MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074

M.Tech in Computer Science and Engineering

Scheme and Syllabus of I Semester

(2024 Scheme)

VISION

To empower young minds through technology, research and innovation, to produce technically competent and socially responsible professionals in higher education.

MISSION

1. To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.
2. To foster a transformative learning environment that integrates technology, research and practical experience, empowering students to become skilled professionals and socially conscious leaders.
3. To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.
4. To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

QUALITY POLICY

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

CORE VALUES

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement.

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MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

M. Tech in Computer Science and Engineering

Scheme of Teaching and Examinations – 2024

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

I Semester

S. No	Course Category and Course Code		Course Title	TD/PSB	Teaching Hours/ Week			Examination				Credits
					Lecture	Tutorial/ SDA	Practical/ Seminar	SEE Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T/S	P					
1.	**PCC**	**P24SCS101**	Artificial Intelligence	CSE	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**3**
2.	**PCC**	**P24SCS102**	Data Science and Management	CSE	**3**	**2**	**0**	**3**	**50**	**50**	**100**	**4**
3.	**PCC**	**P24SCS103**	Data Structures & Algorithms for Problem Solving	CSE	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**3**
4.	**PCC**	**P24SCS104**	Advanced Software Engineering	CSE	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**3**
5.	**IPCC**	**P24SCS105**	Internet of Things	CSE	**3**	**0**	**2**	**3**	**50**	**50**	**100**	**4**
6.	**PCCL**	**P24SCSL106**	Algorithms & AI Lab	CSE	**0**	**0**	**2**	**3**	**50**	**50**	**100**	**1**
							TOTAL		**300**	**300**	**600**	**18**

PCC: Professional core Course, IPCC-Integrated Professional Core Courses, PCC(PB): Professional Core Courses (Project Based), PCCL-Professional Core Course lab ,NCMC- None Credit Mandatory Course, L-Lecture, T/SDA-Tutorial / Skill Development Activities, P-Practical (Hours are for Interaction between faculty and students)

P24SCS305 Research Methodology and IPR- Non- Credit Mandatory Course (NCMC) if students have not studied this course in their undergraduate program then he /she has to take this course compulsorily and complete the certification before the minimum duration of the program (Two years), however, this course will not be considered for vertical progression. **This course will be evaluated in the III semester**.

HOD **Dean-Academics** **Principal**

SEMESTER-I					
ARTIFICIAL INTELLIGENCE **Category: PCC**					
Course Code	:	P24SCS101	CIE	:	50 Marks
Teaching Hours L : P : SDA	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Objectives	
1.	Define the foundational concepts of artificial intelligence and key problem-solving techniques.
2.	Explain the knowledge representation and reasoning techniques to solve complex problems in AI systems.
3.	Use machine learning algorithms to evaluate their performance in real-world applications.
4.	Build the applications of natural language processing and robotics to enhance human-computer interaction.
5.	Explore the ethical considerations and societal implications of AI technologies.

Module 1	**No. of Hours.**
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.	9
Module 2	**No. of Hours.**
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.	9
Module 3	**No. of Hours.**
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.	9
Module 4	**No. of Hours.**
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.	9
Module 5	**No. of Hours.**
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	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the foundational concepts of artificial intelligence, including its history, types, and key problem-solving techniques.
CO2	Apply knowledge representation and reasoning techniques to solve complex problems in AI systems.
CO3	Implement machine learning algorithms and evaluate their performance in real-world applications
CO4	Explore the principles and applications of natural language processing and robotics to enhance human-computer interaction.

Text Books	
1.	Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach", 4th Edition (2021)
2.	Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", 3rd Edition.

Reference Text Books	
1.	Christopher M. Bishop, "Pattern Recognition and Machine Learning", 4th Edition (2020)
2.	David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents" 3rd 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

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-I					
DATA SCIENCE AND MANAGEMENT **Category: PCC**					
Course Code	:	P24SCS102	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:2:0	SEE	:	50 Marks
Total Hours	:	50	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course 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	**No. of Hrs**
Introduction: Big Data and Data Science Hype Getting Past the Hype Datafication. The Current Landscape, Data Science Jobs, A Data Science Profile, Statistical Inference, Exploratory Data Analysis, and the Data Science Process, Statistical Thinking in the Age of Big Data, Statistical Inference, Populations and Samples, Populations and Samples of Big Data, Big Data Can Mean Big Assumptions. Modeling, Exploratory Data Analysis, Philosophy of Exploratory Data Analysis, Exercise: EDA, The Data Science Process, A Data Scientist's Role in This Process.	10
Module - 2	**No. of Hrs**
Algorithms, Machine Learning Algorithms, Three Basic Algorithms, Linear Regression, k-Nearest Neighbors (k-NN),k-means, Naive Bayes, Bayes Law, A Spam Filter for Individual Words, A Spam Filter That Combines Words: Naive Bayes Exercise Basic Machine Learning Algorithms, Spam Filters, Naive Bayes, and Wrangling, Logistic Regression Thought Experiments Classifiers, Logistic Regression Case Study, Estimating α and β, Newton's Method, Stochastic Gradient Descent, Implementation, Evaluation, Sample R Code	10
Module - 3	**No. of Hrs**
Time Stamps and Financial Modeling, Kyle Teague and GetGlue,Timestamps, Exploratory Data Analysis (EDA), Metrics and New Variables or Features, Financial Modeling In-Sample, Out-of Sample, and Causality, Preparing Financial Data, Log Returns.	10
Module - 4	**No. of Hrs**
Extracting Meaning from Data, Background: Data Science Competitions, Background Crowdsourcing, The Kaggle Model, A Single Contestant, Their Customers, Data Visualization and Fraud Detection, Data Visualization History, A Sample of Data Visualization Projects, Mark's Data Visualization, Data Science and Risk About Square, The Risk Challenge, The Trouble with Performance Estimation, Model Building Tips.	10
Module - 5	**No. of Hrs**
Data Engineering: MapReduce, Pregel, and Hadoop, MapReduce, Word Frequency Problem. Enter MapReduce. Other Examples of MapReduce,Pregel, Thought Experiment, On Being a Data Scientist, Data Abundanceversus Data Scarcity, Designing Models, Economic Interlude: Hadoop. A Brief Introduction in Hadoop, Cloudera, Next Generation Data Scientists, Hubris, and Ethics.	10

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explore the foundational concepts of data science, history, significance, and process.
CO2	Apply statistical methods and data analysis techniques to interpret and draw insights from complex datasets.
CO3	Implement various machine learning algorithms and assess their performance using appropriate evaluation metrics in real-world scenarios.
CO4	Utilize data visualization tools and techniques to effectively communicate findings and insights to diverse audiences.

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

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

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment1**	**50**	**30 (Average of Best Two Assessments)**	**50**
	Internal Assessment2	**50**		
	Internal Assessment3	**50**		
Self learning	**Two Assignments**	**20**	**10**	
	Seminar Presentation	**20**	**10**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Grand Total				**100**

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-I					
DATA STRUCTURES & ALGORITHMS FOR PROBLEM SOLVING **Category: PCC**					
Course Code	:	P24SCS103	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	To reduce development time and the resources required to maintain existing applications.
2.	To increase code reuse and provide a competitive advantage through effective use of data structures and algorithms.

Module - 1	**No. of Hours.**
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.	9
Module - 2	**No. of Hours.**
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 Semi group Model. Kd-Trees and Related Structures.	9
Module - 3	**No. of Hours.**
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	9
Module - 4	**No. of Hours.**
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	9
Module - 5	**No. of Hours.**
String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Analyze and apply fundamental data structures and algorithms to solve complex computational problems effectively
CO2	Evaluate and implement various searching, sorting to optimize algorithm performance.
CO3	Design and analyze advanced tree and graph algorithms, including balanced search trees and graph traversal methods, to address real-world applications

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

ASSESSMENT DETAILS (BOTH CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	**Internal Assessment1**	**50**	**30 (Average of Best Two Assessments)**	**50**
	Internal Assessment2	**50**		
	Internal Assessment3	**50**		
Self learning	**Two Assignments**	**20**	**10**	
	Seminar Presentation	**20**	**10**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Grand Total				**100**

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-I					
ADVANCED SOFTWARE ENGINEERING **Category: PCC**					
Course Code	:	P24SCS104	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs.

Course Objectives	
1.	Reduce the development time, and resources required to maintain existing applications
2.	Increase code reuse, and provide a competitive advantage to organizations that uses it

Module - 1	**No. of Hours**
INTRODUCTION: What is software engineering? Software Engineering Concepts, Development Activities, Managing Software Development, Modeling with UML, Project Organization and Communication	9
Module - 2	**No. of Hours.**
REQUIREMENT ELICITATION AND ANALYSIS: Requirements Elicitation: Requirements Elicitation Concepts, Requirements Elicitation Activities, Managing Requirements Elicitation, Analysis: Analysis Concepts, Analysis Activities, Managing Analysis.	9
Module - 3	**No. of Hours.**
SYSTEM DESIGN: System design-Decomposing the system: Overview of System Design, System Design Concepts, System Design Activities: Objects to Subsystems, System Design – Addressing design goals: Activities: An overview of system design actives, UML deployment diagrams, Addressing Design Goals, Managing System Design.	9
Module - 4	**No. of Hours.**
OBJECT DESIGN, IMPLEMENTATION AND TESTING : Object design-Reusing pattern solutions: An Overview of Object Design, Reuse Concepts: Design Patterns, Reuse Activities, Managing Reuse, Object design-Specifying interface: An overview of interface specification, Interfaces Specification Concepts, Interfaces Specification Activities, Managing Object Design, Mapping model to code: Mapping Models to Code Overview, Mapping Concepts, Mapping Activities, Managing Implementation, Testing: An overview of testing, Testing concepts, Managing testing.	9
Module - 5	**No. of Hours.**
SOFTWARE MAINTENANCE AND SOFTWARE CONFIGURATION MANAGEMENT: Software maintenance: What is Software Maintenance?, Factors that Mandate Change, Lehman's Laws of system evolution, Types of software maintenance, Software maintenance process and actives, Reverse Engineering, Software Re-engineering, Patterns for Software Maintenance, Tool support for Software Maintenance. Software Configuration Management: The baseline of Software Life Cycle, What is Software Configuration Management, Why Software Configuration Management, Software Configuration Management Functions, Software Configuration Management Tools.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Apply Object Oriented Software Engineering approach in every aspect of software project.
CO2	Adapt appropriate object oriented design aspects in the development process.
CO3	Adapt the concepts and tools related to software configuration management.

Text Books	
1.	Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, Pearson Education, 3rd edition, 2014.
2.	David C. Kung, Object oriented software engineering, Tata McGraw Hill 2015.

Reference Text Books	
1.	Stephan R. Schach, Object oriented software engineering, Tata McGraw Hill 2008.
2.	Craig Larman, Applying UML and Patterns, Pearson Education 3rd edition, 2005

Web links and Video lectures (e-Resources)
• https://medium.com/javarevisited/my-favorite-courses-to-learn-object-oriented-programming-and- designin-2019-197bab351733 • https://www.youtube.com/watch?v=BqVqjJq7_vI

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Theory	Internal Assessment1	50	30 (Average of Best Two Assessments)	50
	Internal Assessment2	50		
	Internal Assessment3	50		
Self learning	Two Assignments	20	10	
	Seminar Presentation	20	10	
SEE	Semester End Examination	100	50	50
Grand Total				100

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-I					
INTERNET OF THINGS **Category: IPCC**					
Course Code	:	P24SCS105	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:2	SEE	:	50 Marks
Total Hours	:	45+30	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course Objectives	
1.	Explore the knowledge on combination of functionalities and services of networking.
2.	Explain the definition and significance of the Internet of Things.
3.	Discuss the architecture, operation and business benefits of an IoT solution.

Module - 1	**No. of Hours**
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, Over The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.	9
Module - 2	**No. of Hours**
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	9
Module - 3	**No. of Hours**
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	9
Module - 4	**No. of Hours**
Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.	9
Module - 5	**No. of Hours**
Data Analytics for IoT – Introduction, Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real time Data Analysis, Structural Health Monitoring Case Study.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Choose appropriate schemes for the applications of IOT in real time scenarios
CO2	Manage the Internet resources through different protocols used in each layer
CO3	Compare various protocols and algorithms in different layers that facilitate effective communication mechanisms
CO4	Identify how IoT differs from traditional data collection systems

Text Books	
1.	Daniel Minoli Wiley, Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, 2013
2.	Arshdeep Bahga, Internet of Things: A Hands-on Approach, Vijay Madisetti Universities Press 2015
Reference Text Books	
1.	Michael Miller, The Internet of Things, Pearson 2015 1st Edition
2.	Claire Rowland, Elizabeth Goodman et.al O'Reilly, Designing Connected Products 1st 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.javatpoint.com/iot-internet-of-things • https://www.digimat.in/nptel/courses/video/106105166/L01.html(Video Lectures)

Sl. No	**List of Experiments**
1.	Transmit a string using UART
2.	Point-to-Point communication of two Motes over the radio frequency
3.	Multi-point to single point communication of Motes over the radio frequency AN (Sub netting).
4.	I2C protocol study
5.	Reading Temperature and Relative Humidity value from the sensor
6.	Study of Connectivity and Configuration of Raspberry-Pi/Be agle Board circuit with Basic peripherals, LEDs, Understanding GPIO and its use in program.
7.	Study of different operating systems for RaspberryPi/Be agle board. Understanding the Process of osinstallation on Raspberry–Pi/Be agle board.
8.	Familiarization with the concept of IOT, Arduino/Raspberry Pi and perform necessary Software installation.

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 marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	**Type of Assessment**	**Max. Marks**	**Max. Marks Scaling Down to**	**Total Marks**
Theory	**Internal Assessment-1**	**50**	**30 (Average of Best Two Assessments)**	**50/2 = 25**
	Internal Assessment-2	**50**		
	Internal Assessment-3	**50**		
Self Learning	**Two Assignments**	**10+10**	**20**	
Laboratory	**Record & Observation**	**Evaluating each expt. for 10 marks*12 expts.**	**10**	**25**
	Lab Internal Test	**50**	**15**	
SEE	**Semester End Examination**	**100**	**50**	**50**
Grand Total				**100**

SEMESTER END EXAMINATION

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. Two questions of 20 marks (with minimum of 3 sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Question papers to be set as per the Blooms Taxonomy levels.

SEMESTER-I					
ALGORITHMS & AI LAB **Category: PCCL**					
Course Code	:	P24SCSL106	CIE	:	50 Marks
Teaching Hours L:T:P	:	0:0:2	SEE	:	50 Marks
Total Hours	:	15	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Sl. No.	**Course objectives**
1.	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.

Sl. No.	**List of Experiments**
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 Back propagation 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.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Implement and demonstrate AI algorithms.
CO2	Evaluate different algorithms.

ASSESSMENT STRUCTURE FOR LABORATORY:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing marks for the CIE is 50% of the maximum marks and Minimum passing marks for the SEE is 40% of the maximum marks of SEE. The minimum passing marks is 50% i.e. sum of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE):

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks
Laboratory	Lab Conduction & Record	Evaluating Each Expt. For 10marks*12 expts.	15	50
	Laboratory Test 1: After 6 expts	50	15	
	Laboratory Test 1: After 12 expts	50	20	
SEE	Semester End Examination	100	50	50
Grand Total				100