

<b>Artificial Intelligence</b>			
Course Code	MCS101	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning Objectives:</b>			
<ul style="list-style-type: none"> <li>● Define the foundational concepts of artificial intelligence and key problem-solving techniques.</li> <li>● Explain the knowledge representation and reasoning techniques to solve complex problems in AI systems.</li> <li>● Use machine learning algorithms to evaluate their performance in real-world applications.</li> <li>● Build the applications of natural language processing and robotics to enhance human-computer interaction.</li> <li>● Explore the ethical considerations and societal implications of AI technologies.</li> </ul>			
<b>Module-1</b>			
<b>Module 1: Introduction to Artificial Intelligence and Problem Solving</b> , Definition and scope of AI, History and evolution of AI, Types of AI: Narrow AI vs. General AI, Problem formulation and problem-solving techniques, Search algorithms: Uninformed and informed search strategies, Heuristic search and constraint satisfaction problems.			
Teaching Learning Process	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
<b>Module 2: Knowledge Representation and Reasoning</b> , Types of knowledge representation, Propositional logic and first-order logic, Semantic networks and frames, Ontologies and their applications, Deductive and inductive reasoning, Rule-based systems and non-monotonic reasoning, Probabilistic reasoning and Bayesian networks.			
Teaching Learning Process	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
<b>Module 3: Machine Learning</b> , Introduction to machine learning, Supervised, unsupervised, and reinforcement learning, Common algorithms: Decision trees, SVM, neural networks Evaluation metrics for machine learning models, Practical applications of machine learning in AI systems.			
Teaching Learning Process	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
<b>Module 4: Natural Language Processing and Robotics</b> , Basics of natural language processing (NLP), Text processing and language models, Sentiment analysis and language generation, Robotics fundamentals and sensor technologies, Robot kinematics, control, and applications of AI in robotics.			
Teaching Learning Process	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
<b>Module 5: Ethical and Societal Implications of AI</b> , Ethical considerations in AI development, AI and job displacement, Privacy concerns and data security, Bias and fairness in AI algorithms, Accountability and transparency in AI systems, The role of government and regulation in AI, Public perception and trust in AI technologies, Future of AI and its impact on society.			
Teaching Learning Processes	Chalk and talk/PPT/case study/web content		

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks**

to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the Outcome defined for the course.**

**Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module.

**Suggested Learning Resources:****Text Books:**

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig, 4th Edition (2021)
2. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville third Edition.

**Reference Books:**

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop Edition: fourth Edition (2020)
- "Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth Edition: third Edition (2021).

**Web links and Video Lectures (e-Resources):**

- <https://cs221.stanford.edu>
- <https://www.kaggle.com/learn/machine-learning>
- <https://www.youtube.com/playlist?list=PLkDaE6sXhPqQ5s2cW2g1iGgC4eD9W6xZ2>
- <https://www.youtube.com/playlist?list=PLD6B6F0A3B1D4D3D8A7E3C5E8A7B2E0C>

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Explain the foundational concepts of artificial intelligence, including its history, types, and key problem-solving techniques.	L2
CO2	Apply knowledge representation and reasoning techniques to solve complex problems in AI systems.	L3
CO3	Implement machine learning algorithms and evaluate their performance in real-world applications.	L2
CO4	Explore the principles and applications of natural language processing and robotics to enhance human-computer interaction.	L4

Mapping of COS and Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	x			x		
CO2			x		x	
CO3		x				
CO4	x					

Program Outcome of this course

Sl. No.	Description	POs
1	Demonstrate the ability to independently conduct research and development work to address practical engineering problems.	PO1
2	Develop and deliver comprehensive technical presentations that effectively convey complex information to diverse audiences.	PO2
3	Exhibit mastery in the specialized study area, surpassing the requirements of a relevant bachelor's program.	PO3
4	Analyze engineering problems critically and apply appropriate techniques, skills, and modern tools to develop innovative solutions.	PO4
5	Collaborate effectively in teams while also functioning independently, recognizing opportunities for career advancement and research.	PO5
6	Cultivate a proactive approach to continuous learning and professional development in response to evolving technological landscapes.	PO6

<b>Data Science and Management</b>			
Course Code	MCS102	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	4:0:2	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
1. Explain the foundational concepts of data science, including its history, significance, and the data science process. 2. Apply statistical methods and data analysis techniques to interpret and draw insights from complex datasets. 3. Implement various machine learning algorithms and assess their performance using appropriate evaluation metrics in real-world scenarios. 4. Utilize data visualization tools and techniques to effectively communicate findings and insights to diverse audiences.			
<b>Module-1</b>			
<b>Module 1:</b> Introduction to Data Science and R Tool, Overview of Data Science Importance of Data Science in Engineering , Data Science Process , Data Types and Structures, Introduction to R Programming, Basic Data Manipulation in R, Simple programs using R. Introduction to RDBMS: Definition and Purpose of RDBMS Key Concepts: Tables, Rows, Columns, and Relationships, SQL Basics: SELECT, INSERT, UPDATE, DELETE Importance of RDBMS in Data Management for Data Science			
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
<b>Module 2:</b> Linear Algebra for Data Science, Algebraic View, Vectors and Matrices, Product of Matrix & Vector, Rank and Null Space, Solutions of Over determined Equations, Pseudo inverse, Geometric View, Vectors and Distances, Projections, Eigenvalue Decomposition.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
<b>Module 3:</b> Statistical Foundations, Descriptive Statistics, Notion of Probability, Probability Distributions Understanding Univariate and Multivariate Normal Distributions, Mean, Variance, Covariance, and Covariance Matrix, Introduction to Hypothesis Testing, Confidence Intervals for Estimates.			
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
<b>Module 4:</b> Optimization and Data Science Problem Solving, Introduction to Optimization Understanding Optimization Techniques, Typology of Data Science Problems, Solution Framework for Data Science Problems.			
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			

<b>Module 5:</b> Regression and Classification Techniques, Linear Regression , Simple Linear Regression and Assumptions, Multivariate Linear Regression, Model Assessment and Variable Importance, Subset Selection, Classification Techniques , Classification using Logistic Regression.	
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:****Text Books:**

1. "Python for Data Analysis" by Wes McKinney, 2nd Edition (2018)
2. "Data Science from Scratch: First Principles with Python" by Joel Grus, 2nd Edition (2019)

**Reference Books:**

1. "An Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, 2nd Edition (2021)
2. "The Elements of Statistical Learning" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman, 2nd Edition (2009)
3. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett, 2nd Edition (2013)

**Web links and Video Lectures (e-Resources):**

<https://www.coursera.org/specializations/jhu-data-science>  
<https://www.kaggle.com/learn/data-science>  
<https://www.edx.org/professional-certificate/harvardx-data-science>  
<https://www.youtube.com/playlist?list=PL4cUxeGkcC9g1s4L6G8p8Fq5XK6Pq7b1k>

**Sl. No. Description**

1	Demonstrate the ability to independently conduct research and development work to address practical engineering problems.
2	Develop and deliver comprehensive technical presentations that effectively convey complex information to diverse audiences.
3	Exhibit mastery in the specialized study area, surpassing the requirements of a relevant bachelor's program.
4	Analyze engineering problems critically and apply appropriate techniques, skills, and modern tools to develop innovative solutions.
5	Collaborate effectively in teams while also functioning independently, recognizing opportunities for career advancement and professional growth.
6	Cultivate a proactive approach to continuous learning and professional development in response to evolving technological challenges.

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
C01	Explore the foundational concepts of data science, history, significance, and process.	L3
C02	Apply statistical methods and data analysis techniques to interpret and draw insights from complex datasets.	L3
C03	Implement various machine learning algorithms and assess their performance using appropriate evaluation metrics in real-world scenarios.	L2
C04	Utilize data visualization tools and techniques to effectively communicate findings and insights to diverse audiences.	L4

### Data Structures & Algorithms for Problem Solving

Course Code	MCS103	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	03	Exam Hours	03

#### Course Learning Objectives:

Mapping of COS and POs	<ul style="list-style-type: none"> <li>To reduce development time and the resources required to maintain existing applications.</li> <li>To increase code reuse and provide a competitive advantage through effective use of data structures and algorithms.</li> </ul>	PO1 x	PO2 x	PO3 x	PO4 x	PO5 x	PO6 x
		<b>CO1</b>					
		<b>CO2</b>	<b>Module-1</b>	x		x	
		<b>CO3</b>					
		Search Trees: Two Models of Search Trees. General Properties and Transformations. Height of a Search Tree. Basic Find, Insert, and Delete. Returning from Leaf to Root. Dealing with Non unique Keys. Queries for the Keys in an Interval. Building Optimal Search Trees. Converting Trees into Lists. Removing a Tree. Balanced Search Trees: Height-Balanced Trees. Weight-Balanced Trees. (a, b)- And B-Trees. Red-Black Trees and Trees of Almost Optimal Height. Top-Down Rebalancing for Red-Black Trees.					
<b>Teaching Learning Process</b>	Chalk and talk/PPT/web content						
	<b>Module-2</b>						
	Tree Structures for Sets of Intervals. Interval Trees. Segment Trees. Trees for the Union of Intervals. Trees for Sums of Weighted Interval. Trees for Interval-Restricted Maximum Sum Queries. Orthogonal Range Trees. Higher-Dimensional Segment Trees. Other Systems of Building Blocks. Range-Counting and the Semigroup Model. Kd-Trees and Related Structures.						

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
<b>Module-3</b>	
Heaps: Balanced Search Trees as Heaps. Array-Based Heaps. Heap-Ordered Trees and Half Ordered Trees. Leftist Heaps. Skew Heaps. Binomial Heaps. Changing Keys in Heaps. Fibonacci Heaps. Heaps of Optimal Complexity. Double-Ended Heap Structures and Multidimensional Heaps. Heap-Related Structures with Constant-Time Updates.	
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content
<b>Module-4</b>	
Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.	
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content
<b>Module-5</b>	
String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.	
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

#### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module



**Suggested Learning Resources:****Text Books:**

1. Advanced Data Structures, Peter Brass, Cambridge University Press, 2008.
2. Kenneth A. Berman. Algorithms. Cengage Learning. 2002.
3. T. H Cormen, C E Leiserson, R L Rivest and C Stein. Introduction to Algorithms. PHI, 3rd Edition, 2010

**Text Books:**

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4 th Edition, 2014, Pearson.
2. Data structures with Java, Ford and Topp, Pearson Education.
3. Ellis Horowitz, SartajSahni, S.Rajasekharan. Fundamentals of Computer Algorithms. Universities press. 2nd Edition, 2007
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3rd edition, Wiley India Edition.

**Web links and Video Lectures (e-Resources):**

<https://www.coursera.org/learn/advanced-data-structures>

<https://nptel.ac.in/courses/106106133>

<https://pages.cs.wisc.edu/~shuchi/courses/787-F07/about.html>

<https://www.youtube.com/watch?v=0JUN9aDxVmI&list=PL2SOU6wwxB0uP4rJgf5ayhHWgw7akUWSf>

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical activities which will enhance their skills. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
C01	Analyze and apply fundamental data structures and algorithms to solve complex computational problems effectively	L4
C02	Evaluate and implement various searching, sorting to optimize algorithm performance.	L5
C03	Design and analyze advanced tree and graph algorithms, including balanced search trees and graph traversal methods, to address real-world applications	L5

Sl. No.	Description	POs
1	Demonstrate the ability to independently conduct research and development work to address practical engineering problems.	PO1
2	Develop and deliver comprehensive technical presentations that effectively convey complex information to diverse audiences.	PO2
3	Exhibit mastery in the specialized study area, surpassing the requirements of a relevant bachelor's program.	PO3
4	Analyze engineering problems critically and apply appropriate techniques, skills, and modern tools to develop innovative solutions.	PO4
5	Collaborate effectively in teams while also functioning independently, recognizing opportunities for career advancement and research.	PO5

6	Cultivate a proactive approach to continuous learning and professional development in response to evolving technological landscapes.	PO6
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Program Outcome of this course

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	x			x		
CO2			x		x	
CO3		x				
CO4					x	

<b>Cyber Security and Ethics</b>				
Course Code	MCS104D		CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0		SEE Marks	50
Total Hours of Pedagogy	40		Total Marks	100
Credits	03		Exam Hours	03
<b>Course Learning objectives:</b>				
<ul style="list-style-type: none"> <li>● Illustrate the basics of cyber security</li> <li>● Define Authentication of Electronic Records and Electronic Governance</li> <li>● Explore the different certifying Authorities.</li> </ul>				
<b>Module-1</b>				
Fundamentals of Computer and Internet, Basics of Computer & Cyber Security				
<b>Teaching-Learning Process</b>	<b>Chalk and talk/PowerPoint presentation.</b>			
<b>Module-2</b>				
An Overview of Cyber World and Cyber Law, Cyber Crimes, Information Technology Act, 2000.				

<b>Teaching-Learning Process</b>	<b>Chalk and talk/PowerPoint presentation.</b>
<b>Module-3</b>	
Cyberspace Jurisdiction and Investigation of Cyber Crime ,Information Technology and Intellectual Property - The Indian Perspective, Authentication of Electronic Records and Electronic Governance.	
<b>Teaching-Learning Process</b>	<b>Chalk and talk/PowerPoint presentation.</b>
<b>Module-4</b>	
Certifying Authorities, Intellectual Property Rights, Domain Name Disputes and Trademark Law,E-Commerce.	
<b>Teaching-Learning Process</b>	<b>Chalk and talk/PowerPoint presentation.</b>
<b>Module-5</b>	
The Cyber Appellate Tribunal, Constitutional and Human Rights Issues in Cyberspace, Cyber Law - Domestic (Indian) Perspective and Regulatory Framework (Domestic Legal Regime),Cyber Law - International Perspective, and Regulatory Framework (International Legal Regime)	
<b>Teaching-Learning Process</b>	<b>Chalk and talk/PowerPoint presentation.</b>

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

### Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

### Suggested Learning Resources:

#### Books

1. Textbook on Cyber Law , by Dr. Bhagyashree A. Deshpande, Central Law Publication's,2019

#### Reference Book

2. Cryptography, Network Security and Cyber Laws Bernard Menezes Cengage Learning, , 2010 edition
3. Ethical Decision making and Information Technology: An Introduction with Cases Earnest A. Kallman, J.P Grillo McGraw Hill
4. Cyber security Operations Handbook John W. Rittinghouse, William M. Hancock Elsevier

### Web links and Video Lectures (e-Resources):

<https://youtu.be/bmZx9xaQH0U>  
<https://youtu.be/hgXoocOGjkc>  
<https://youtu.be/F7mH5vz1qEI?list=PLf8YqCm9HoI6fb4LdoY2tFgJfM0PrgInS>

### Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Explore the Basics of Computer & Cyber Security	L3
CO2	Interpret Cyber Law, Cyber Crimes	L3
CO3	Explain the Investigation of Cyber Crime	L2
Co4	Illustrate Disputes and Trademark Law and E-Commerce.	L2

	P01	P02	P03	P04	P05	P06
<b>C01</b>						
<b>C02</b>						
<b>C03</b>	x					
<b>C04</b>		x				

**Mapping of COS and POs**

<b>Cryptography and Network security</b>			
Course Code	MCS105C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>● To explain the foundational concepts of cryptography, including symmetric and asymmetric encryption, and their applications in securing data.</li> <li>● To analyze and evaluate various network security protocols, such as SSL/TLS and IPsec, to understand their roles in maintaining data confidentiality and integrity.</li> <li>● To implement cryptographic techniques, including hashing and digital signatures, to ensure data authenticity and integrity in software applications.</li> <li>● identify common security threats and vulnerabilities in network systems and propose effective countermeasures to mitigate these risks.</li> </ul>			
<b>Module-1</b>			
<b>Module 1: Introduction to Cryptography</b> , Basics of Cryptography, History and importance, Symmetric vs. asymmetric cryptography, Classical Cryptosystems, Substitution ciphers, Transposition ciphers, Modern Cryptography, Block ciphers (AES, DES), Stream ciphers.			
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
<b>Module 2: Public Key Cryptography</b> , RSA Algorithm , Key generation, Encryption and decryption, Key Management , Public key infrastructure (PKI), Digital certificates, Elliptic Curve Cryptography (ECC), Basics and applications.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
<b>Module 3: Cryptographic Hash Functions</b> , Hash Functions , Properties and applications, SHA family of hash functions , Message Authentication Codes (MACs) ,HMAC and its applications, Digital Signatures Concepts and algorithms, Verification and applications.			
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
<b>Module 4: Network Security Protocols</b> , Secure Socket Layer (SSL)/Transport Layer Security (TLS), Architecture and operation , Internet Protocol Security (IPsec), Modes of operation, Security associations Virtual Private Networks (VPNs), Concepts and implementations.			
<b>Teaching Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
<b>Module 5: Security Threats and Countermeasures</b> , Network Security Threats, Types of attacks (DoS, DDoS, phishing), Malware and its impact, Intrusion Detection Systems (IDS), Types and methodologies Firewalls and Security Policies , Types of firewalls, Designing security policies			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

3. Three Unit Tests each of **20 Marks**
4. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks**

to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

6. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
7. The question paper will have ten full questions carrying equal marks.
8. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
9. Each full question will have a sub-question covering all the topics under a module.
10. The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:****Text Books:**

1. William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson Education.
2. Behrouz A. Forouzan, "Cryptography and Network Security," McGraw-Hill.

**Reference Books:**

1. Charles P. Pfleeger, "Security in Computing," Prentice Hall.
2. Bruce Schneier, "Secrets and Lies: Digital Security in a Networked World," Wiley.

**Web links and Video Lectures (e-Resources):**

- <https://www.coursera.org/learn/crypto>
- <https://www.youtube.com/playlist?list=PLzHjzB7Q0q7WgH3m8pY5MZgRzQm5Z84aC>
- <https://www.edx.org/professional-certificate/ritx-cybersecurity-fundamentals>
- <https://www.youtube.com/playlist?list=PL5eH0n1q4D9hA6XkzJ5n7F8tT8Gz4r4uG>
- <https://www.khanacademy.org/computing/computer-science/cryptography>

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

## Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
C01	Students will be able to explain the foundational concepts of cryptography, including symmetric and asymmetric encryption, and their applications in securing data.	L1
C02	Students will be able to analyze and evaluate various network security protocols, such as SSL/TLS and IPsec, to understand their roles in maintaining data confidentiality and integrity.	L3
C03	Students will be able to implement cryptographic techniques, including hashing and digital signatures, to ensure data authenticity and integrity in software applications.	L2
C04	Students will be able to identify common security threats and vulnerabilities in network systems and propose effective countermeasures to mitigate these risks.	L4
C04	Students will be able to assess real-world security solutions and practices, critically evaluating their effectiveness in addressing contemporary cybersecurity challenges.	L5

## Program Outcome of this course

Sl. No.	Description	POs
1	Demonstrate the ability to independently conduct research and development work to address practical engineering problems.	PO1
2	Develop and deliver comprehensive technical presentations that effectively convey complex information to diverse audiences.	PO2
3	Exhibit mastery in the specialized study area, surpassing the requirements of a relevant bachelor's program.	PO3
4	Analyze engineering problems critically and apply appropriate techniques, skills, and modern tools to develop innovative solutions.	PO4
5	Collaborate effectively in teams while also functioning independently, recognizing opportunities for career advancement and research.	PO5
6	Cultivate a proactive approach to continuous learning and professional development in response to evolving technological landscapes.	PO6

	PO1	PO2	PO3	PO4	PO5	PO6
<b>C01</b>	x			x		
<b>C02</b>			x		x	
<b>C03</b>		x	x			

### Mapping of COS and POs



<b>ALGORITHMS &amp; AI LABORATORY</b>			
<b>Course Code</b>	MCSL106	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	0:0:2	<b>SEE Marks</b>	60
<b>Total Number of Lab Contact Hours</b>	36	<b>Exam Hours</b>	03
<b>Credits - 2</b>			
<b>Course Learning Objectives:</b> This course MCSL106 will enable students to:			
<ul style="list-style-type: none"> <li>● Implement and evaluate Algorithm and AI in Python programming language.</li> </ul>			
<b>Descriptions (if any):</b>			
<b>Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.</b>			
<b>Programs List:</b>			
1.	Implement a simple linear regression algorithm to predict a continuous target variable based on a given dataset.		
2.	Develop a program to implement a Support Vector Machine for binary classification. Use a sample dataset and visualize the decision boundary.		
3.	Develop a simple case-based reasoning system that stores instances of past cases. Implement a retrieval method to find the most similar cases and make predictions based on them.		
4.	Write a program to demonstrate the ID3 decision tree algorithm using an appropriate dataset for classification.		
5.	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test it with suitable datasets.		
6.	Implement a KNN algorithm for regression tasks instead of classification. Use a small dataset, and predict continuous values based on the average of the nearest neighbors.		
7.	Create a program that calculates different distance metrics (Euclidean and Manhattan) between two points in a dataset. Allow the user to input two points and display the calculated distances.		
8.	Implement the k-Nearest Neighbor algorithm to classify the Iris dataset, printing both correct and incorrect predictions.		
9.	Develop a program to implement the non-parametric Locally Weighted Regression algorithm, fitting data points and visualizing results.		
10.	Implement a Q-learning algorithm to navigate a simple grid environment, defining the reward structure and analyzing agent performance.		
<b>Laboratory Outcomes:</b> The student should be able to:			
<ul style="list-style-type: none"> <li>● Implement and demonstrate AI algorithms.</li> <li>● Evaluate different algorithms.</li> </ul>			
<b>Conduct of Practical Examination:</b>			
<ul style="list-style-type: none"> <li>● Experiment distribution. <ul style="list-style-type: none"> <li>○ For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.</li> <li>○ For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.</li> </ul> </li> <li>● Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.</li> <li>● Marks Distribution (<i>Courseed to change in accordance with university regulations</i>) <ul style="list-style-type: none"> <li>q) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks</li> <li>r) For laboratories having PART A and PART B <ul style="list-style-type: none"> <li>i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks</li> </ul> </li> </ul> </li> </ul>			

ii.

Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks