

Artificial Intelligence			
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
Course Learning Objectives:			
<ul style="list-style-type: none"> ● Define the foundational concepts of artificial intelligence and key problem-solving techniques. ● Explain the knowledge representation and reasoning techniques to solve complex problems in AI systems. ● Use machine learning algorithms to evaluate their performance in real-world applications. ● Build the applications of natural language processing and robotics to enhance human-computer interaction. ● Explore the ethical considerations and societal implications of AI technologies. 			
Module-1			
Module 1: Introduction to Artificial Intelligence and Problem Solving , 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		
Module-2			
Module 2: Knowledge Representation and Reasoning , 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		
Module-3			
Module 3: Machine Learning , 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		
Module-4			
Module 4: Natural Language Processing and Robotics , 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		
Module-5			
Module 5: Ethical and Societal Implications of AI , 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

Course Code	Mxx102	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

Course Learning objectives:

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.

Module-1

Module 1: 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

Teaching Learning Process	Chalk and talk/PPT/case study/web content
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Module-2

Module 2: 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.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content
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Module-3

Module 3: 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.

Teaching Learning Process	Chalk and talk/PPT/case study/web content
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Module-4

Module 4: Optimization and Data Science Problem Solving, Introduction to Optimization Understanding Optimization Techniques, Typology of Data Science Problems, Solution Framework for Data Science Problems.

Teaching Learning Process	Chalk and talk/PPT/case study/web content
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Module-5

Module 5: 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.

Teaching-Learning Process	Chalk and talk/PPT/case study/web content
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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:	
<ol style="list-style-type: none"> 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:	
<ol style="list-style-type: none"> 1. "An Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tshigami, 2nd Edition (2021) 2. "The Elements of Statistical Learning" by Trevor Hastie, Robert Tshigami, 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 research.
6	Cultivate a proactive approach to continuous learning and professional development in response to technological landscapes.
Skill Development Activities Suggested	
<ul style="list-style-type: none"> • 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	Explore the foundational concepts of data science, history, significance, and process.	L3
CO2	Apply statistical methods and data analysis techniques to interpret and draw insights from complex datasets.	L3
CO3	Implement various machine learning algorithms and assess their performance using appropriate evaluation metrics in real-world scenarios.	L2

CO4	Utilize data visualization tools and techniques to effectively communicate findings and insights to diverse audiences.	L4
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Data Structures & Algorithms for Problem Solving			
Course Code	MCS103	CIE Marks	5 0
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	5 0
Total Hours of Pedagogy	50	Total Marks	1 0 0
Credits	03	Exam Hours	0 3
Course Learning Objectives: <ul style="list-style-type: none"> • To reduce development time and the resources required to maintain existing applications. • To increase code reuse and provide a competitive advantage through effective use of data structures and algorithms. 			
Module-1			
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.	
Teaching Learning Process	Chalk and talk/PPT/web content
Module-2	
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.	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content
Module-3	
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.	
Teaching Learning Process	Chalk and talk/PPT/case study/web content
Module-4	
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.	
Teaching Learning Process	Chalk and talk/PPT/case study/web content
Module-5	
String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.	
Teaching-Learning Process	Chalk and talk/PPT/case study/web content

Assessment Details (both CIE and SEE)

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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
CO1	Analyze and apply fundamental data structures and algorithms to solve complex computational problems effectively	L4
CO2	Evaluate and implement various searching, sorting to optimize algorithm performance.	L5

CO3	Design and analyze advanced tree and graph algorithms, including balanced search trees and graph traversal methods, to address real-world applications	L5
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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

Program Outcome of this course

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

Internet of Things			
Course Code	MCS104F	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Explore the knowledge on combination of functionalities and services of networking • Explain the definition and significance of the Internet of Things. • Discuss the architecture, operation and business benefits of an IoT solution. 			
Module-1			
<p>What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples-Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, OverThe-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.</p>			
Teaching-Learning Process	Chalk and talk PPT		
Module-2			
<p>Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M, Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Low power WPAN, Zigbee IP(ZIP),IPSO</p>			
Teaching-Learning Process	Chalk and talk PPT		
Module-3			
<p>Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M, Layer 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities, IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6,Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6</p>			
Teaching-Learning Process	Chalk and talk PPT		
Module-4			
<p>Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.</p>			

Teaching-Learning Process	Chalk and talk PPT
Module-5	
Data Analytics for IoT – Introduction, Apache Hadoop, Using HadoopMapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.	
Teaching-Learning Process	Chalk and talk PPT
<p>Assessment Details (both CIE and SEE)</p> <p>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.</p> <p>Continuous Internal Evaluation:</p> <ol style="list-style-type: none"> 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 <p>The sum of three tests, two assignments/skill Development Activities, will be scaled down to 50 marks</p> <p>CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.</p> <p>Semester End Examination:</p> <ol style="list-style-type: none"> 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 	
<p>Suggested Learning Resources:</p> <p>Books</p> <ol style="list-style-type: none"> 9. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications Daniel Minoli Wiley 2013 10. Internet of Things: A Hands-on Approach ArshdeepBahga, Vijay Madisetti Universities Press 2015 11. The Internet of Things Michael Miller Pearson 2015 First Edition 12. Designing Connected Products Claire Rowland,Elizabeth Goodman et.al O’Reilly First Edition, 2015 	
Web links and Video Lectures (e-Resources):	

- [https://www.tutorialspoint.com/internet_of_things/index.htm#:~:text=IoT%20\(Internet%20of%20Things\)%20is,to%20any%20industry%20or%20system.](https://www.tutorialspoint.com/internet_of_things/index.htm#:~:text=IoT%20(Internet%20of%20Things)%20is,to%20any%20industry%20or%20system.)
- <https://www.javatpoint.com/iot-internet-of-things>
- <https://www.digimat.in/nptel/courses/video/106105166/L01.html>(Video Lectures)

Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Le
CO1	Choose appropriate schemes for the applications of IOT in real time scenarios	L2
CO2	Manage the Internet resources through different protocols used in each layer	L1
CO3	Compare various protocols and algorithms in different layers that facilitate effective communication mechanisms	L3
CO4	Identify how IoT differs from traditional data collection systems	L2

Advances in Operating Systems			
Course Code	MCS105G	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<ul style="list-style-type: none"> ● To understand the objectives and functions of operating systems, including their evolution and security issues related to processes. ● To analyze processes and threads, including symmetric multiprocessing (SMP) and memory management in Windows Vista and UNIX systems. ● To evaluate multiprocessor scheduling and real-time scheduling techniques, including process migration and distributed systems concepts. ● To explore the characteristics of embedded operating systems and understand computer security concepts, including threats and malicious software. 			
Module-1			
Operating System Overview, Process description & Control: Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, What is a Process?, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues.			
Module-2			
Threads, SMP, and Microkernel, Virtual Memory: Processes and Threads, Symmetric Multiprocessing (SMP), Micro Kernels, Windows Vista Thread and SMP Hours Management, Linux Process and Thread Management. Hardware and Control Structures, Operating System Software, UNIX Memory Management, Windows Vista Memory Management, Summary			
Module-3			
Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclSI) Scheduling, Windows Vista Hours Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock			
Module-4			
Embedded Operating Systems: Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS, Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious Software Overview, Viruses, Worms, and Bots, Rootkits.			
Module-5			
Kernel Organization: Using Kernel Services, Daemons, Starting the Kernel, Control in the Machine , Modules and Device Management, MODULE Organization, MODULE Installation and Removal, Process and Resource Management, Running Process Manager, Creating a new Task , IPC and Synchronization, The Scheduler , Memory Manager , The Virtual Address Space, The Page Fault Handler , File Management. The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects , Threads, Multiplication Synchronization, Traps, Interrupts and Exceptions, The NT executive , Object Manager, Process and Thread Manager , Virtual Memory Manager, I/o Manager, The cache Manager Kernel local procedure calls and IPC, The native API, subsystems.			

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.

The students will have to answer five full questions, selecting one full question from each module

Course outcome (Course Skill Set)		
At the end of the course the student will be able to :		
Sl. No.	Description	Blooms Le
CO1	To understand the objectives and functions of operating systems, including their evolution and security issues related to processes.	L2
CO2	To analyze processes and threads, including symmetric multiprocessing (SMP) and memory management in Windows Vista and UNIX systems.	L1
CO3	To evaluate multiprocessor scheduling and real-time scheduling techniques, including process migration and distributed systems concepts.	L3
CO4	To explore the characteristics of embedded operating systems and understand computer security concepts, including threats and malicious software	L2

Textbook/Reference Books				
	Title of the book	Author Name	Publisher's Name	Publication year
Text Book(s):				
1	Operating Systems: Internals and Design Principles	William Stallings	Prentice Hall, 6th Edition	2013
2	Operating Systems	Gary Nutt, Pearson	Pearson, 3rd Edition	2014
Reference Book(s):				
1.	Operating System Concepts	Silberschatz, Galvin, Gagne	Wiley, 8th Edition	2008
2	Operating Systems, Design and Implementation	Andrew S. Tanenbaum, Albert S. Woodhull,	Prentice Hall, 3rd Edition	2006
3	Distribute Operating Systems, Concept and Design	Pradeep K Sinha	PHI	2007

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
CO1			x	x		
CO2						
CO3			x			
CO4	x					

ALGORITHMS & AI LABORATORY			
Course Code	MCSL106	CIE Marks	40
Number of Contact Hours/Week	0:0:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	03
Credits – 2			
Course Learning Objectives: This course MCSL106 will enable students to:			
<ul style="list-style-type: none"> ● Implement and evaluate Algorithm and AI in Python programming language. 			
Descriptions (if any):			
Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.			
Programs List:			
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.		
Laboratory Outcomes: The student should be able to:			
<ul style="list-style-type: none"> ● Implement and demonstrate AI algorithms. ● Evaluate different algorithms. 			
Conduct of Practical Examination:			
<ul style="list-style-type: none"> ● Experiment distribution. <ul style="list-style-type: none"> ○ For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity. ○ 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. ● Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only. ● Marks Distribution (<i>Courseed to change in accordance with university regulations</i>) <ul style="list-style-type: none"> q) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks r) For laboratories having PART A and PART B <ul style="list-style-type: none"> i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks 			