MCA

Semester – III

Subject Code	Subject Name	Contact Hours/week			Credits	Examination Scheme				
		L	T	P	C	Theory Marks		Practical Marks		Total
						ESE	IA	ESE	IA	
	Programming with Python	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Principles of Machine Learning	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Software engineering	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Elective I	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Elective II	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Principles of Machine Learning Lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Programming with Python lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Software engineering Lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Elective II Lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Mini project/Dissertation preliminary work	0	0	6	3	**-**	**-**	**30**	**70**	**100**
Total Credit					**22**					**800**

Subject code	Elective I	Subject code	Elective II
	Distributed Database		Internet of Thing
	Artificial Intelligence		Asp.Net

MCA

Semester – III

Subject Code	Subject Name	Contact Hours/week			Credits	Examination Scheme				
		L	T	P	C	Theory Marks		Practical Marks		Total
						ESE	IA	ESE	IA	
	Programming with Python	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Principles of Machine Learning	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Software engineering	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Elective I	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Elective II	3	0	0	3	**30**	**70**	**-**	**-**	**100**
	Principles of Machine Learning Lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Programming with Python lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Software engineering Lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Elective II Lab	0	0	2	1	**-**	**-**	**15**	**35**	**50**
	Mini project/Dissertation preliminary work	0	0	6	3	**-**	**-**	**30**	**70**	**100**
Total Credit					**22**					**800**

Abbreviations: L-Lecture, T-Tutorial, P-Practical, C- Credits, ESE- End Sem Exam, IA-Internal Assessments: Core Course, AC: Ability enhancement compulsory course.

Subject code	Elective I	Subject code	Elective II
	Distributed Database		Internet of Thing
	Artificial Intelligence		Asp.Net

Program Name: **MCA**	Semester: **III**
Subject Name: **Programming with Python**	Subject Code: **1304305362**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits: 3	Contact Hours: 45

Course Objective: To provide an introduction to machine learning using Python as the programming language. Students will learn fundamental Python concepts and then Applying them to machine learning techniques. The course covers regression, unsupervised learning, genetic algorithms, and scikit-learn, offering a practical guide to implementing machine learning algorithms and models.

Detailed Syllabus:

UNIT NO.	UNIT WISE DETAILS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HOURS
1	**Unit1:Basics of Python**: Python Installation and Working of it, get familiar with python variables and data types, Operator understanding and its usage, detail study of python blocks. **Structure Types and mutability**: Hands on with conditional blocks using if, else and elif, Hands on examples and study of looping with range, list and dictionaries. hands on to organize python code with function, modular approach in python and its usage, detail study of python blocks.	CO1 – Recall and define the fundamental concepts of Python, the structure of Python programs, and the basic elements of the language such as variables, data types, and operators.	Remembering	Global	7
2	**UNIT- 2 Structure Types and mutability**: Hands on with conditional blocks using if, else and elif, Hands on examples and study of looping with range, list and dictionaries. hands on to organize python code with function, modular approach in python	CO2: Implement modular programming and differentiate mutability of various datatypes.	Understanding	Global	10
3	**Exception, Testing and Debugging**: Handling if exceptions to handle the code cracks, handling and helping file operations, coding with the exceptional handling and testing Anonymous method, Properties, Indexers, Exception	CO3 – Understand inductive learning and its importance, along with the foundational framework for ML algorithms.	Understanding	Global	8

4	**UNIT- 4 Classes and OOP Concepts**: Procedural and Object-Oriented Programming, Classes and working with instances, Method overloading, Polymorphism, importing internal module as well as external modules in the code Packages understanding and their usage, hands on with Lambda function in python coding with the use of functions, modules and external packages	CO4 – Apply regression models, prepare datasets, and use models to predict new data. Understand unsupervised learning and classification methods.	Applying	Global	10
5	**UNIT-5 Algorithm and Data Structure**: Stack, Queue, Tree, ordered list, Introduction to Recursion, Divide and Conquer Strategy, Greedy Strategy, Graph Algorithms. Advance Topics: Regular Expression, Multi thread Programming, Security	CO5- Analyze and solve problems using data structures and algorithms, including recursion, graph algorithms, and regular expressions.	Applying	Global	10
Total Hours					**45**

Textbooks:

- Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*, O'Reilly Media, 2019.
- Ian Goodfellow, Yoshua Bengio, and Aaron Courville, *Deep Learning*, MIT Press, 2016.

Reference Books:

- Jake VanderPlas, *Python Data Science Handbook: Essential Tools for Working with Data*, O'Reilly Media, 2016.
- Kevin Markham, *Data Science for Business with Python*, O'Reilly Media, 2021.
- Sebastian Raschka, *Python Machine Learning*, Packt Publishing, 2015.
- Bharath Ramesh, *Machine Learning with Python Cookbook*, Packt Publishing, 2019.

Name of the Program: **MCA**	Batch: **2025-2029**
Name of the Course**: Principal of Machine Learning**	Course Cod**e:**
End Sem Exam (MM): **70**	Internal Assessment (MM): **30**
Credits: **3**	Contact Hours: **45**

Course Objectives

1. To introduce the foundational concepts and types of Machine Learning, including supervised, unsupervised, and reinforcement learning.
2. To develop an understanding of supervised learning algorithms such as linear/logistic regression, decision trees, k- NN, and SVM with performance evaluation.
3. To explore unsupervised learning techniques including clustering, dimensionality reduction, and association rule mining.
4. To apply model evaluation techniques and tuning strategies like cross-validation, ROC analysis, and hyperparameter optimization.
5. To provide insights into modern ML applications, tools, and ethical practices, including ensemble methods and deep learning basics.

Teaching Pedagogy

1. Lecture with real-life analogies
2. Discussion and Demonstration
3. Presentation and assignments
4. Infographic-based Learning

Course Details

Unit No.	Unit Description	Course Outcome	Bloom Taxonomy Level	Relevance Need	Hours
I	**Introduction to Machine Learning**: Definition, types (supervised, unsupervised, reinforcement), applications, ML process, bias-variance tradeoff, overfitting, underfitting	CO1: Understand the fundamentals and types of machine learning.	Understand (K2)	Global	7
II	**Supervised Learning**: Linear regression, logistic regression, k-NN, decision trees, SVM, evaluation metrics (accuracy, precision, recall, F1)	CO2: Apply basic supervised learning algorithms and evaluate their performance.	Apply (K3)	Global	10

III	**Unsupervised Learning**: Clustering (K-means, hierarchical), dimensionality reduction (PCA, t-SNE), association rule mining (Apriori, FP-Growth)	CO3: Implement unsupervised algorithms and interpret results.	Apply (K3)	Global	8

IV	**Model Evaluation and Tuning**: Cross-validation, confusion matrix, ROC curve, hyperparameter tuning (grid search), regularization (L1, L2)	CO4: Evaluate and optimize ML models for better performance.	Analyze (K4)	Global	10
V	**Recent Trends and Applications**: Overview of deep learning, ensemble methods (bagging, boosting), ML tools (Scikit-learn, TensorFlow), ethical considerations	CO5: Explore current ML trends, tools, and responsible AI practices.	Evaluate (K5)	Global	10

Text Books:

- Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly Media, 2019.
- Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 2016.

Reference books:

- Jake VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media, 2016.
- Kevin Markham, Data Science for Business with Python, O'Reilly Media, 2021.
- Sebastian Raschka, Python Machine Learning, Packt Publishing, 2015.
  Bharath Ramesh, Machine Learning with Python Cookbook, Packt Publishing, 2019

Program Name: **MCA**	Semester: **III**
Subject Name: **Software Engineering**	Subject Code: **1304305366**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits:**3**	Contact Hours: **45**

Course Objective: To provide an introduction to Software Engineering, covering fundamental principles, processes, and methodologies. Students will explore software crisis, process models, analysis, design, and quality assurance. The course includes software testing, verification, validation, and an understanding of software maintenance and project management, equipping students with a strong foundation in the field.

Detailed Syllabus:

S.NO	UNIT WISE DETAILS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTAC HOURS
1	**Introduction to Software Engineering**; Software Engineering Principles (Layers); Software Process –Process Framework, Umbrella Activities, Process Adaptation; Software Crisis; Process Models-Waterfall, Model, Prototype Model, Incremental Model, Spiral Model, RAD Model;	**CO1 –** Understanding basic layers of software engineering.	Understanding	Global	8
2	**Software Analysis and Design:** Requirement Engineering; Analysis Model-Data Flow Diagram, Data Dictionary, E-R Diagram, Decision Table; Software Requirements Specification (SRS), Structure of SRS; Pseudo code; Software Design; Design Process; Design Concepts-Abstraction, Partitioning, Modularity (Cohesion and Coupling.), Information Hiding, Refinement, Refactoring;	**CO2 –** Design analysis model and modularity	Creating	Global	8
3	**Software Quality** Software Metrics, Categories of Metrics, Function Point Metric; Software Quality's Quality Factors; Software Maturity Model-CMM,CMMI; Software Quality Assurance, Design Qualities.	**CO3-** Understanding CMM and CMMI	Understanding	Global	10

4	**Testing**: Software, Testing-Verification and Validation; Alpha and Beta Testing; Levels of Testing-Unit, Integration and System, Testing; Testing Techniques- White Box, Black Box; Cyclomatic Complexity; Test Plan; Debugging-Debugging Process, Debugging Strategies (Approaches).	**CO4-** Understanding and compare different types of testing.	Understanding	Global	10
5	**Software Maintenance and Project** Management: Risk Management – Software Risk, Risk Identification; Introduction to Software Maintenance, Categories of Maintenance; Belady and Lehman Model; Boehm Model; Project Management Concept – People, Product, Process, Project; Software Team; Software Project Planning; Software Project Estimation; Cost, Estimation Model, COCOMO, COCOMO II	**CO5-** Applying project cost estimation technique.	Applying	Global	9
				Total Hours:	**45**

TextBook:

- "Software Engineering" by Ian Sommerville (10th Edition, 2015).
- "Introduction to Software Engineering" by Philip Laplante (4th Edition, 2018)

Reference Books:

- Software Engineering: A Practitioner's Approach" by Roger S. Pressman and Bruce R. Maxim (10th Edition, 2019)
- "The Software Engineering Body of Knowledge (SWEBOK)" by IEEE Computer Society (2014)

Program Name: MCA	Semester: III
Subject Name: Programming With Python Lab	Subject Code:
End Sem Exam (MM): 35	Internal Assessment (MM): 15
Credits:1	Contact Hours: 30

Teaching Pedagogy

1. Problem-Based Learning
2. Presentation and assignments
3. Experiential Learning

List Of Experiments:

S.NO.	EXPERIMENTS	COURSE OUTCOME	RELEVANCE NEED	BLOOMS LEVEL	CONTACT HRS	EVALUATION TOOLS
1	Implement a Python program to Calculate GCD of two numbers.	**CO1:** To develop the ability to implement mathematical operations in Python such as calculating the GCD and square roots using algorithms like Newton's method.	Applying	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
2	Implement a Python Program to Calculate the square root of a number by Newton's Method.	**CO2:** To apply list operations and Python logic to find the largest element in a list.	Applying	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
3	Implement a Python Program to find the largest number from a list of numbers.	**CO3:** To implement basic search algorithms including linear and binary search for efficient data retrieval.	Applying	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva

4	Implement a Python Program to perform Search 1. Implement a Python Program to perform Liner search 2. Implement a Python Program to perform Binary search	**CO4:** To understand and implement fundamental sorting algorithms such as insertion sort.	Applying	Local	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
5	Implement a Python Program to perform insertion sort.	**CO5:** To apply selection sort algorithm for arranging data in a specified order using Python.	Analyzing	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
6	Implement a Python Program to perform selection sort	**CO6:** To perform matrix multiplication using nested loops and lists to handle multidimensi onal data.	Applying	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
7	Implement a Python program to multiply matrices.	**CO7:** To develop file handling skills and text analysis to determine word frequency in a file.	Applying	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
8	Implement a Python program to Calculate the most frequent words in a text from a file.	**CO8:** To demonstrate function overloading with different parameter types and argument lists in Python.	Analyzing	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva

9	Implement function overloading with different function signatures.	**CO9:** To design object-oriented programs using classes and instances to encapsulate data and behavior.	Evaluating	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva
10	Implement concept of class, instances and inheritance.	**CO10:** To apply inheritance in Python for reusability and extension of class functionalities .	Applying	Global	3	Internal Assessment : Lab Participation, record, Internal Viva **End term**: Practical Exam and Viva

Program Name: MCA	Semester: **III**
Subject Name: **Principal of Machine Learning Lab**	SubjectCode:
End Sem Exam(MM): 3**5**	Internal Assessment (MM): 15
Credits:**1**	ContactHours:**30**

Sno	**NAMEOF EXPERIMENTS**	**COURSE OUTCOME**	**BLOOM'S LEVEL**	**RELEVANC ENEED**	**CONTACT HOURS**
1	Implement data preprocessing steps (handling missing values, encoding, normalization) using Python.	Implement data preprocessing steps (handling missing values, encoding, normalization) using Python.	Applying	Global	03
2	Perform data visualization using matplotlib and seaborn to explore feature relationships.	Perform data visualization using matplotlib and seaborn to explore feature relationships.	Applying	Global	03
3	Implement linear regression and evaluate using RMSE and R^2 score.	Implement linear regression and evaluate using RMSE and R^2 score.	Applying	Global	03
4	Implement logistic regression for binary classification. Evaluate using accuracy, precision, and recall.	Implement logistic regression for binary classification. Evaluate using accuracy, precision, and recall.	Applying	Global	03
5	Implement k-Nearest Neighbors (k-NN) algorithm and evaluate performance.	Implement k-Nearest Neighbors (k-NN) algorithm and evaluate performance.	Applying	Global	03

6	Apply Decision Tree and Random Forest classifiers on a dataset and visualize the trees.	Apply Decision Tree and Random Forest classifiers on a dataset and visualize the trees.	Applying	Global	03
7	Implement Support Vector Machine (SVM) for classification tasks.	Implement Support Vector Machine (SVM) for classification tasks.	Applying	Global	03
8	Perform unsupervised learning using k-Means clustering and visualize clusters.	Perform unsupervised learning using k-Means clustering and visualize clusters.	Applying	Global	03
9	Implement Principal Component Analysis (PCA) for dimensionality reduction.	Implement Principal Component Analysis (PCA) for dimensionality reduction.	Applying	Global	03
10	Train and evaluate models using cross-validation and hyperparameter tuning (GridSearchCV).	Train and evaluate models using cross-validation and hyperparameter tuning (GridSearchCV).	Applying	Global	03
	Total Hours:				**30**

Name of the Program: MCA	**Batch: 2024-2028**
Name of the Course: : Software Engineering lab	**Course Code:**
End Sem Exam (MM): **35**	Internal Assessment (MM): **15**
Credits: **1**	Contact Hours: 30

S. No.	Name of Experiment	Course Outcome	Bloom Taxonomy Level	Relevance / Need	Contact Hours
1	Demonstrate an SRS document in line with the IEEE recommended standards.	CO1: Demonstrate an SRS document in line with the IEEE recommended standards.	Remembering (K1)	Global	3
2	Demonstrate the use case diagram and specify the role of each actor. State the precondition, post condition, and function of each use case.	CO2: Demonstrate the use case diagram and specify the role of each of the actors. Also state the precondition, post condition, and function of each use case.	Applying (K3)	Global	3
3	Demonstrate the activity diagram.	CO3: Demonstrate the activity diagram.	Understanding (K2)	Global	3
4	Demonstrate and identify the classes. Classify them as weak and strong classes and draw the class diagram.	CO4: Demonstrate and identify the classes. Classify them as weak and strong classes and draw the class diagram.	Applying (K3)	Global	3
5	Demonstrate the sequence diagram for any two scenarios.	CO5: Demonstrate the sequence diagram for any two scenarios.	Understanding (K2)	Global	3
6	Demonstrate the collaboration diagram.	CO6: Demonstrate the collaboration diagram.	Understanding (K2)	Global	3
7	Demonstrate the state chart diagram.	CO7: Demonstrate the state chart diagram.	Applying (K3)	Global	3
8	Demonstrate the component diagram.	CO8: Demonstrate the component diagram.	Applying (K3)	Global	3
9	Demonstrate test cases for unit testing and integration testing.	CO9: Demonstrate test cases for unit testing and integration testing.	Applying (K3)	Global	3
10	Demonstrate test cases for various white box and black box testing techniques.	CO10: Demonstrate test cases for various white box and black box testing techniques.	Understanding (K2)	Global	3
				Total Hours	30

ELECTIVE-I SUBJECT

Program Name: **MCA**	Semester: III
Subject Name: **Distributed Database**	Subject Code: **1304305365**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits: **3**	Contact Hours: **45**

Course Objective: To introduce the concepts of distributed database systems, including their architecture, data distribution, transparency, and query processing. Students will explore fragmentation, replication, security, integrity control, and optimization techniques for distributed queries. The course covers the challenges and benefits of distributed data processing, providing a strong foundation in this specialized area of database management.

Detailed Syllabus:

S.NO.	UNIT WISE DETAILS	COURSE OUTCOME	BLOOM 'S LEVEL	RELEVANCE NEED	CONTACT HOURS
1	Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas, Distributed DBMS Architecture : Models- Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS	CO1: Understanding distributed data processing, database systems, and architecture models for DDBMS including client/server and peer-to-peer.	Understanding	Global	10
2	Data Distribution Alternatives: Design Alternatives – localized data, distributed data Fragmentation – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency – location, fragmentation, replication Impact of distribution on user queries – No Global Data Dictionary(GDD), GDD containing location information, Example on fragmentation	CO2: Applying design alternatives for data distribution, including fragmentation types, correctness rules, and impacts on user queries.	Applying	Global	10
3	Semantic Data Control: View Management, Authentication – database authentication, OS authentication, Access Rights, Semantic Integrity Control – Centralized & Distributed, Cost of enforcing semantic integrity	CO3: Explain semantic data control, including view management, authentication methods, access rights, and cost of semantic integrity enforcement.	Understanding	Global	8
4	Query Processing : Query Processing Problem, Layers of Query Processing Query Processing in Centralized Systems – Parsing &	CO4:Analyzing query processing in centralized and distributed systems, focusing on parsing,	Analyzing	Global	10

	Translation, Optimization, Code generation, Example Query Processing in Distributed Systems – Mapping global query to local, Optimization	translation, optimization, and mapping queries			
5	Optimization of Distributed Queries: Query Optimization, Centralized Query Optimization, Join Ordering Distributed Query Optimization Algorithms	**CO5:** Evaluating query optimization techniques, including centralized and distributed query optimization algorithms and join ordering methods.	Evaluating	Global	7
Total Hours					**45**

Textbooks:

- Stefano Ceri and Giuseppe Pelagatti, *Distributed Databases: Principles and Systems*, McGraw-Hill, 1984.
- M. Tamer Özsu and Patrick Valduriez, *Principles of Distributed Database Systems*, Springer, 2011.

Reference Books:

- Ramez Elmasri and Shamkant Navathe, *Fundamentals of Database Systems*, Pearson Education, 2010.
- Abraham Silberschatz, Henry Korth, and S. Sudarshan, *Database System Concepts*, McGraw-Hill, 2019.
- Atul Kahate, *Distributed Systems: Concepts and Design*, McGraw-Hill, 2018.
- George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, *Distributed Systems: Principles and Paradigms*, Pearson Education, 2011.

Program Name: **MCA**	Semester: **III**
Subject Name: **Artificial Intelligence**	Subject Code: **1304305364**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits: **3**	Contact Hours: **45**

Detailed Syllabus:

UNIT NO.	UNIT WISE DETAILS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HOURS
1	Artificial Intelligence: Introduction, historical development, foundational areas, AI problems, techniques, tasks, applications, intelligent agents, computer vision, NLP. Searching Techniques: Problem solving by search, uninformed and informed search, local search, adversarial search, Alpha-Beta pruning, heuristic search (Hill climbing, branch and bound, best-first, A*), AND/OR graphs, AO* algorithm, constraint satisfaction.	**CO1**: Understand the basics of artificial intelligence, its historical development, and foundational areas.	Understanding	Global	8
2	Knowledge Representation and Reasoning: Propositional logic, predicate logic, FOL inference, clause form, resolution, forward & backward chaining, Horn clauses, utility theory, probabilistic reasoning, HMM, Bayesian networks, conceptual dependency.	**CO2**: Apply knowledge of first-order logic for inference and perform resolution chaining.	Applying	Global	10
3	Reasoning Under Uncertainty: Non-monotonic reasoning, default & minimalistic reasoning, statistical reasoning, Bayes theorem, Bayesian networks, certainty factors, Dempster-Shafer theory. Planning: Blocks world, goal stack planning, nonlinear planning.	**CO3**: Apply probabilistic and statistical reasoning methods such as Bayesian networks and planning strategies.	Applying	Global	9

4	Expert Systems: Characteristics, applications, shells, rule-based & non-production system architectures, knowledge acquisition, MYCIN, DENDRAL. Learning: Rote learning, learning by advice, induction, explanation-based learning, and discovery.	**CO4**: Apply classification and learning techniques in expert systems using practical case studies.	Applying	Global	8
5	Neural Networks & NLP: Biological neuron vs. artificial neuron, McCulloch-Pitts model, Perceptron, Learning rules: Hebbian, Perceptron, Delta, Linear separability, XOR problem, Multilayer Perceptron, and Backpropagation. Architecture of feedforward neural networks, Gradient descent, learning rate, Backpropagation algorithm, Applications of neural networks. NLP: Text preprocessing, language models (Word2Vec, BERT), NLP applications.	**CO5**: Apply neural network models and natural language processing techniques in AI applications	Applying	Global	12
Total Hours				**45**	

Textbooks:

- Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2020.
- Patrick Winston, *Artificial Intelligence*, MIT Press, 2020.

Reference Books:

- Judea Pearl, *The Book of Why: The New Science of Cause and Effect*, Basic Books, 2018.
- Nils J. Nilsson, *The Quest for Artificial Intelligence: A History of Ideas and Achievements*, Cambridge University Press, 2009.
- Russell C. Eberhart and Yuhui Shi, *Computational Intelligence: Concepts to Implementations*, Morgan Kaufmann, 2007.
- Michael Wooldridge, *An Introduction to MultiAgent Systems*, Wiley, 2009.

ELECTIVE-II

Program Name: **MCA**	Semester: III
Subject Name: **Internet of Things**	Subject Code: **1304305367**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits: **3**	Contact Hours: **45**

Course Outcome: Develop a comprehensive understanding of IoT design, technologies, and applications, including device management, connectivity, network protocols, and data analytics for smart systems and services.

Detailed Syllabus:

UNIT NO.	TOPICS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HRS
1	Introduction to IoT Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels & Deployment Templates. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management	**CO1:** Understanding IoT concepts, physical and logical design, enabling technologies, and deployment templates across various IoT levels and business processes.	Understanding	Global	10
2	IoT Design Methodology Steps, Home Automation Case Study, Smart Cities, Health Care, Agriculture. IoT Devices IoT System Design Cycle, Sensors - Terminologies, Calibration, Types, Specification, Use, Actuators - Types and Use, Prototype Development Platform - Arduino / Raspberry pi / Node MCU, Interface with Embedded System.	**CO2:** Applying IoT design methodology to case studies in home automation, smart cities, healthcare, and agriculture, using IoT system design cycles.	Applying	Global	7

3	Introduction to Wireless Sensor Network Sensor Node, Smart Sensor Network, Wireless Sensor Network, RFID - Principles and Components, PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP	**CO3:** Utilize sensors, actuators, and prototyping platforms like Arduino, Raspberry Pi, and Node MCU in IoT device development and embedded system interfacing.	Applying	Global	8
4	Connectivity Technologies Network Configuration in IoT, IoT Stack and Web Stack, IEEE 802.15.4 Standard, Zigbee, Bluetooth, MQTT, Cloud Architecture and Types, Cloud Service Providers. Node MCU. PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP.	**CO4:**Analyzing wireless sensor networks, connectivity technologies, and protocols including RFID, Zigbee, Bluetooth Low Energy, and network layers for IoT solutions.	Analyzing	Global	10
5	SDN for IoT, oneM2M, European Telecommunications Standards Institute (ETSI) M2M (Machine- to-Machine), OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, Routing Protocol for Low-Power and Lossy Networks (RPL), Application Layer, Data Handling and Analytics, Cloud Computing, Cloud Computing, Sensor-Cloud, Fog Computing, Smart Cities and Smart Homes.	**CO5:** Implement cloud and edge computing architectures, and Understanding their integration with IoT technologies, including service providers and configuration.	Applying	Global	10
				Total Hours	**45**

Textbooks:

- Arshdeep Bahga and Vijay Madisetti, *Internet of Things: A Hands-On Approach*, VPT, 2014.
- Ollie Whitehouse, *Architecting the Internet of Things: An Architectural Approach*, Wiley, 2016.

Reference Books:

- Daniel Kellmereit and Daniel Obodovski, *The Silent Intelligence: The Internet of Things*, CreateSpace Independent Publishing Platform, 2013.
- Michael Miller, *The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World*, Que Publishing, 2015.
- Cuno Pfister, *Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud*, O'Reilly Media, 2011.
- David Hanes, Gonzalo Salgueiro, and Patrick Grossetete, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things*, Cisco Press, 2017.

Program Name: **MCA**	Semester: **III**
Subject Name: **Internet and Things Lab**	Subject Code: **1304305367**
End Sem Exam (MM): **15**	Internal Assessment (MM): **35**
Credits: **1**	Contact Hours: **30**

List of Experiments

S No	NAME OF EXPERIMENTS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HOURS
1	Introduction to Local Area Network with its cables, connectors, and topologies.	**CO1:** Understanding and describe the fundamental components of a Local Area Network (LAN), including cables, connectors, and topologies.	Remembering	Global	02
2	Installation of Switch. Hub their cascading and network mapping.	**CO2:** Install and configure network switches and hubs, including their cascading and network mapping for efficient network management.	Applying	Global	02
3	Installation of UTP, Co-axial cable, Cross cable, parallel cable NIC and LAN card.	**CO3:** Successfully install and test various types of network cables (UTP, Co- axial, Cross cable, Parallel cable) and network interface cards (NICs) for proper connectivity.	Understanding	Global	02
4	Case Study of Ethernet (10 base 5,10 base 2,10 base T)	**CO4:** Analyzing and describe the different types of Ethernet technologies (10Base5, 10Base2, 10BaseT) and their applications in network setups.	Applying	Global	02
5	Installation and working of Net meeting and Remote Desktop.	**CO5:** Install and configure NetMeeting and Remote Desktop for remote access and collaboration within a networked environment.	Understanding	Global	02
6	Installation and working with Telnet (Terminal Network). 7. Installation and working with FTP (File Transfer Protocol)	**CO6:** Set up and utilize Telnet for remote terminal access, enabling command- line interactions over a network.	Understanding	Global	02
7	Installation and Computers via serial or Parallel ports and enable	**CO7:** Install and configure FTP for file transfers over a network, understanding its	Applying	Global	03
	the computers to share disk and printer port.	role in file sharing and management.			

8	To connect two Personal Computer with Telephone line	**CO8:** Connect and configure computers using serial or parallel ports, enabling disk and printer sharing among devices.	Applying	Global	03
9	Installation of Modem and Proxy Server.	**CO9:** Establish a network connection between two personal computers using a telephone line and Understanding the associated setup procedures.	Applying	Global	03
10	Working with Null Modem.	**CO10:** Install and configure a modem and proxy server, understanding their roles in network connectivity and security.	Understanding	Global	03
11	Installation of Windows 2003 server/ Windows 200 server.	**CO11:** Work with null modem cables to enable direct communication between computers via serial ports.	Understanding	Global	03
12	Introduction to Server administration.	**CO12:** Install and configure Windows Server 2003/2000, including basic server setup and administration tasks.	Understanding	Global	03
	Total Hours:				**30**

Program Name: **MCA**	Semester: **III**
Subject Name: **Asp.net**	Subject Code: **1304305363**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits: **3**	Contact Hours: **45**

Course Objective: To provide a comprehensive introduction to ASP.NET, a web development framework, and its role within the .NET framework. Students will learn about the .NET ecosystem, programming fundamentals, XML handling, and web form creation. The course covers Windows process management, file handling, database connectivity, and advanced concepts, equipping students to build robust web applications using ASP.NET.

Detailed Syllabus:

S.NO.	UNIT WISE DETAILS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HOURS
1	**Inside the .NET framework:** Overview of .net framework, Managed, Execution process, CLR, Common language , Specification, JIT Compilation, MSIL, Namespaces, Assemblies, metadata, Common, Type System, cross language, interoperability, Garbage collection.	**CO1:** Understanding .NET Framework and describe some of the major enhancements to the new version of Visual Basic.	Understanding	Global	7
2	**Programming with .NET Framework** Working with Visual Studio IDE, creating a .NET solution, components and controls, Data types, variables, Type conversions, Operators, Control Structures: conditional statements, loops, arrays, types of methods, method data, Introduction to exception handling-exception statements.	**CO2:** describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE).	Understanding	Global	10
3	**XML, Windows process and File Handling** Client Server technologies, Introduction to ASP .NET, Differentiate classic ASP and ASP.NET, Web application, Web Forms. Various windows of Visual Studio and their use. Web.config file and its use. Various states and their use in ASP.NET.	**CO3:** Creating applications using Microsoft Windows Form sand also ADO .NET.	Creating	Global	10

4	**Building .NET Framework Applications** ASP.NET Controls Client-side vs Server-Side Controls, Standard Controls, Validation Controls, Data Controls. Basic properties of controls. Introduction to ASP.NET MVC, MVC Architecture. Adding new elements to existing project. Events in Web form.	**CO4:** design web applications using ASP.NET	Creating	Global	10
5	**Advanced concepts and Database Programming** ADO .NET Architecture, .NET data provider, dataset components, creating database applications using web forms (Database connectivity through ADO .NET),	**CO5 -** Understanding basic ADO.net architecture	Understanding	Global	8
Total Hours:					45

Textbooks:

- Andrew Troelsen and Philip Japikse, *Pro ASP.NET Core 6*, A press, 2022.
- Scott Guthrie, *ASP.NET Core in Action*, Manning Publications, 2018.

Reference Books:

- Adam Freeman, *Pro ASP.NET Core MVC 2*, Apress, 2017.
- Mark J. Price, *ASP.NET Core 6 and Angular*, Packt Publishing, 2022.
- Dino Esposito, *Programming ASP.NET Core*, Microsoft Press, 2019.
- Joseph Alba hari and Ben Alba hari, *C# 9.0 in a Nutshell: The Definitive Reference*, O'Reilly Media, 2020.

Program Name: **MCA**	Semester: **III**
Subject Name: **ASP.net**	Subject Code: **1304305363**
End Sem Exam (MM): **15**	Internal Assessment (MM): **35**
Credits: **1**	Contact Hours: **30**

NAME OF EXPERIMENTS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HOURS
Experiment No. -1 Installation and working on ASP.net.	**CO1 -** Develop an Installation and working on Python IDLE.	Creating	Global	03
Experiment No. – 2 Creating a simple ASP.NET Web Forms application that includes a master page, a content page, and a few basic controls like labels, textboxes, and buttons. Demonstrate how data entered into the textboxes can be displayed on the labels upon button click.	**CO2 -** Develop a program usage of conditional and looping statements.	Creating	Global	03
Experiment No. – 3 Set up a connection to a SQL Server database using ADO.NET in ASP.NET Web Forms. Retrieve data from a database table and display it in a GridView control.	**CO3 -** Develop a program Tuples, Sets and Dictionaries.	Creating	Global	03
Experiment No. – 4 Creating a form in ASP.NET MVC that accepts user input (e.g., name, email, message). Upon submission, validate the input and display a confirmation message.	**CO4 -** Develop a program concept of OOPs.	Creating	Global	03
Experiment No. – 5 Implement session state in an ASP.NET application to maintain user-specific data across multiple pages. Demonstrate storing and retrieving data from session variables.	**CO5 -** Develop a program of Processing text (Word and Sentence Tokenization).	Creating	Global	03
Experiment No. – 6 Creating an ASP.NET Web Forms page that retrieves data from a hardcoded list or array (e.g., list of products with names and prices) and displays it in a GridView control.	**CO6 -** Develop a program of Morphological analysis (Stop word removal).	Creating	Global	03

Experiment No. – 7 Implement a click event handler for a Button control in ASP.NET Web Forms. Upon clicking the button, display a message (e.g., "Button clicked!") in a Label control on the same page.	**CO7 -** Develop a program of k-nearest neighbours classification using python.	Creating	Global	03
Experiment No. – 8 Add validation controls to an ASP.NET Web Forms page (e.g., RequiredFieldValidator, RegularExpressionValidator). Ensure that form submission is only successful when all validation conditions are met.	**CO8 -** Develop a program of linear regression using python.	Creating	Global	03
Experiment No. – 9 Applying CSS styles to various elements (e.g., buttons, textboxes) on an ASP.NET Web Forms page. Customize the appearance of controls using inline styles and/or linked CSS files.	**CO9 -** Develop a program	Creating	Global	03
Experiment No. – 10 Creating a basic ASP.NET MVC application that uses session state to store and retrieve a simple counter. Increment the counter each time a specific action or button is clicked on the page.	**CO10 -** Develop a program of ASP.net MVC	Creating	Global	03
Total Hours:				**30**

Program Name: **MCA**	Semester: III
Subject Name: **Cyber Security**	Subject Code: **1304305368**
End Sem Exam (MM): **30**	Internal Assessment (MM): **70**
Credits:**3**	Contact Hours: **45**

Course Outcome: Understanding cyber security fundamentals, web and network vulnerabilities, cybercrimes, legal frameworks, data privacy regulations, and security management practices. Applying knowledge to safeguard data, systems, and organizational assets effectively.

Detailed Syllabus:

UNIT NO.	TOPICS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HRS
1	Introduction to Cyber Security: Introduction, Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control and Cryptography. Web attack: Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks. Network Vulnerabilities: Overview of vulnerability scanning	**CO1**:- Students after completing this module will be able to Understanding the basic terminologies related to cyber security and current cyber security threat landscape.	Understanding	Global	10
2	Introduction to cybercrimes Definition, cybercrime and information security, classes of cybercrime and categories, cyber offences, cyber-crimes with mobile and wireless devices, cyber-crime against women and children, financial frauds, social engineering attacks.	**CO2**:- After completion of the module, students will have complete understanding of the cyberattacks that target computers, mobiles and persons.	Understanding	Global	7
3	Cybercrime and Cyber law Malware and ransom ware attacks, zero day and zero click attacks, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cyber crime and offences, Organizations dealing with Cyber crime and Cyber studies security in India	**CO3:-** Students after completing this module will be able to Understanding the legal framework that exist in India for cybercrimes and penalties and punishments for such crimes.	Understanding	National	7
4	Data Privacy and Data Security Defining data, meta-data, big data, nonpersonal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic	**CO4:-** After completing this module, students will Understanding the aspects related to personal data privacy and security.	Applying	National	11
	Documents Act (PIPEDA)., Social media- data privacy and security issues.				

5	Cyber security Management, Compliance and Governance Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	**CO5:-** Students after completing this module will Understanding the main components of cyber security plan.	Remembering	Global	10
	Total Hours				**45**

Textbooks:

- William Stallings and Lawrie Brown, *Computer Security: Principles and Practice*, Pearson, 2019.
- Charles P. Pfleeger and Shari Lawrence Pfleeger, *Security in Computing*, Pearson, 2018.

Reference Books:

- Bruce Schneier, *Secrets and Lies: Digital Security in a Networked World*, Wiley, 2015.
- NIST, *Computer Security Resource Center (CSRC) Guidelines*, National Institute of Standards and Technology, various years.
- Mike Chapple and David Seidl, *CISSP: Certified Information Systems Security Professional Study Guide*, Wiley, 2020.
- Dan Sullivan, *CompTIA Security+ Guide to Network Security Fundamentals*, Cengage Learning, 2021.

Program Name: **MCA**	Semester: **III**
Subject Name: **Cyber Security Lab**	Subject Code: **1304305368**
End Sem Exam (MM): **15**	Internal Assessment (MM): **35**
Credits: **1**	Contact Hours: **30**

List of Experiments

S. No	NAME OF EXPERIMENTS	COURSE OUTCOME	BLOOM'S LEVEL	RELEVANCE NEED	CONTACT HOURS
1	Introduction to Cyber Security Basics	Understanding basic cybersecurity concepts like authentication, access control, and cryptography	Understanding	Global	3
2	Web Attack Simulations	Identify and Understanding various web attacks, including XSS and SQL injection	Applying	Global	3
3	Network Vulnerability Scanning	Perform vulnerability assessments on networks to identify and address security gaps	Applying	Global	3
4	Case Study on Cybercrime Types	Recognize various categories of cybercrimes, including social engineering and financial frauds	Understanding	Local	3
5	Hands-on Malware Analysis	Analyzing malware behavior and identify indicators of compromise (IOCs) in a safe lab environment	Analyzing	Global	3
6	Study of Cyber Laws and Legal Framework	Understanding the IT Act 2000, amendments, and the legal implications on cybersecurity practices	Understanding	National	3
7	Data Privacy Simulation	Applying data anonymization techniques to meet data privacy and regulatory compliance	Applying	Global	3
8	Compliance with Data Protection Standards	Analyzing and Applying GDPR and PIPEDA requirements for regulatory compliance	Analyzing	Global	3
9	Cyber Security Policy and Crisis Management	Develop a cybersecurity policy and crisis management plan for organizational continuity	Creating	Local	3
10	Cyber Security Audit and Governance Simulation	Conduct a mock cybersecurity audit, identifying gaps and suggesting policy improvements	Evaluating	National	3
	Total Hours:				**30**