

| 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 Process | 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 |
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Data Science and Management

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|-------------------------------|--------|-------------|-----|
| 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 |

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

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| 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.

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| 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.

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| 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.

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| 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.

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

Mapping of COS and Pos

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

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. |

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|--|---|
| 4 | Analyze engineering problems critically and apply appropriate techniques, skills, and modern tools to develop innovative sc |
| 5 | Collaborate effectively in teams while also functioning independently, recognizing opportunities for career advancement an |
| 6 | Cultivate a proactive approach to continuous learning and professional development in response to evolving technological l: |
| 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 |

Mapping of COS and Pos

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

| 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. | | | |

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|----------------------------------|---|
| 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 |

| 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 | |

| FULL STACK WEB OPEN | | | |
|--|---|-------------|-----|
| Course Code | MCS104H | CIE Marks | 50 |
| Teaching Hours/Week (L:P:SDA) | 3:2:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 hours Theory + 10 hours Lab | Total Marks | 100 |
| Credits | 04 | Exam Hours | 03 |
| Course objectives: | | | |
| <ul style="list-style-type: none"> • To develop dynamic website using JavaScript, JDBC • To get expertise of Java Server Pages and Servlets for server-side programming. • To become familiar with the data operations carried out by XML-based web applications. | | | |
| MODULE-1 | | | |
| HTML basics – structuring, positioning, alignment, CSS and JS basics, Browser development tools, Bootstrap basics. Basic Backend App serving text/HTML and HTML from templates. Introduction to web development, Git and GitHub, Taxonomy of frameworks. | | | |
| Teaching-Learning Process | Using GitHub/Chalk and Talk/PPT | | |
| MODULE-2 | | | |
| Introduction to JavaScript - Introduction to Document and Window Object - Objects and Arrays - Functions. MERN stack - Introduction to ReactJS - Templating using JSX - Components, State and Props - Lifecycle of Components - Rendering List and Portals - Error Handling – Routers - Redux and Redux Saga – Immutable. | | | |
| Teaching-Learning Process | Chalk and Talk/ PPT / https://www.youtube.com/watch?v=s2fRbcAsG-Q | | |
| MODULE-3 | | | |
| .js - Service Side Rendering - Webpack. Node js Overview - Basics and Setup - Modules – Events - Server side javascript - Exploring package.json - Express js. Creating templates using PUG. Introduction to MVC, Flux, Redux. | | | |
| Teaching-Learning Process | Chalk and Talk/ PPT / web resource: https://youtu.be/-gd73iczlS8?list=PL3vQyqzqjZ637sWpKvniMCxdqZhnMJC1d | | |
| MODULE-4 | | | |
| Node js Overview: Node js - Basics and Setup, Node js Console, Node js Command Utilities, Node js Modules, Node js Concepts, Node js Events, Node js with Express js, Node js Database Access | | | |
| Teaching-Learning Process | Chalk and Talk/ PPT / web resource: https://youtu.be/ | | |

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|---|--|
| Process | gd73iczlS8?list=PL3vQyqzqjZ637sWpKvniMCxdqZhnMJC1d |
| MODULE 5 | |
| Introduction to NoSQL databases - MongoDB A Database for the Modern We - CRUD Operations in MongoD - Indexing and Aggregation - Replication and Sharding - Creating Backup for database - Developing Node JS Application with MongoDB. Hosting web application using public web hosting services | |
| Teaching-Learning Process | Chalk and Talk/ PPT / web resource: https://youtu.be/-gd73iczlS8?list=PL3vQyqzqjZ637sWpKvniMCxdqZhnMJC1d |

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

| Sl. NO | Experiments |
|--------|---|
| 1 | Explore Basic HTML Tags and Elements. 2 Familiarize with JS |
| 2 | Design a Webpage using advance HTML Form tags input–date, time, number, email, HTML5 Header And Footer, spell check and editable areas. |
| 3 | Design a Webpage Demonstrating Drag and Drop Functionality. Implement program demonstrating Local Storage and session storage. |
| 4 | Design a Webpage using Basic CSS Tags. Demonstrate Inline, Internal and External Style sheets using advanced CSS. |
| 5 | Design signup form to validate username, password, and phone numbers etc using Java script |
| 6 | Design a Form using HTML and CSS and accept the data from it and insert it into Database using PHP. |
| 7 | Change a Content of webpage using AJAX. Perform Different Operations using JQUERY Selectors. |
| 8 | Create a form with a text box asking to enter your favourite city with a submit button when the user enters the city and clicks the submit button another PHP page should be opened displaying “Welcome to the city”. |

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

CIE for the theory component of IPCC

1. Two Tests each of **20 Marks**
2. Two assignments each of **10 Marks/One Skill Development Activity of 20 marks**
3. Total Marks of two tests and two assignments/one Skill Development Activity added will be CIE for 60 marks, marks scored will be proportionally scaled down to **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test at the end /after completion of all the experiments shall be conducted for 50 marks and scaled down to 05 marks.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours)

1. The question paper will be set for 100 marks and marks scored will be scaled down proportionately to 50 marks.
2. The question paper will have ten questions. Each question is set for 20 marks.
3. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
4. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 15 (50% of maximum marks-30) in the theory component and 10 (50% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
- SEE will be conducted for 100 marks and students shall secure 40% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50. (Student has to secure an aggregate of 50% of maximum marks of the course(CIE+SEE))

Suggested Learning Resources:

Textbooks:

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, “Mastering HTML, CSS & JavaScript Web Publishing”, Paperback, 2016.
2. Jon Duckett, “Web Design with HTML, CSS, JavaScript and jQuery”, Paperback, 2014.
3. Wilson, Eddy. MERN Quick Start Guide: Build Web Applications with MongoDB, Express.js, React, and Node. United Kingdom: Packt Publishing, 2018.
4. Mardan, Azat. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. United States: Apress, 2015.
5. Elrom, Elad. React and Libraries: Your Complete Guide to the React Ecosystem. United States: Apress, 2021

Web links and Video Lectures (e-Resources):

- <https://www.simplilearn.com/free-online-full-stack-development-course-skillup>
- <https://www.coursera.org/courses?query=full%20stack%20web%20development>
- <https://www.freecodecamp.org/news/learn-web-development-free-full-stack-developer-courses-for-beginners/>

Course outcome (Course Skill Set)

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

| Sl. No. | Description | Blooms Level |
|---------|---|----------------|
| CO1 | Use markup and scripting languages to design and validate dynamic webpages | L3 |
| CO2 | Estimate pages for users need based on responsive web design concepts | L2 |
| CO3 | Summarize to design appropriate database services based on the requirements | L2 |
| CO4 | Analyze, Design, develop and deploy an end-to-end web application as a term project | L4(Assignment) |

Mapping of COS and POs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|------------|-----|-----|-----|-----|-----|-----|
| CO1 | x | | | | | |
| CO2 | | | | | | |
| 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 |

Advances in Web Technologies

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|--------------------------------|---------|-----------|----|
| Course Code | MCS105H | CIE Marks | 50 |
| Teaching Hours/Week (L:P: SDA) | 2:1:0 | SEE Marks | 50 |

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|---|----|-------------|-----|
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 03 |
| Course Learning Objectives: | | | |
| <ol style="list-style-type: none"> 1. To understand the fundamental concepts and technologies of web application development. 2. To gain proficiency in front-end and back-end web development. 3. To learn and apply modern web frameworks and libraries. 4. To develop skills in creating responsive and dynamic web applications. 5. To prepare students for industry roles requiring expertise in web development. | | | |
| Module-1 | | 08 Hours | |
| Introduction to Web Development and HTML5: | | | |
| <p>Web Development Basics: Introduction to web technologies and protocols, Client-server architecture, Overview of front-end and back-end development</p> <p>HTML5 Fundamentals: HTML5 elements and attributes, Semantic HTML5 tags, Forms and input types, Multimedia elements (audio, video)</p> <p>Advanced HTML5: Canvas and SVG for graphics, HTML5 APIs(Geolocation, Web Storage, Web Workers), Offline web applications using AppCache.</p> | | | |
| Teaching Learning Process: | | | |
| Lectures with PowerPoint presentations, Hands-on coding exercises in HTML5, Interactive discussions and problem-solving sessions, Assignments and quizzes for assessment. | | | |
| Module-2 | | 08 Hours | |
| CSS3 and Responsive Web Design: | | | |
| <p>CSS3 Basics: Introduction to CSS3, Selectors, properties, and values, Box model, layout, and positioning, Flexbox and Grid layouts.</p> <p>Responsive Web Design: Media queries, Responsive design principles, Fluid grids and flexible images, Mobile-first design approach.</p> <p>CSS Frameworks: Introduction to Bootstrap, Bootstrap components and utilities, Customizing Bootstrap with Sass.</p> | | | |
| Teaching Learning Process: | | | |
| Practical sessions on CSS3 and responsive design, Interactive coding exercises to implement responsive layouts, Group projects on developing responsive web pages, Continuous assessment through quizzes and assignments. | | | |
| Module-3 | | 08 Hours | |

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|---|--|
| JavaScript and DOM Manipulation: | |
| JavaScript Basics: Introduction to JavaScript, Variables, data types, and operators, Control structures (if-else, loops), Functions and scope | |
| Document Object Model (DOM): DOM structure and manipulation, Event handling and event listeners, Creating and modifying DOM elements, Form validation using JavaScript | |
| Advanced JavaScript: Asynchronous JavaScript (callbacks, promises, async/await), AJAX and Fetch API, Introduction to JavaScript libraries (e.g., jQuery). | |
| Teaching Learning Process: | |
| Lab exercises on JavaScript and DOM manipulation, Practical coding sessions with real-time problem-solving, Group projects on creating interactive web applications, Continuous assessment through quizzes and coding challenges. | |

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| | |
| Module-4 | 08 Hours |
| Front-End Frameworks and AngularJS: | |
| Introduction to Front-End Frameworks: Importance of front-end frameworks, Overview of popular frameworks (React, Angular, Vue) | |
| AngularJS Basics: Introduction to AngularJS, Modules, controllers, and scope, Directives, expressions, and filters | |
| Advanced AngularJS: Services and dependency injection, Routing and single-page applications (SPAs), Data binding and form handling, Custom directives and components. | |
| Teaching Learning Process: | |
| Practical sessions on AngularJS basics and advanced topics, Interactive coding exercises to build AngularJS applications, Group projects on developing single-page applications, Continuous assessment through quizzes and practical tests. | |
| Module-5 | 08 Hours |

Back-End Integration and Deployment:

Back-End Development: Introduction to server-side programming, Overview of server-side languages (Node.js, PHP, Python), RESTful web services and APIs, Database integration (SQL, NoSQL)

Full-Stack Development: Integrating front-end and back-end technologies, Developing full-stack web applications, Case studies on full-stack applications

Deployment and Security: Web application deployment (cloud platforms, hosting services), Security best practices for web applications, Authentication and authorization, Performance optimization.

Teaching Learning Process:

Lab exercises on back-end development and integration, Practical sessions on deploying web applications, Group discussions on web application security, Final project presentation and assessment.

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.

CIE for the theory component of IPCC:

1. Two Tests each of 20 Marks
2. Two assignments each of 10 Marks/One Skill Development Activity of 20 marks
3. Total Marks of two tests and two assignments/one Skill Development Activity added will be CIE for 60 marks, marks scored will be proportionally scaled down to 30 marks.

CIE for the practical component of IPCC:

On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The 15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.

The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments" write-ups are added and scaled down to 15 marks.

The laboratory test at the end /after completion of all the experiments shall be conducted for 50 marks and scaled down to 05 marks.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 20 marks.

SEE for IPCC:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours)

1. The question paper will be set for 100 marks and marks scored will be scaled down Proportionately to 50 marks.
2. The question paper will have ten questions. Each question is set for 20 marks.
3. There will be 2 questions from each module. Each of the two questions under a module (With a maximum of 3 Sub-questions), should have a mix of topics under that module.
4. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

The minimum marks to be secured in CIE to appear for SEE shall be the 15 (50% of maximum Marks -30) in the theory component and 10 (50% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included.

The maximum of 04/05 questions to be set from the practical component of IPCC, the total Marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 40% of the maximum marks to (Student has to secure an aggregate of 50% of maximum marks of the course(CIE+SEE))

| | | |
|-----|---|-------|
| CO2 | Develop and deploy web applications using HTML5, CSS3, JavaScript, and modern frameworks. | L1,L2 |
| CO3 | Apply responsive design principles using frameworks like Bootstrap. | L3 |
| CO4 | Implement dynamic web applications using AngularJS. | L4,L5 |
| CO5 | Integrate front-end and back-end technologies to create full-stack web applications. | L5 |

Industry-Relevant Key Points:

- Emphasis on coding standards and best practices.
- Integration of version control systems (e.g., Git) in project work.
- Exposure to industry-standard tools and frameworks.
- Real-world application development projects.
- Focus on collaborative development and agile methodologies.

Mapping of COS and POs

| | P01 | P02 | P03 | P04 | P05 | P06 |
|------------|------------|------------|------------|------------|------------|------------|
| C01 | X | | | | | |
| C02 | | X | | | | |
| C03 | | | X | | | |
| C04 | | | | | | |
| C05 | | | | 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 | | | |

| Research Methodology and IPR | | | |
|---|---|-------------|-----|
| Course Code | MRMI107 | 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 |
| Course Learning Objectives: | | | |
| <ul style="list-style-type: none"> ● Introduce various technologies for conducting research. ● Choose an appropriate research design for the chosen problem. ● Explain the art of interpretation and the art of writing research reports. ● Explore the various forms of intellectual property, its relevance and business impact in the changing global business environment. ● Discuss leading International Instruments concerning Intellectual Property Rights. | | | |
| Module-1 | | | |
| <p>Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration</p> | | | |
| Teaching-Learning Process | Chalk and talk/PPT/case study | | |
| Module-2 | | | |
| <p>Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.</p> | | | |
| Teaching-Learning Process | Chalk and talk/PPT/case study/web content | | |
| Module-3 | | | |
| <p>Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale. Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.</p> | | | |
| Teaching-Learning Process | Chalk and talk/PPT/case study/web content | | |
| Module-4 | | | |
| <p>Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for</p> | | | |

Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests

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

Module-5

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, The Protection of Plant Varieties and Farmers' Rights Act, 2001, The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO), WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing,

| | |
|----------------------------------|--------------------|
| Teaching-Learning Process | Chalk and talk/PPT |
|----------------------------------|--------------------|

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:

- *Research Methodology: Methods and Techniques*, C.R. Kothari, Gaurav Garg, New Age International, 4th Edition, 2018..
- Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture," PHI, 6th Edition
- *Research Methodology a step-by-step guide for beginners*. RanjitKumar, SAGE Publications, 3rd Edition, 2011.

Reference Books:

- *Research Methods: the concise knowledge base*, Trochim, Atomic Dog Publishing, 2005.
- *Conducting Research Literature Reviews: From the Internet to Paper*, Fink A, Sage Publications, 2009.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=A7oioOJ4g0Y&list=PLVf5enqoJ-yVQ2RXU16mCfLPf3J_JUfoc

Course outcome (Course Skill Set)

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

| Sl. No. | Description |
|---------|--|
| CO1 | Identify and Conduct research independently in suitable research field. |
| CO2 | Choose research designs, sampling designs, measurement and scaling techniques and also different methods of data collection. |
| CO3 | Explore the Precautions in interpreting the data and drawing inferences. |

Mapping of COS and POs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | | x | | x | | |
| CO2 | | x | x | | | |
| CO3 | | | | | x | |