPE4004: Cryptography and Network Security

Teaching Scheme		Examination Scheme	
Lectures	**3Hrs/Week**	**ISE- I**	**15 Marks**
Tutorial	**0**	**ISE-II**	**15 Marks**
Total Credits	**03**	**ISE- III**	**10 Marks**
		End Semester Exam	**60 Marks**

Prerequisites: None

Course Description: This course will introduce the concepts of Cryptography and Network Security. The course begins with basic cryptographic algorithms and extends to the advance ones. Several standards and frameworks like Kerberos, X.509 etc are included. Some aspects of firewalls, intrusion detection and cloud security are also a part of this course.

Course Outcomes:

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

	Course Outcomes
CO1	To provide introduction to the concept of Network Security Model and Cryptography systems.
CO2	To give the knowledge of Digital Signature and other Security Measures available.
CO3	To familiarize with the various techniques like PGP and S/MIME.
CO4	To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks.
CO5	To explain the firewall design principles and various intrusion detection system.

Detailed Syllabus:

Unit 1	**Overview:** Computer Security Concepts, Security Attacks, Security Services, Security Mechanism, A Model for Network Security, Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers and the Data Encryption, Euclid's Algorithm, Placement of Encryption Function, Traffic Confidentiality, key distribution.
Unit 2	**Public Key Crypto System and RSA:** Prime Numbers, Fermat's and Euler's Theorems, Principles of Public-Key Cryptography, the RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Cryptographic Hash Function: Applications, Requirements & Security, SHA-3, Authentication Requirements, Authentication Functions. Introduction to Elliptic curve cryptography
Unit 3	Digital Signatures, Digital Signature Standards. Authentication Application & Electronic Mail Security: Kerberos, X.509 Authentication Service, Pretty Good Privacy, S/MIME.
Unit 4	IP Security and Web Security: IP Security overview, IP Security Policy, Encapsulating Security Payload, Transport Level Security, Wireless Network Security

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Unit 5	System Security: Intruders, Intrusion Detection, Firewalls, Cloud Security: Threats, Cloud Security Controls, Mobile Security: Challenges, Attacks based on Communication, vulnerabilities in Software application, Countermeasures

Text and Reference Books:

1. William Stallings, "*Cryptography and Network Security: Principals & Practice*", Pearson Education
2. Atul kahate , "*Cryptography and Network Security",* Mc Graw Hill Education.

Web Resources:

NPTEL course : Cryptography and network security(IITK): Cryptography and Network Security - Course (nptel.ac.in)

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	1	2								2				
CO2	1	1	2								2				
CO3	3	2	3	3										2	
CO4	3	2	3												
CO5	3	2	3	2				2			2		3		

3 - High 2 – Medium 1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.
ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1. Quiz
2. Assignments
3. Question and answer
4. PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyze	00	05	05	10

K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3**
	CO1,CO2	CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks 100		

Special Instructions if any: Nil

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Dated: 18th April 2023

CSPE4005 : Data Analytics

Teaching Scheme		Examination Scheme	
Lectures	**3Hrs/Week**	**ISE- I**	**15 Marks**
Tutorial	**0**	**ISE-II**	**15 Marks**
Total Credits	**03**	**ISE- III**	**10 Marks**
		End Semester Exam	**60 Marks**

Prerequisites: Nil

Course Description: Identify and explain fundamental ingredients that constitute a recommendation engine. Describe what data science is and the skill sets needed to be a data scientist.

Course Outcomes:

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

	Course Outcomes
CO1	Describe the data science process and how its components interact
CO2	Use API's And other tools to scrap the web and Collect data.
CO3	Build Your Own Recommendation system using existing Components
CO4	Work effectively in teams of data science projects.
CO5	Reason around ethical and privacy issues in data science conduct and apply ethical practices

Detailed Syllabus:

Unit 1	Introduction to data science Big Data and Data science Hype, Datafication, The emergence of data lakes, Introduce the federation business data lakes, data lake ingests ,stores and processes data
Unit 2	Recommendation systems Algorithmic ingredients of a recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Building your own recommendation systems.
Unit 3	Mining Social Network Graphs: Social Networks as graphs, clustering of graphs, direct discovery of communities in graphs, partitioning of graphs, neighborhood properties in graphs.
Unit 4	Data Science and Ethical Issues Discussions on privacy, security and ethics
Unit 5	Data Wrangling and Forecasting Web Scraping and API's , Compare various types of time-series components, Discuss Time Series, Forecasting methods(ARIMA model),Evaluation Criteria of Forecasting Model

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Text and Reference Books:

1. David Dietrich, Barry Hiller, "*Data Science and Big Data Analytics*", EMC education services, Wiley, publications, 2012, ISBN0-07-120413-X

2. Ashutosh Nandeshwar , "*Tableau Data Visualization Codebook*", Packt Publishing, ISBN 978-1-84968-978-6

3. Maheshwari Anil, Rakshit, Acharya, "*Data Analytics*", McGraw Hill, ISBN: 789353160258.

4. Mark Gardner, "*Beginning R: The Statistical Programming Language*", Wrox Publication, ISBN: 978-1-118-16430-3

3. Luís Torgo, "*Data Mining with R, Learning with Case Studies*", CRC Press, Talay and Francis Group, ISBN9781482234893

4. Carlo Vercellis, "*Business Intelligence - Data Mining and Optimization for Decision Making*", Wiley, Publications, ISBN: 978047075386

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1	3		
CO2	1														
CO3	2	2	1										2		
CO4	3	1	2		1				2	1			1	1	
CO5	3	1			1				1	1		1	1	1	

3 - High 2 – Medium1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISEI and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1) Quiz
2) Assignments
3) Question and answer
4) PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20

K3	Apply	05	05	05	30
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3**
	CO1	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

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Dated: 18th April 2023

CSPE4006: Internet of Things

Teaching Scheme		Examination Scheme	
Lectures	**3Hrs/Week**	**ISE- I**	**15 Marks**
Tutorial	**0**	**ISE-II**	**15 Marks**
Total Credits	**03**	**ISE- III**	**10 Marks**
		End Semester Exam	**60 Marks**

Course Outcomes:

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

Course Outcomes	
CO1	Understand the applications of IOT
CO2	Describe the working of different sensors & circuit modules.
CO3	Demonstrate working of different types of connectivity.
CO4	Illustrate Feature of different microcontrollers.
CO5	Discuss different case studies related to IOT eg. AWS smart city

Detailed Syllabus:

Unit 1	**IOT-MOTIVATION AND APPLICATIONS**: Importance of IoT. Motivating Applications of IoT: Smart Cities- Smart Waste Management, Smart Street Lights, Smart Street Parking, Security without Surveillance, Connected Vehicles. Healthcare- Baby Monitoring, Elderly Monitoring, Mood Enhancing, Disease Treatment and Progression Monitoring, Enhance Adherence, Challenges. Agriculture- Precision Agriculture, Connected Livestock, Food Safety. Manufacturing and Logistics- Smart Manufacturing- Smart Packaging, Smart Label. Smart Electricity Grid- Managing Supply and Demand. Home Automation.
Unit 2	**SENSORS and CIRCUITS:** Sensor – Introduction, Terminology, Behaviour, Selection, Circuits – Overview and Applications, Battery Issue and Energy Management, Wireless Link, Digital and Analog – Digital Computing, Analog to Digital Interfaces
Unit 3	**Embedded Systems, Connectivity and Networking:** Embedded Systems – Overview, Technology Drivers, Energy, Microcontrollers, Software Connectivity and Networking – Introduction, Connectivity Challenges in IoT, Energy Harvesting Transmitters, Massive Multiple Access, Computation vs Communication.
Unit 4	**BUILDING IoT WITH RASPBERRY PI & ARDUINO:** Building IOT with RASPERRY PI- IoT Architectures – embedded System, Gateway and Cloud (MGC) Architecture and other reference models and architectures. IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.
Unit 5	**CASE STUDIES AND REAL-WORLD APPLICATIONS:** Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models &

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	Communication APIs - Cloud for IoT - Amazon Web Services for IoT. **TECHNOLOGY CHALLENGES** Security, Connectivity, Compatibility and Longevity, Standards, Intelligent Analysis and Actions Business Challenges – Consumer IoT, Commercial IoT, Industrial IoT Society Challenges – Privacy, Regulatory Standards.

Text and Reference Books:

1. Pethuru Raj and Anupama C. Raman , "*The Internet of Things: Enabling Technologies, Platforms, and Use Cases*", (CRC Press)
2. Adrian McEwen and Hakim Cassimally, "*Designing the Internet of Things*", John Wiley & Sons Ltd., UK, 2014.
3. ArshdeepBahga and Vijay Madisetti , "*Internet of Things: A Hands-on Approach*", (Universities Press)
4. David Boswarthick, Omar Elloumi and OlivierHersent, "*M2M Communications: A Systems Approach*", John Wiley & Sons Ltd, UK, 2012.
5. Dieter Uckelmann, Mark Harrison and Florian Michahelles, "*Architecting the Internet of Things*", Springer, NewYork, 2011.

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1							1							
CO2		2	3					1						1	
CO3		2	3					2					1	1	
CO4	2	2	3					2	3			3	1	1	
CO5		2	3					2	3			3	1		

3 - High 2 – Medium 1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1) Quiz
2) Assignments
3) Question and answer
4) PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	00	10
K2	Understand	10	05	02	15

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K3	Apply	05	05	02	15
K4	Analyze	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	02	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3,K4,K5**
	CO1,CO2	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	00	15
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

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CSPE4007: Natural Language Processing

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	ESE	**60 Marks**

Prerequisites: Compiler Design

Course Description: This course teaches the students the leading trends and systems in natural language processing & make them understand the concepts of morphology, syntax, semantics and pragmatics of the language . It also describes the application based on natural language processing and to show the points of syntactic, semantic processing.

Course Outcomes:

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

	Course Outcomes
CO1	Describe the mathematical and linguistic foundations underlying approaches to the areas in NLP. (Measured by problem sets and quizzes).
CO2	Design, implement and test algorithms for NLP problems (measured by problem sets).
CO3	Apply basic algorithms in the field, Morphology syntax semantics and pragmatics as well as the resources of natural language data corpora.
CO4	Grape basics of knowledge representations, inference and relations to the artificial intelligence
CO5	Find opportunities for research and prepare to conduct research in NLP or related fields.

Detailed Syllabus:

Unit 1	Motivation for studying NLP; Natural Language Processing as the forcing function of AI; Classical approaches to NLP with knowledge bases and linguistic rules; Data Driven and Machine Learning Approaches to NLP; Efficient, Robust and Scalable NLP
Unit 2	Classical NLP: Linguistics Fundamentals: Syntax and Parsing, Morphological analysis, Text and speech processing.
Unit 3	Empirical or Statistical NLP: Probabilistic Methods on Introductory Graphical Models for NLP: Shallow Parsing: Probabilistic Parsing
Unit 4	Applications: Machine Translation, Information Retrieval, Question Answering, Summarization, Information Extraction
Unit 5	Biology and Sociology of NLP: Neuro-linguistics, Child Language Acquisition

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Text and Reference Books:

1. Jurafsky, Daniel, and James H. Martin, *Speech and Language Processing:An Introduction to Natural Language Processing, Speech Recognition,and Computational Linguistics*, PrenticeHall, 2000.
2. Christopher D. Manning and Hinrich Schütze, *Foundations of Statistical Natural Language Processing. Cambridge*, MIT Press, 1999.
3. James Allen, *Natural Language Understanding*, Benjamin/Cummings, 2ed, 1995.
4. Eugene Charniak, *Statistical Language Learning*, MIT Press, 1996.
5. P. Lieberman, *Toward an evolutionary biology of language*, Harvard university Press, 2006.

Web Resources:
NPTEL course : IIT Kharagpur:- https://nptel.ac.in/courses/106105158.

IIT Madras :- https://nptel.ac.in/courses/106106211

IIT Bombay:- https://nptel.ac.in/courses/106101007

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2												1	1	
CO2	2									2			1	1	
CO3	3	3								2		2	1	1	1
CO4	3	3								2		2	1	1	1
CO5	3	3								2		2	1	1	1

3 - High 2 – Medium 1 –Low

Assessment:
ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

5) Quiz
6) Assignments
7) Class room Question & answer
8) Power point presentation of Topic which is related but out of syllabus
5) Overall approach towards learning, creativity.

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination

K1	Remember	05	00	02	10
K2	Understand	05	05	02	20
K3	Apply	05	05	03	20
K4	Analyze	00	05	03	10
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3,K4**
	CO1	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

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CSPE4008: Deep Learning

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	ESE	**60 Marks**

Prerequisites: Artificial Intelligence, Machine Learning

Course description: This course is focusing on the basics of Deep Learning concept to the implementation level of Deep Learning Algorithms**.**

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Comprehend the basic concept Deep Learning and get the exposure to use of mathematical concept in deep learning models.
CO2	Will acquire the knowledge about learning model algorithms, cognize the application of deep learning algorithms.
CO3	Will be able to implement the Deep Learning Network.
CO4	Will be able to optimize the training model in Deep Learning Network.
CO5	Implement the solution for deep learning application.

Detailed Syllabus:

Unit 1	Introduction to Deep Learning, Linear Algebra: Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Eigendecomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Useful Properties of Common Functions, Bayes' Rule.
Unit 2	Numerical Computation: Overflow and Underflow, Poor Conditioning, Gradient-Based Optimization, Constrained Optimization, Example: Linear Least Squares. Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Challenges Motivating Deep Learning.
Unit 3	Deep Feedforward Networks: Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms, Regularization for Deep Learning: Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent

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	Classifier.
Unit 4	Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms. Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.
Unit 5	Sequence Modeling: Recurrent and Recursive Nets, Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies. Applications: Large Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

Text and Reference Books

1. Ian Goodfelllow, Yoshua Benjio, Aaron Courville , *Deep Learning*-, The MIT Press
2. Richard O. Duda, Peter E. Hart, David G. Stork *Pattern Classification*-, John Wiley & Sons Inc.

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1					2	1	1			2		
CO2	3	3						3	1	2			2		1
CO3	2	3		1				3	1	1			1	1	2
CO4	1	3		3	1			3	2	2	1	1	1	2	2
CO5	2	3	1	3	3			3	2	2	1	1	1	1	2

3 – High 2 – Medium 1 - Low

Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1) Quiz
2) Assignments
3) Question and answer
4) PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	02	10
K2	Understand	10	05	02	15
K3	Apply	05	05	02	15
K4	Analyze	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K1, K2	K3,K4,K5
	CO1,CO2	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	00	15
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	25	35
Total Marks 100		

Special Instructions if any:

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CSPE4009: Design of Linux OS

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs/ week	ISE I	15 Marks
Tutorial: 0	ISE II	15 Marks
Credits:03	ISE III	10 Marks
	ESE	60 Marks

Course description: This course covers design principles of Linux Operating System, algorithms for process management, memory management. Structure of File system and virtual file system is also elaborated. This course contains details of shell programming and introduces system administration.

Course Outcomes:

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

	Course Outcomes
CO1	Classify Linux Kernel mode with user mode & contrast between Kernel structures. (K3) (Process creation) (K2)
CO2	Identify and estimate process management & thread management strategies along with their different operations
CO3	Implement different system calls for various file handling operations. (K2)
CO4	Determine paging and Caching techniques related to Virtual Memory. (k2,K4)
CO5	Construct shell scripts. (k3,k6)

Detailed Syllabus:

Unit 1	**Introduction to Linux operating and Kernel:-** Overview of operating system and kernel, Features of linux, Linux Distributions ,Obtaining the Kernel source ,Building & configuring the kernel, Types of kernels , Kernel modules, Design principles of Linux system.
Unit 2	**Process Management :**-Process management: The Process Descriptor and task structure, Process creation, , process termination.Thread definition, Motivation for Threads,Thread States: Life Cycle of a,Thread,Thread Operations Threading Models -User-Level Threads *Kernel-Level Threads.Process scheduling-Policy,* preemption and context switching
Unit 3	**Filesystem and system calls:** Inodes, directories, . System calls & their implementation: Open, create, read, write, fseek, pipe, dup, chair, chown, change, mode, state & stat etc
Unit 4	**Memory Management & I/O:**-Pages, Zones, Slab layer and Slab allocator interface, Virtual file system, Ext2 filesystem ,Ext3 filesystem **,** Device drivers **,**Anatomy of block device,Character device ,Network Device , I/O scheduler.

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Unit 5	**Shell Programming and System Administration:** Writing simple shell scripts , command line arguments, if then else, case, do while, for loop, until loop, operators, advanced shell programming, requirements of system administration. Case study of R programming with linux

Text and Reference Books:

1. Maurice Bach , "*The Design of Unix Operating System*", Pearson Education
2. Robert Love, "*Linux Kernel Development* ", Person Education
3. Harvey M. Deitel, "*Operating Systems*", Prentice Hall, 3rd Edition,2003, ISBN-10: 0131828
4. Abraham Silberschatz ,Peter Baer Galvin Greg Gagne , "*Operating System Concepts*", 7th edition
5. Maurice J. Bach, *The Design Of The Unix Operating System*, AT & T labs

Web Resources:

1. https://linuxconfig.org/running-gnu-r-on-linux-operating-system

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1		3	3						3				2	1	
CO2		3	3										2	1	
CO3		2											2	1	
CO4		2							3				2	1	
CO5		2	3						2		1	2	1	1	1

3 - High 2 – Medium 1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1. Quiz
2. Assignments
3. Class room Question & answer
4. Power point presentation of Topic which is related but out of syllabus
5. Overall approach towards learning, creativity.

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	05	02	10
K2	Understand	05	05	02	10
K3	Apply	03	03	02	20

K4	Analyze	02	02	02	10
K5	Evaluate	00	00	00	00
K6	Create	00	00	02	10
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3,K4,k6**
	CO1	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks 100		

Special Instructions if any: Nil

CSPE4010: Information Retrieval

Teaching Scheme		Examination Scheme	
Lectures	**3Hrs/Week**	**ISE- I**	**15 Marks**
Tutorial	**0**	**ISE-II**	**15 Marks**
Total Credits	**03**	**ISE- III**	**10 Marks**
		End Semester Exam	**60 Marks**

Prerequisites: Mathematics, Programming language.

Course Description: This is an introductory course for students covering the practices, issues, and theoretical foundations of organizing and analyzing information and information content for the purpose of providing intellectual access to textual and non-textual information resources. This course will introduce students to the principles of information retrieval systems and models, query expansion, queries, web crawling, taxonomy and ontology. Students will learn how effective information search and retrieval is interrelated with the organization and description of information to be retrieved. Students will also learn to use a set of tools and procedures for organizing information, will become familiar with the techniques involved in conducting effective searches.

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

Course Outcomes	
CO1	Understand the Information retrieval models.
CO2	Illustrate the different query properties.
CO3	Determine retrieval metric by various methods.
CO4	Compare different search engine ranking techniques
CO5	Describe different ontology and taxonomy architectures and processes.

Detailed Syllabus:

Unit 1	**Introduction:** Information Retrieval Early Developments, Information Retrieval in Libraries and Digital Libraries, IR at the Center of the Stage, The IR Problem, The IR System, The Web **Modeling:** IR Models, Classic Information Retrieval, Other Models
Unit 2	**Queries: Languages and Properties** Query Languages, Keyword-Based Querying, Beyond Keywords, Structural Queries, Query Protocols Query Properties, Characterizing Web Queries, User Search Behavior, Query Intent Query Topic, Query Sessions and Missions, Query Difficulty
Unit 3	**Retrieval Evaluation and Query Expansion:** Introduction, Retrieval Metrics, Implicit Feedback Through Global Analysis, Query Expansion based on a Similarity Thesaurus, Query Expansion based on a Statistical Thesaurus
Unit 4	**Web Retrieval and Web Crawling** Introduction, The Web, Search Engine Architectures, Search Engine Ranking,

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	Managing Web Data, Search Engine User Interaction, Browsing, Beyond Browsing, Web Crawling
Unit 5	**Taxonomy and Ontology:** Creating domain specific ontology, Ontology life cycle Distributed and Parallel IR: Relationships between documents, Identify appropriate networked collections, Multiple distributed collections simultaneously, Parallel IR - MIMD Architectures, Distributed IR – Collection Partitioning, Source Selection, Query Processing

Text and Reference Books:

1. Ricardo Baeza-Yates ,Berthier Ribeiro-Neto *Modern Information Retrieval, The Concepts and Technology behind Search Second edition* Addison Wesley Publication
2. Butcher, larke, Cormak *Information Retrieval : Implementing and Evaluating Search Engines*
3. William Frakes, *Information Retrieval : Data Structures and Algorithms*
4. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze. *Introduction to Information Retrieval*, Cambridge university press. 2008

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	3						2					1		
CO2	2	3						3		2			1		
CO3	2	3						3		2			1	1	2
CO4	2	3			1			3	1	2			1	1	2
CO5	1	3			1			2	1	2		2	1	1	2

3 - High 2 – Medium 1 –Low

Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISEI II) of 15 marks, each will be based on Class Test I and Class Test II respectively.

ISE III: Teachers Assessment of 10 marks is based on one of the / or combination of few of the following:

1. Quiz
2. Assignments
3. Question and answer
4. PowerPoint presentation

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	02	10
K2	Understand	10	05	02	15

K3	Apply	05	05	02	15
K4	Analyze	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1, K2**	**K3,K4,K5**
	CO1,CO2	CO2,CO3, CO4,CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	00	15
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	25	35
Total Marks 100		

Special Instructions if any: Nil

CSPC4011: Lab Artificial Intelligence

Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**ESE**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Identify and apply suitable Intelligent agents for various AI applications
CO2	Design smart system using different informed search / uninformed search or heuristic approaches.
CO3	Design knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
CO4	Apply the suitable algorithms to solve AI problems
CO5	Design and provide best solution to AI problems by measuring the performance of different algorithms and comparing them.

List of the Experiments:

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				
1	Implement Tic-Tac-Toe using A* algorithm .	S1	CO1	05
2	Implement 3 missionaries and 3 cannibals problem depicting appropriate graph. Use A* algorithm.	S2	CO1,CO2	05
3	Solve 8-puzzle problem using A* algorithm. Assume any initial configuration and define goal configuration clearly	S2	CO2	05
Level: Moderate (any three)				
4	Implement any one of the following Expert System , Medical Diagnosis of 10 diseases based on adequate symptoms. Identifying birds of India based on characteristics	S2	CO1, CO2	05
5	Implement alpha-beta pruning graphically with proper example and justify the pruning.	S2	CO1, CO2	05
6	Develop elementary chatbot for suggesting investment as per the customers need.	S2	CO2	06
Level: Complex (any two)				
7	Implement goal stack planning for the following configurations from the blocks world.	S2	CO2	05
8	Use Heuristic Search Techniques to Implement Hill-Climbing Algorithm.	S2	CO2	05

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9	Use Heuristic Search Techniques to Implement Best first search (Best-Solution but not always optimal) and A* algorithm (Always gives optimal solution).	S2	CO4	05
10	Constraint Satisfaction Problem: Implement crypt-arithmetic problem or n-queens or graph coloring problem (Branch and Bound and Backtracking)	S2	CO4	05
11	Implement syntax analysis for the assertive English statements. The stages to be executed are, • Sentence segmentation • Word tokenization • Part-of-speech/morpho syntactic tagging • Syntactic parsing (Use any of the parser like stanford)	S2	CO5	05

Assessment:
ISEI: In-Semester Evaluation of 50 marks based on performance of students in practical hours, practical assignments completed, and timely submission.

Assessment Table:

Assessment Tool	S1	S2
	CO1	CO2,C03, CO4
ESE (25Marks)	10	15

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**End Semester Examination**
S1	Imitation	05
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total Marks		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	**Program Outcomes**												**PSO's**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3		1		2				1						
CO2	3	2	2		2				1			1	1		
CO3	3	1	1		2				1			1		1	
CO4	3	1	1		2				1			1	1	1	

3 – High 2 – Medium 1- Low

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CSPE4012: Lab Blockchain Technology

Teaching Scheme		Examination Scheme	
Practical	**2Hrs/Week**	**ISE III**	**25 Marks**
Total Credits	**01**	**ESE**	**25 Marks**

Minimum of 8 Programs should be completed which will be based on the subject and record for the same shall be submitted. Topic can be Block chain technologies Blockchain- Ethereum Hyperledger Fabric,cryptocurrencies etc

CSPE4013: Lab Neural Network

Teaching Scheme		Examination Scheme	
Practical	**2Hrs/Week**	**ISE III**	**25 Marks**
Total Credits	**01**	**ESE**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

Course Outcomes	
CO1	Generate bag of word model
CO2	Apply classification algorithms like EM , HMM to suitable data.
CO3	Demonstrate logistic regression, association rule mining.
CO4	Apply dimensionality reduction using SVM
CO5	Develop any application using RL

List of the Experiments:

The student shall perform minimum 8 experiments of the following using NLP tools & algorithms

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level -all				
1.	Parallel and distributed processing-I: Interactive activation and competition models.	SO1	CO1	4
2.	Parallel and distributed processing-II: Constraint satisfaction neural network models.	SO1	CO1	4
3.	Perceptron learning	SO2	CO2	4
4.	Multilayer feed forward neural network	SO2	CO2	4
5.	Hop field model for pattern storage task.	SO3	CO3	5

6.	Hop field model with stochastic update	SO3	CO3	6
7.	Competitive learning neural networks for pattern clustering	SO3	CO3	5
8.	Solution to travelling salesman problem using self organizing maps.	SO3	CO5	6
9.	Solution to optimize problems using Hopfield models	SO3	CO5	6
10.	Weighted matching problem: Deterministic, stochastic and mean-field annealing of a Hopfield model.	SO3	CO4	6

Assessment:

ISEI: In-Semester Evaluation of 25 marks based on performance of students in practical hours, practical assignments completed, and timely submission.

Assessment Table:

Assessment Tool	S1	S2, S3
	CO1	CO2,C03, CO4,CO5
ESE (25 Marks)	02	23

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	End Semester Examination
S1	Imitation	02
S2	Manipulation	12
S3	Precision	11
S4	Articulation	00
S5	Naturalization	00
Total Marks		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	3				2	1	2		3	2	1	2
CO2	3	3	1	3				2	1	2		3	2	1	2
CO3	3	3	1	3				2	1	2		3	2	1	2
CO4	3	3	1	3				2	1	2		3	2	1	2
CO5	3	3	1	3				2	1	2		3	2	1	2

3 – High 2 – Medium 1- Low

CSPE4014: Lab Cryptography and Network Security

Teaching Scheme		Examination Scheme	
Practical	**2Hrs/Week**	**ISE III**	**25 Marks**
Total Credits	**01**	**End Semester Exam**	**25 Marks**

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

	Course Outcomes
CO1	Identify Vulnerabilities in a Network
CO2	Solve Problems using various Algorithms
CO3	Identify Various Attacks and Formulate Defense Mechanism
CO4	Understand Wireless Security
CO5	Understand Web Security for email transfers

List of the Experiments:
The student shall perform minimum ten experiments of the following using Oracle databases.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				
1	1. Network/Vulnerability scanner (case study: nmap and nessus)	S1	CO1	04
2	2. Write a program to implement Caesar Cipher and play fair cipher Algorithms	S2	CO2	04
3	3. Programs on RSA and Diffie Hellman algorithms	S2	CO2	04
4	DoS and other Network Attacks	S1	CO3	04
5	Implement Hill cipher Encryption technique	S2	CO2	04
Level: Moderate				
6	Firewalls - Case Study	S2	CO3, CO4	05
7	Wireless network security – Case Study	S2	CO4	05
Level: Complex				

8	Packet Sniffers: Tcpdump, Ettercap, Dsniff	S2	CO4	05
9	Intrusion Detection/Prevention Systems (case study: snort IDS)	S2	CO4	05
10	Using PGP Mail freeware to encrypt and sign email messages and individual files	S2	CO5	04

Assessment:
ISEI: In-Semester Evaluation of 50 marks based on performance of students in practical hours, practical assignments completed, and timely submission.

Assessment Table:

Assessment Tool	S1	S2
	CO1	CO2,C03, CO4,CO5
ESE (25 Marks)	10	15

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**End Semester Examination**
S1	Imitation	5
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total Marks		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1									3					
CO2	2									2				1	
CO3	2									2				1	
CO4	2								2	2		1		1	1
CO5	2	1	1	1	1			2	3	2	3	1	3	1	1

3 – High 2 – Medium 1- Low

Approved in XXVth Academic Council
Dated: 18th April 2023

CSPE4015: Lab Data Analytics

Teaching Scheme		Examination Scheme	
Practical	**2Hrs/Week**	**ISE III**	**25 Marks**
Total Credits	**01**	**End Semester Exam**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Use Python and other tools to scrape, clean, and process data
CO2	Use data management techniques to store data locally and in cloud infrastructures
CO3	Use statistical methods and visualization to quickly explore data

List of the Experiments: From any of the following Domains Health Care, Finance, It for Analytics, Marketing Analytics & Decision & Operations Analytics.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
	Level: Basic (all)			
1	Download the Iris flower dataset or any other dataset into a DataFrame. (eg https://archive.ics.uci.edu/ml/datasets/Iris) Use Python/R and Perform following – • How many features are there and what are their types (e.g., numeric, nominal)? • Compute and display summary statistics for each feature available in the dataset. (eg. minimum value, maximum value, mean, range, standard deviation, variance and percentiles • Data Visualization-Create a histogram for each feature in the dataset to illustrate the feature distributions. Plot each histogram. • Create a boxplot for each feature in the dataset. All of the boxplots should be combined into a single plot. Compare distributions and identify outliers	S1	CO1	05
2	Download Pima Indians Diabetes dataset. Use Naive Bayes‟ Algorithm for classification. • Load the data from CSV file and split it into training and test datasets. • summarize the properties in the training dataset so that we can calculate robabilities and make predictions. • Classify samples from a test dataset and a summarized training dataset.	S2	CO1,CO2	05
3	Write a Hadoop program that counts the number of occurrences of each word in a text file.	S2	CO2	05

Level: Moderate (any three)				
4	Write a program that interacts with the weather database. Find the day and the station with the maximum snowfall in 2013.	S2	CO1, CO2	05
5	Use Movies Dataset. Write the map and reduce methods to determine the average ratings of movies. The input consists of a series of lines, each containing a movie number, user number, rating, and a timestamp: The map should emit movie number and list of rating, and reduce should return for each movie number a list of average rating.	S2	CO1, CO2	05
6	Trip History Analysis: Use trip history dataset that is from a bike sharing service in the United States. The data is provided quarter-wise from 2010 (Q4) onwards. Each file has 7 columns. Predict the class of user. Sample Test data set available here https://www.capitalbikeshare.com/trip-history-dat	S2	CO2	06
Level: Complex (any two)				
7	Bigmart Sales Analysis: For data comprising of transaction records of a sales store. The data has 8523 rows of 12 variables. Predict the sales of a store. Sample Test data set available here https://datahack.analyticsvidhya.com/contest/practice-problem-big-mart-sales-iii/	S2	CO2	05
8	Twitter Data Analysis: Use Twitter data for sentiment analysis. The dataset is 3MB in size and has 31,962 tweets. Identify the tweets which are hate tweets and which are not. Sample Test data set available here https://datahack.analyticsvidhya.com/contest/practice-problemtwitter-sentiment-ana	S2	CO2	05
9	Time Series Analysis: Use time series and forecast traffic on a mode of transportation. Sample Test data set available here https://datahack.analyticsvidhya.com/contest/practice-problemtime-series-2/	S2	CO3	05

Assessment:
ISEI: In-Semester Evaluation of 50 marks based on performance of students in practical hours, practical assignments completed, and timely submission.

Assessment Table:

Assessment Tool	S1	S2
	CO1	CO2,C03,
ESE (25Marks)	10	15

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	End Semester Examination
S1	Imitation	02
S2	Manipulation	12
S3	Precision	11
S4	Articulation	00
S5	Naturalization	00
Total Marks		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3		1		2				1	1		1	2		
CO2	3	2	2		2				1	1		1	2	2	1
CO3	3	1	1		2				1	2		2	2	2	1
CO4	3	1	1		2				1	2		2	1	2	1

3 – High 2 – Medium 1- Low

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Dated: 18th April 2023

CSPE4016: Lab Internet Of Things

Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**ESE**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Demonstrate use of Arduino
CO2	Demonstrate use of Raspberry Pi.
CO3	Performance of task based on Arduino
CO4	Implementing programs using of Raspberry Pi.

List of the Experiments:

The student shall perform minimum 8 experiments of the following using Arduino.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level -all				
1.	Sense the Available Networks Using Arduino.	SO1	CO1	4
2.	Measure the Distance Using Ultrasonic Sensor and Make Led Blink Using Arduino.	SO1	CO1	4
3.	Detect the Vibration of an Object Using Arduino.	SO2	CO2	4
4.	Connect with the Available Wi-Fi Using Arduino.	SO2	CO2	4
5.	Sense a Finger When it is Placed on Board Using Arduino.	SO3	CO3	4
6.	Temperature Notification Using Arduino.	SO3	CO3	6
7.	LDR to Vary the Light Intensity of LED Using Arduino.	SO3	CO3	6
8.	MySQL Database Installation in Raspberry Pi.	SO4	CO4	6
9.	SQL Queries by Fetching Data from Database in Raspberry Pi.	SO4	CO4	6
10.	Switch Light On and Off Based on the Input of User Using Raspberry Pi.	SO4	CO4	6

Assessment:

ISEI: In Term work of 25 marks based on performance of students in practical hours, attendance ,practical assignments completion , and timely submission.

End Semester Evaluation: In ESE of 25 marks Practical conduction and Oral Examination

Approved in XXVth Academic Council
Dated: 18th April 2023

Assessment Table:

Assessment Tool	S1	S2	S3	S4
	CO1	CO2	CO3	CO4
ESE	07	07	06	05

Assessment Pattern:

Assessment Pattern Level No.	**Skill Level**	**End Semester Examination**
S1	Imitation	05
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

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

3 – High 2 – Medium 1- Low

CSPE4017: Lab Natural Language Processing

Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**ESE**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Learn how to apply basic algorithms in NLP field
CO2	Get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language data - corpora
CO3	Conceive basics of knowledge representation, inference, and relations to the artificial intelligence.
CO4	Implement mathematical foundations, Probability theory with Linguistic essentials such as syntactic and semantic analysis of text

List of the Experiments:

The student shall perform minimum 8 experiments of the following using NLP tools & algorithms

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level -all				
1.	Implement Word Analysis task	SO1	1	4
2.	Implement Word Generation program	SO1	1	4
3.	Implement task of Morphology	SO2	2	4
4.	Implement N-Grams program	SO2	2	4
5.	Implement POS Tagging: Hidden Markov Model	SO3	3	4
6.	Building POS Tagger	SO3	3	6
7.	Write a program for Chunking words	SO3	3	4
8.	Building Chunker	SO4	4	6

Assessment:
ISEI: In Term work of 25 marks based on performance of students in practical hours, attendance ,practical assignments completion , and timely submission.
End Semester Evaluation: In ESE of 25 marks Practical conduction and Oral Examination

Assessment Table:

Assessment Tool	S1	S2	S3	S4
	CO1	CO2	CO3	CO4
ESE	07	07	06	05

Assessment Pattern:

Assessment Pattern Level No.	**Skill Level**	**End Semester Examination**
S1	Imitation	05
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcome	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO12	PS O1	PS O2	PSO3
CO1		3	3							1		1	2	3	1
CO2		3	3							1		1	2	3	1
CO3		3	3							1		1	2	3	1
CO4		3	2							1		1	1	3	1
CO5		3	2							1		1	1	3	1

3 – High 2 – Medium 1- Low

Approved in XXVth Academic Council
Dated: 18th April 2023

CSPE4018: Lab Deep Learning

Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Get familiar with deep learning environment.
CO2	Create the image classification model using deep learning model.
CO3	Build the text summarization model.
CO4	Develop the Application of deep learning like

List of the Experiments

The student shall perform minimum eight experiments of the following using PYTHON

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
1	Introduction and Installation of Notebooks, Keras fundamentals Jupyter notebook: keras-test-setup.ipynb	S1	CO1	04
2	Classification using Multilayer Perceptron (MLP)	S1	CO1	04
3	Image classification with CNNs	S1	CO2, CO1	04
4	Image classification: dogs vs. cats; traffic signs	S2	CO2	04
5	Text categorization and labeling	S2	CO3, CO1	04
6	Text sentiment classification with CNNs, RNNs	S2	CO3	04
7	Image Classification with CIFAR Dataset	S3	CO5, CO2	04
8	Human Face Detection	S3	CO5, CO2	04
9	The traffic sign classification using GTSRB dataset	S3	CO5	04
10	Chatbot Using Deep Learning	S3	CO5	04

Assessment:

ISEI: In Term work of 25 marks based on performance of students in practical hours, attendance ,practical assignments completion , and timely submission.

End Semester Evaluation: In ESE of 25 marks Practical conduction and Oral Examination

Assessment Table:

Assessment Tool	S1	S2	S3	S3	S2

	CO1	CO2	CO3	CO4	CO5
ESE	05	05	05	05	05

Assessment Pattern:

Assessment Pattern Level No.	**Skill Level**	**End Semester Examination**
S1	Imitation	05
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total		25

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1		2	3	1							1		1	1	
CO2	1	3	3	1				1	1	3	1	1	2	2	1
CO3	1	3	3	2				1	2	3	2	3	3	2	1
CO4	2	3	3	2	1	1		1	2	3	3	3	3	2	2

CSPE4019: Lab Design of Linux OS

Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**ESE**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Understand the basic commands & logging in Linux.
CO2	Apply different process management commands.
CO3	Demonstrate the programs various system calls.
CO4	Apply various memory management , allocation & I/O commands
CO5	Develop programs using shell scripting.

List of the Experiments:

The student shall perform minimum ten experiments of the following using Ubuntu, Fedora or any Linux platform

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: (all)				
1	Installation of Linux OS	S1	CO1	04
2	Study & Analyzing Gnome & KDE desktop environment	S1	CO1	04
3	Write a C program in Gedit	S1	CO1	04
4	Implement different basic commands in Linux	S1	CO2	04
5	Study of VI editor with implementing commands	S2	CO1, CO3	04
6	Study of nano editor with implementing commands	S2	CO1, CO3	04
7	Study of Emacs editor with implementing commands	S2	CO1,CO3	04
8	Implement a program for process management	S2	CO2	04
9	Implement a program to create a new process	S2	CO2	04
10	Write a C program for I/O management.	S2	CO3	04
11	Write a shell script for loops	S2	CO4	04
12	Write shell scripts using advanced commands	S2	CO5	06

Assessment:

ISEI: In Term work of 25 marks based on performance of students in practical hours, attendance ,practical assignments completion , and timely submission.

End Semester Evaluation: In ESE of 25 marks Practical conduction and Oral Examination

Assessment Table:

Assessment Tool	S1	S2	S3	S3	S2
	CO1	CO2	CO3	CO4	CO5
ESE	05	05	05	05	05

Assessment Pattern:

Assessment Pattern Level No.	**Skill Level**	**End Semester Examination**
S1	Imitation	05
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcome	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO12	PS O1	PS O2	PSO3
CO1	2	3								1	1		3	3	1
CO2	2	3								1	1		3	3	1
CO3	2	3								1	1	1	3	3	1
CO4	2	3								1	1	1	3	3	1
CO5	2	3								1	1	1	3	3	1

3 **– High 2 – Medium 1- Low**

CSPE4020: Lab Information Retrieval

Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**ESE**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Implement Conflation Algorithm using File Handling.
CO2	Illustrate clustering algo
CO3	Implementation of Web crawler
CO4	Implementation based on Multimedia.
CO5	Implementation based on Digital Libraries.

List of the Experiments:

The student shall perform the experiments of the following.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: (all)				
1	To implement Conflation Algorithm using File Handling.	S1	CO1	04
2	To implement single pass algorithm for clustering.	S1	CO1	04
3	To implement a program Retrieval of documents using inverted files.	S1	CO1	04
4	To implement a simple Web Crawler in Java.	S1	CO2	04
5	To implement a program for feature extraction in 2D color images (any features like color, texture etc.)	S2	CO1, CO3	04
6	To study recent papers on IR / search engine / Digital Libraries/ content management system for document .	S2	CO1, CO3	04
7	Assignments based on Multimedia.	S2	CO1,CO3	04
8	Assignments based on Digital Libraries.	S2	CO2	04

Assessment:

ISEI: In Term work of 25 marks based on performance of students in practical hours, attendance ,practical assignments completion , and timely submission.

End Semester Evaluation: In ESE of 25 marks Practical conduction and Oral Examination

Assessment Table:

Assessment Tool	S1	S2	S3	S3	S2
	CO1	CO2	CO3	CO4	CO5
ESE	05	05	05	05	05

Assessment Pattern:

Assessment Pattern Level No.	**Skill Level**	**Practical Examination & viva voce**
S1	Imitation	05
S2	Manipulation	10
S3	Precision	10
S4	Articulation	00
S5	Naturalization	00
Total		25

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

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

3– High 2 – Medium 1-Low

CSPR4021: Project I

Teaching Scheme	Examination Scheme	
Practical: 6Hrs/Week	**ISE III (Term Work)**	**50 Marks**
Credits:03	**ESE**	**50 Marks**

Course Outcome:

After applying this course, students will able to:

CO1	Identify and finalize problem statements by surveying variety of domains.
CO2	Perform requirement analysis and identify design methodologies.
CO3	Apply advance programming techniques.
CO4	Present technical report by applying different visualizations tools and evaluation metrics.

The project will consist of the work on the topic selected for the project. The project must be done in a group not exceeding 4 Students.

The candidate is expected to select the project do the requirement analysis, and carry out the necessary design procedure.

Term Work:

The assessment of the term work should be done by two internal examiners, one of which will be the guide and the other will be the HOD or senior staff member from the department.

Practical Examination:

Practical exam will be consist of a presentation along with actual demonstration of the project. The said examination will be conducted by a panel of two examiners (one internal guide and one external examiner).

Guideline for completing the PROJECT I:

- Weekly report of students work for finalization of his area of work and topics of projects should be submitted to the faculty during designated hours meant for seminar.
- Format of weekly report should be finalize by the department with sufficient inputs receive from the student it should have following stage wise reports:
  Project area and project groups by 3rd week.
  Tentative project problem statement by 5th week.
  Literature/ field study mechanism identified source and strategy by 6th week.
  Weekly report on literature, field study 6th,7th, and 8th week
  Trial design sheets, SRS, ER diagrams completion of the field data, trial database design and normalization, hardware design documents, prototype software or hardware modules design/develop 9th to 11th week.
- It is expected that the group of candidates prepare a report based on outcomes of literature studies, field visits, observation schedules, focus group meeting etc related to the problem statement. It shall include trial design documents, SRS, hardware and software prototypes, testing strategy.
- The report shall be tested for any plagiarism out of books, journals, and internet based articles and reports by appropriate web based tools.

- Assessment criteria of term work assessment should be viva-voce examinations by two examiners appointed by the department.
- Assessment criteria of seminar delivery for the term work should be design by the faculty with inputs receive form student of the class. It should include provision for peer group assessment if possible.
- Assessment criteria so designed will be displayed on the department notice board with the approval from department along with this guidelines.

Assessment Pattern

Assessment Pattern Level No.	**Knowledge level**	**ISE1**	**End Semester Examination**
S1	Imitation	15	15
S2	Manipulation	15	15
S3	Precision	15	15
S4	Articulation	15	15
55	Naturalization	15	15
Total		75	75

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course outcome	**Program Outcomes**												**PSO's**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	1	2	3						3	3	1	2	3	2
CO2	1	1	2	3						3	3	1	2	3	2
CO3	1	1	2	2				3	3	3	3	2	2	3	2
CO4	1	1	2	2		3				3	3	2	1	3	2

3– High 2 – Medium 1-Low

.

CSPR4022: Project II

Teaching Scheme	Examination Scheme	
Practical: 20 Hrs/Week	**ISE I (Term Work)**	**100 Marks**
Credits:10	**ESE**	**100 Marks**

Course Outcomes:

After applying this course, students will able to:

CO1	Identify and finalize problem statements by surveying variety of domains.
CO2	Perform requirement analysis and identify design methodologies.
CO3	Apply advance programming techniques.
CO4	Present technical report by applying different visualizations tools and evaluation metrics.
CO5	Apply engineering and management principles to achieve project goal.

Student may complete the said project work in the industry or within the department/Institute or any reputed academic / research organization. Performance of the student will be evaluated in the midterm and at the end of the semester .Students are required to prepare a complete project report duly signed by the appropriate authorities at the time of examination, where the work done by the student will be evaluated by the examiners.

The project will consist of the work on the topic selected for the project. The project must be done in a group not exceeding four students.

Term Work:

The assessment of the term work should be done by two internal examiners, one of which will be the guide and the other will be the HOD or senior staff member from the department. Guidelines for the term work and assessment shall be as described in the Project I of the same program.

Practical Examination:

Practical exam will be consist of a presentation along with actual demonstration of the project. The said examination will be conducted by a panel of two examiners (one internal guide and one external examiner).

Assessment Pattern

Assessment Pattern Level No.	Knowledge level	ISE1	End Semester Examination
S1	Imitation	10	20
S2	Manipulation	10	20
S3	Precision	10	20
S4	Articulation	10	20
55	Naturalization	10	20
Total		50	100

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes:

Course	PO1	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO

Outcome		2	3	4	5	6	7	8	9	10	11	12
CO1	1	1	2	3						3	3	1
CO2	1	1	2	3						3	3	1
CO3	1	1	2	2				3	3	3	3	2
CO4	1	1	2	2		3				3	3	2
CO5	1	1	2	3						3	3	1

3- High 2 – Medium 1-Low

Audit course :- Industrial Training

Teaching Scheme	**Examination Scheme**	
Practical: Hrs/Week	**ISE III (Term Work)**	
Credits:00	**ESE**	

Industrial training of minimum four weeks may be completed after second/ third years(work in the industry or within the department/Institute or any reputed academic / research organization).ISE III will be accessed on basis work done and presentation