

Session: 2022-2023

Name of College:	Uttaranchal School of Computing Sciences
Program Name:	Master of Computer Applications (MCA)
Program Code:	20

Program Educational Objectives- PEO, Program Outcomes-PO, Course Outcomes-CO

Program Educational Objectives (PEO)

PEO-1	To solidify foundation of mathematics, computer science and problem solving methodology for effective implementation in the area of software development.
PEO-2	To prepare the students as successful professionals ready for Industry, Government sectors, Academia, Research, Entrepreneurial Pursuit and Consultancy firms
PEO-3	To prepare the graduates to adapt themselves for life-long learning through professional activities on latest technology and trends needed for a successful career
PEO-4	To inculcate professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.
PEO-5	To prepare students the ability to gain multidisciplinary knowledge through real-time projects and industry internship training and providing a sustainable competitive edge in R&D and meeting industry needs

Program Outcomes-(PO)

PO-1	Understand basic computer application concepts and acquire problem solving skills to develop software required in various multidisciplinary setups.
PO-2	Identify, formulate and analyse computing problems using fundamental concepts of mathematics, computer science and research.
PO-3	Develop leadership skills and analytical reasoning for solving real-time critical problems
PO-4	Understand the impact of professional IT solutions in societal contexts and work for sustainable development.
PO-5	Develop competent technical writing skills, design documentation and make effective presentation using appropriate supporting technologies.
PO-6	Enhance project-based learning skills, such as to define the problem, identify alternative solutions, plan the project, execute the plan, monitor and control the project progress for successful completion of the project.
PO-7	Develop competent skills required by the IT professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms.
PO-8	Strengthen the independent and life-long learning for continued professional development

Semester- I

Course Name: Design and Analysis of Algorithm	
Course Code (CC): MCA-C101	
MCA-C101-CO-1	Argue and analyze the correctness of time and space complexity of algorithms.
MCA-C101-CO-2	Device and analyze the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.
MCA-C101-CO-3	Design and synthesize the solution of optimization problems using Dynamic Programming and Greedy algorithm design techniques and therefore develop technical skills by analysing them.
MCA-C101-CO-4	Device and analyze the usage of algorithms under several categories like sorting algorithms and string matching algorithms which develop technical and logical skills.
MCA-C101-CO-5	Able to understand major graph algorithms and tree structures, analyse them and able to employ these to model engineering problems, when appropriate.

Semester- I	
Course Name: Programming in Java	
Course Code (CC): MCA-C102	
MCA-C102-CO-1	Understand the Concept of Java Programming to design and develop console- based applications to solve mathematical and small business problems using Exception Handling and Multithreading, interface and inheritance.
MCA-C102-CO-2	Understand the concept of Regular Expressions, packages and collections in java to implement real world applications.
MCA-C102-CO-3	Understand the concept of Java programming to design Event driven GUI applications using Java AWT and Java Swing
MCA-C102-CO-4	Understand the concept of JavaFX and JDBC to implement the solution for real time problems.
MCA-C102-CO-5	Understand the concepts of Java Servlet to design and develop database supported web applications

Semester- I
Course Name: Data Warehousing and Data Mining

Course Code (CC): MCA-C103

MCA C103-CO-1	Understand the elementary concepts, pros & cons and implications related to data warehouse and data mining.
MCA-C103-CO-2	Understand and illustrate the role of classification and prediction using e.g. Bayesian classifier.
MCA-C103-CO-3	Understand the working of different data warehouse models and allied components.
MCA-C103-CO-4	Develop critical thinking skills to select a set of feasible techniques for domain specific data mining.
MCA-C103-CO-5	Evaluate and organize the unlabeled data using suitable clustering techniques.

Semester- I

Course Name: Software Engineering and Project Management

Course Code (CC): MCA-C104

MCA-C104-CO-1	Compare and evaluate various Software Development Life Cycle Models and solve Engineering problems to Design and Implementation of Software Systems.
MCA-C104-CO-2	Apply new Engineering Technologies like Agile to develop Quality Software which customer requirements within budget and allotted time period.
MCA-C104-CO-3	Apply various Testing Techniques, Metrics and Strategies for the development of Projects.
MCA-C104-CO-4	Proficiently apply CMM standards, CASE tools and COCOMO Cost Estimation Tech Engineering Software Projects.
MCA-C104-CO-5	Be able to develop high-quality software that meets the Organization need and evaluate of their solutions in a global and societal context.

Semester- I

Course Name: Automata Theory

Course Code (CC): MCA-C105[G1]

MCA-C105[G1]-CO-1	Understand and apply acquired fundamental knowledge of automata theory to formulate various models/machine for solving real time mathematical problems.
MCA-C105[G1]-CO-2	Apply concepts of formal computation and its relationship with languages to evaluate the validity of any token in a programming language through designed DFA or N DFA model/machine
MCA-C105[G1]-CO-3	Classify and critically evaluate various types of ambiguous and non-ambiguous grammar and thus analyze, formulate the

	syntax of various programming languages through designing solutions using Push Down Automata
MCA-C105[G1]-CO-4	Critically analyze the mathematical problem and Design solution to solve it using Turing Machine.
MCA-C105[G1]-CO-5	Evaluate the mathematical problem on solvability, decidability, finiteness and provide solution to PCP problems.

Semester- I

Course Name: Machine Learning Using Python

Course Code (CC): MCA- 105 [AI1]

MCA- 105 [AI1]-CO-1	Formulate machine-learning problems corresponding to different applications.
MCA- 105 [AI1]-CO-2	Apply a range of machine learning algorithms along with their strengths and weaknesses.
MCA- 105 [AI1]-CO-3	Understand the basic theory underlying machine learning with real life examples.
MCA- 105 [AI1]-CO-4	Apply and Evaluate machine-learning algorithms to solve problems of moderate complexity.
MCA- 105 [AI1]-CO-5	Apply machine-learning algorithms in real world problems.

Semester- I

Course Name: Introduction of Cloud Computing

Course Code (CC): MCA-105[CC1]

MCA-105[CC1]-CO-1	Understand the fundamentals of cloud, cloud Architectures and types of services in Cloud.
MCA-105[CC1]-CO-2	Understand the concept of virtualization and how this has enabled the development of Cloud computing.
MCA-105[CC1]-CO-3	Know the various Cloud Simulators for Cloud Environment.
MCA-105[CC1]-CO-4	Analyze different Applications in cloud.
MCA-105[CC1]-CO-5	Explore the important concepts of Virtualizations

Semester- I

Course Name: Programming in Java Lab

Course Code (CC): MCA-C151

MCA-C151-CO-1	Implement console based applications to solve mathematical and business problems using Exception Handling, Inheritance, and Multithreading.
MCA-C151-CO-2	Design Java programs to implement small GUI applications to solve real world problems.

MCA-C151-CO-3	Design and Develop GUI applications with event handling and Swing and Regex support to solve real life problems.
MCA-C151-CO-4	Implement enrich GUI applications with database support using JavaFX to solve real world problems.
MCA-C151-CO-5	Develop technical knowledge to design dynamic web applications using JDBC and Servlet.

Semester- I

Course Name: PL/SQL Lab

Course Code (CC): MCA-C152

MCA-C152-CO-1	Understand installing DBMS and execute the queries.
MCA-C152-CO-2	Implement the tables and execute various DML queries.
MCA-C152-CO-3	Implement and apply Cursors on database tables.
MCA-C152-CO-4	Implement and apply Triggers on database tables.
MCA-C152-CO-5	Develop solutions using database concepts for real life applications.

Semester- I

Course Name: Technical Skills Lab

Course Code (CC): MCA-C153[G1]

MCA-C153[G1]-CO-1	Understand and illustrate the technical concepts of C and C++ programming language
MCA-C153[G1]-CO-2	Develop the technical skills in the students.
MCA-C153[G1]-CO-3	Enhance and improve the employability of students.
MCA-C153[G1]-CO-4	Develop the lifelong learning skills.
MCA-C153[G1]-CO-5	Enhance the problem-solving abilities and skills of the students.

Semester- I

Course Name: Machine Learning Using Python Lab

Course Code (CC): MCA-C153[AI1]

MCA-C153[AI1]-CO-1	Create the records maintaining datasheets and dataset.
MCA-C153[AI1]-CO-2	Demonstrate and implement the characteristics of CSV file formats.
MCA-C153[AI1]-CO-3	Construct and analyze different types of data using data pre-processing techniques.
MCA-C153[AI1]-CO-4	Design, Develop & Deploy the regression models with various datasets.
MCA-C153[AI1]-CO-5	Apply different Python libraries for data visualization in real world applications.

Semester- I	
Course Name: Cloud Computing Lab	
Course Code (CC): MCA-C153[CC1]	
MCA-C153[CC1]-CO-1	Configure various virtualization tools such as Virtual Box, VMware workstation.
MCA-C153[CC1]-CO-2	Design and deploy a web application in a PaaS environment.
MCA-C153[CC1]-CO-3	Learn how to simulate a cloud environment to implement new schedulers
MCA-C153[CC1]-CO-4	Install and use a generic cloud environment that can be used as a private cloud.
MCA-C153[CC1]-CO-5	Manipulate large data sets in a parallel environment

Semester- I	
Course Name: Mini Project-I	
Course Code (CC): MCA-S154	
MCA-S154-CO-1	Define the problems in various domains that can be solved using computer applications.
MCA-S154-CO-2	Develop the ability to identify alternative solutions and plan the project.
MCA-S154-CO-3	Analyze and Design the software development process.
MCA-S154-CO-4	To develop coding and testing skills for software development.
MCA-S154-CO-5	Build technical presentation skills and Create project documentation of the complete process.

Semester- II	
Course Name: Responsive Web Applications	
Course Code (CC): MCA-C201	
MCA-C201-CO-1	Understand to combine web technologies fundamentals of java script, document object model and apply them to develop AJAX applications or formulate solutions.
MCA-C201-CO-2	Recognize the basic concepts of JQuery and JSON technology, apply these technologies to create website to solve problem of fetching data.
MCA-C201-CO-3	Demonstrate problem solving ability to design and develop rich applications with the integration of Web API and Java Script object notation.
MCA-C201-CO-4	Design and develop effective application with the help of

	session management techniques and enhance security.
MCA-C201-CO-5	Enhance web development skills with the understanding and applications of collaborative web technologies to develop solutions and create employability

Semester- II	
Course Name: Artificial Intelligence	
Course Code (CC): MCA-C202	
MCA-C202-CO-1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline.
MCA-C202-CO-2	Outline and choose appropriate idealizations for converting real world problems into AI search problems formulated using the appropriate search algorithm.
MCA-C202- CO-3	Interpret functions and strategies for game playing and implementing different search problems based on time and space complexities for standard search algorithms.
MCA-C202-CO-4	Apply knowledge representation techniques for problem solving and analyze various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
MCA-C202-CO-5	Combine self-learning and research skills to be able to tackle a topic of interest on his/her own or as part of a team.

Semester- II	
Course Name: Data Communication and Computer Networks	
Course Code (CC): MCA-C203	
MCA-C203-CO-1	Understand and apply acquired fundamental knowledge of digital data Communication techniques and its standards.
MCA-C203-CO-2	Determine, explicate and analyze problems using fundamental concepts of Computer Networks and suggest new ways to solve the problem.
MCA-C203-CO-3	Inspect the various concepts of network topologies, components and categories of networks to enhance the employability status.
MCA-C203-CO-4	Make use of the concepts of OSI layers, functions and its protocols to examine challenges in Computer Networks.
MCA-C203-CO-5	Build skills in Computer Networks to enhance competitive skills and lifelong learning in the broadest context of technological change.

Semester- II

Course Name: Digital Forensics

Course Code (CC): MCA-204(G1)

MCA-204(G1)-CO-1	Identify the need for cybercrime investigation.
MCA-204(G1)-CO-2	Understand the hardware and software components responsible for seeking evidence
MCA-204(G1)-CO-3	Have knowledge on the techniques used for collecting evidences.
MCA-204(G1)-CO-4	Analyze the evidence through suitable tools.
MCA-204(G1)-CO-5	Examine other sources of evidences

Semester- II

Course Name: Computer Organization and Architecture

Course Code (CC): MCA-204(G2)

MCA-204(G2)-CO-1	Describe the fundamental organization of Computer System.
MCA-204(G2)-CO-2	Explain addressing modes, instruction formats and program control statements.
MCA-204(G2)-CO-3	Design of adders, ALU and Memory management unit and Illustrate problems related to cache memory.
MCA-204(G2)-CO-4	Understand pipelining and parallelism features applied in single processor, multiple processors and multicore architectures.
MCA-204(G2)-CO-5	Explain the concept of Instruction pipeline, RISC, CISC

Semester- II

Course Name: Cognitive Computing

Course Code (CC): MCA-204 [AI1]

MCA-204 [AI1]-CO-1	Analyze different applications of Cognitive Computing in different scenarios.
MCA-204 [AI1]-CO-2	Devise and apply Natural language processor role in Cognitive computing applications.
MCA-204 [AI1]-CO-3	Understand future directions of Cognitive Computing.
MCA-204 [AI1]-CO-4	Analyze perception and sensing in relation to hardware to provide a solution.
MCA-204 [AI1]-CO-5	Apply the Innovation Canvas to justify potentially successful products.

Semester- II

Course Name: Reinforcement Learning

Course Code (CC): MCA- 204 (AI2)

MCA- 204 (AI2)-CO-1	Analyze RL tasks and the core principles behind the RL, including policies, value functions, deriving Bellman equations to implement in code common algorithms using RL Libraries.
MCA- 204 (AI2)-CO-2	Analyze to tackle traditional control problems, learn and apply tabular approaches.
MCA- 204 (AI2)-CO-3	Understand and work with approximate solutions (deep Q network-based algorithms), learn the policy gradient methods from vanilla to more complex cases
MCA- 204 (AI2)-CO-4	Examine the various tasks and solutions for imitation learning.
MCA- 204 (AI2)-CO-5	Recognize current advanced techniques and applications in RL to create projects.

Semester- II

Course Name: Agile Practices

Course Code (CC): MCA-204 (CC1)

MCA-204 (CC1)-CO-1	Explain common agile practices in DevOps
MCA-204 (CC1)-CO-2	Illustrate Automation testing and continuous integration with Agile.
MCA-204 (CC1)-CO-3	Examine Scrum and Kanban methodologies
MCA-204 (CC1)-CO-4	Utilize various programming methodologies like extreme programming, pair Programming and test-driven development for designing, testing and refactoring.
MCA-204 (CC1)-CO-5	Apply agile practices and plan for agility for agile software development.

Semester- II

Course Name: Design Thinking

Course Code (CC): MCA-204(CC2)

MCA-204(CC2)-CO-1	Understand the importance of design thinking and its different phases & Empathize with user situations and be able to define clear problem statements
MCA-204(CC2)-CO-2	Use the different ideation methods and come with different feasible and viable ideas for solving the problem statements.
MCA-204(CC2)-CO-3	Create prototypes for clear understanding of the problem statement.
MCA-204(CC2)-CO-4	Test the created prototypes and be able to iterate if the design does not meet the customer Requirement
MCA-204(CC2)-CO-5	Apply agile practices and plan for agility for agile software development.

Semester- II

Course Name: Mobile Programming with Android

Course Code (CC): MCA-205 (G1)

MCA-205 (G1)-CO-1	Able to understand the concept of mobile and android applications
MCA-205 (G1)-CO-2	Familiarize with the functional/operational Mobile an android application.
MCA-205 (G1)-CO-3	Able to understand screen design.
MCA-205 (G1)-CO-4	Identify the major data and storage concepts in android programming
MCA-205 (G1)-CO-5	Able to create mobile applications involving data storage in SQLite database

Semester- II

Course Name: Functional Programming Using Python

Course Code (CC): MCA-205 (G2)

MCA-205 (G2)-CO-1	Understand the basis of Python to implement the solutions for various data structure problems.
MCA-205 (G2)-CO-2	Design and develop Object Oriented support and database enables application to solve real world problems.
MCA-205 (G2)-CO-3	Understand the application of NumPy and use them to solve real world data analysis problems
MCA-205 (G2)-CO-4	Understand the basics of Pandas and apply for solving real world problems.
MCA-205 (G2)-CO-5	Ability to implement the solutions for real world problems with NumPy, Pandas and Matplotlib.

Semester- II

Course Name: Block chain Technology

Course Code (CC): MCA-205 (G3)

MCA-205 (G3)-CO-1	Able to implement the block chain
MCA-205 (G3)-CO-2	Familiarize with the functional/operational aspects of cryptocurrency ecosystem.
MCA-205 (G3)-CO-3	Able to implement the smart contracts for use cases
MCA-205 (G3)-CO-4	Identify the major research challenges and technical gaps existing between theory and practice in Blockchain.
MCA-205 (G3)-CO-5	Understand the concept of Hyperledger

Semester- II

Course Name: Natural Language Processing

Course Code (CC): MCA- 205 (AI1)

MCA- 205 (AI1)-CO-1	Understand approaches to syntax and semantics in NLP.
MCA- 205 (AI1)-CO-2	Analyse approaches to discourse, generation, dialogue and summarization within NLP.
MCA- 205 (AI1)-CO-3	Apply current methods for statistical approaches to machine translation.
MCA- 205 (AI1)CO-4	Devise and Apply machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, clustering and unsupervised methods.
MCA- 205 (AI1)-CO-5	Apply log-linear and discriminative models, and the EM algorithm within NLP.

Semester- II

Course Name: Deep Learning

Course Code (CC): MCA- 205 [AI2]

MCA- 205 [AI2]-CO-1	Recognize the characteristics of deep learning models that are useful to solve real-world problems.
MCA- 205 [AI2]-CO-2	Understand different methodologies to create application using deep nets.
MCA- 205 [AI2]-CO-3	Identify and apply appropriate deep learning algorithms for analysing the data for variety of problems.
MCA- 205 [AI2]-CO-4	Design the test procedures to assess the efficacy of the developed model.
MCA- 205 [AI2]-CO-5	Implement different deep learning algorithms and Combine several models in to gain better results.

Semester- II

Course Name: Soft Computing

Course Code (CC): MCA- 205 [AI3]

MCA- 205 [AI3]-CO-1	Analyze the genetic algorithms and their practical applications.
MCA- 205 [AI3]-CO-2	Analyze fuzzy sets, fuzzy logic and use of heuristics based on human experience.
MCA- 205 [AI3]-CO-3	Understand the basic concept of fuzzy sets, fuzzy logic & de-fuzzification.
MCA- 205 [AI3]-CO-4	Provide the mathematical background for carrying out the optimization associated with neural network learning
MCA- 205 [AI3]-CO-5	Analyze the different types of Hybrid system and understand

their practical applications.

Semester- II

Course Name: DevOps Overview and Automation

Course Code (CC): MCA-205 (CC1)

MCA-205 (CC1)-CO-1	Explain traditional software development methodologies like waterfall.
MCA-205 (CC1)-CO-2	Apply the Agile Methodology and comparing various other software development models with agile.
MCA-205 (CC1)-CO-3	Explain implementing Continuous Integration and Continuous Delivery.
MCA-205 (CC1)-CO-4	Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing).
MCA-205 (CC1)-CO-5	Create quick MVP prototypes for modules and functionalities.

Semester- II

Course Name: Application Development Framework for Cloud

Course Code (CC): MCA-205 (CC2)

MCA-205 (CC2)-CO-1	Design, Develop & Deploy real-world applications in the cloud computing platforms they have learnt.
MCA-205 (CC2)-CO-2	Demonstrate the ability to access the various cloud platforms used.
MCA-205 (CC2)-CO-3	Describe the standardization process of cloud platform and various API's.
MCA-205 (CC2)-CO-4	Describe the methods for managing the data in cloud and demonstrate the concepts of automation, provisioning using puppet tool.
MCA-205 (CC2)-CO-5	Develop Applications in the cloud platform.

Semester- II

Course Name: Virtualization

Course Code (CC): MCA-205 (CC3)

MCA-205 (CC3)-CO-1	Categorize the levels of abstraction in a computer system correspond to implementation layers in both hardware and software
MCA-205 (CC3)CO-2	Apply and design the procedure used for concurrency and memory management.
MCA-205 (CC3)-CO-3	Comprehend the basics of virtualization and to differentiate types of Virtualization
MCA-205 (CC3)-CO-4	Develop and provision server and desktop virtualization

MCA-205 (CC3)-CO-5

Analyze the inner-working of a Virtual Machine and its Management

Semester- II

Course Name: Responsive Web Applications Lab

Course Code (CC): MCA-C251

MCA-C251-CO-1

Implement the understood concepts of HTML & CSS to design the layout of HTML document and design static web pages.

MCA-C251-CO-2

Enhance the responsiveness of web site with the integration of Bootstrap Components and Flex.

MCA-C251-CO-3

Learn and demonstrate the basic concepts of client side scripting and various validations constructs using JavaScript, AJAX.

MCA-C251-CO-4

Learn and demonstrate the fundamental concepts of server side scripting and basic programming concepts using PHP.

MCA-C251-CO-5

Develop technical knowledge of database connectivity and validation of web application through MySQL, PHP and JavaScript so that student can meet the current industry, Academic and research requirement.

Semester- II

Course Name: Artificial Intelligence Lab

Course Code (CC): MCA-C252

MCA-C252-CO-1

To Understand the concept of Artificial intelligence.

MCA-C252-CO-2

To apply various search algorithms of artificial intelligence.

MCA-C252-CO-3

To apply knowledge representation and reasoning techniques.

MCA-C252-CO-4

To understand & apply algorithms of artificial intelligence in games.

MCA-C252-CO-5

Apply basic principles of AI in solutions that require problem solving

Semester- II

Course Name: Mobile Programming with Android Lab

Course Code (CC): MCA-253(G1)

MCA-253(G1)-CO-1	To be able to install android studio
MCA-253(G1)-CO-2	To implement the concept of android applications
MCA-253(G1)-CO-3	To implement user interface
MCA-253(G1)-CO-4	To implement database supported applications
MCA-253(G1)-CO-5	To solve real world business problems.

Semester- II

Course Name: Functional Programming using Python Lab

Course Code (CC): MCA-253(G2)

MCA-253(G2)-CO-1	Understand the working of Python IDE various data structure and develop small applications in python
MCA-253(G2)-CO-2	Ability to implement various data structure in python to solve real world problems.
MCA-253(G2)-CO-3	Implement the solutions of real-world problems using NumPy.
MCA-253(G2)-CO-4	Develop and implement .applications using pandas to solve real world problems.
MCA-253(G2)-CO-5	Design develop and implement application using Matplotlib.

Semester- II

Course Name: Blockchain Technology Lab

Course Code (CC): MCA-253(G3)

MCA-253(G3)-CO-1	Learn the tools: Python, VS Code, POSTMAN, FLASK, Node.js, Ganache, and MyEther Wallet.
MCA-253(G3)-CO-2	Understand the concept of Blockchain.
MCA-253(G3)-CO-3	Learn the Cryptocurrencies.
MCA-253(G3)-CO-4	Understand the concept of smart contract.
MCA-253(G3)-CO-5	Learn Blockchain platforms: Ethereum, Hyperledger Fabric, IBM Blockchain and Relictum Pro.

Semester- II

Course Name: Natural Language Processing Lab

Course Code (CC): MCA-253 (AI1)

MCA-253 (AI1)-CO-1	Understand how to apply syntax and semantics in NLP.
MCA-253 (AI1)-CO-2	Devise and Analyze approaches for word analysis and generation.
MCA-253 (AI1)-CO-3	Apply POS tagging through Hidden Markov Model, Viterbi Decoder within NLP.
MCA-253 (AI1)-CO-4	Design, Develop & Deploy the speech signal analysis.
MCA-253 (AI1)-CO-5	Demonstrate the machine learning techniques used in NLP in real life applications.

Semester- II

Course Name: Deep Learning Lab

Course Code (CC): MCA-253 (AI2)

MCA-253 (AI2)-CO-1	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems
MCA-253 (AI2)-CO-2	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
MCA-253 (AI2)-CO-3	Implement deep learning algorithms and solve real-world problems in Keras and Tensor flow.
MCA-253 (AI2)-CO-4	Implement deep learning algorithms using Recurrent Neural Network in real world problems.
MCA-253 (AI2)-CO-5	Implement deep learning algorithms using Convolution Neural Network in real world problems

Semester- II

Course Name: Soft Computing Lab

Course Code (CC): MCA-253 (AI3)

MCA-253 (AI3)-CO-1	Distinguish between hard and soft computing by understanding the components of soft computing.
MCA-253 (AI3)-CO-2	Discover the distinction between learning and programming, as well as actual Neural Network applications (NN).
MCA-253 (AI3)-CO-3	Examine and understand the applications that can benefit from fuzzy logic.
MCA-253 (AI3)-CO-4	Understand the crisp logic to design inference systems.
MCA-253 (AI3)-CO-5	Understand the fundamentals of genetic algorithms, how to utilize GA operators, and its real-life application.

Semester- II

Course Name: DevOps Overview and Automation Lab

Course Code (CC): MCA-253 (CC1)	
MCA-253 (CC1)-CO-1	Explain traditional software development methodologies like waterfall.
MCA-253 (CC1)-CO-2	Apply the Agile Methodology and comparing various other software development models with agile.
MCA-253 (CC1)-CO-3	Explain implementing Continuous Integration and Continuous Delivery.
MCA-253 (CC1)-CO-4	Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing).
MCA-253 (CC1)-CO-5	Create quick MVP prototypes for modules and functionalities.

Semester- II	
Course Name: Application Development Framework for Cloud Lab	
Course Code (CC): MCA-253 (CC2)	
MCA-253 (CC2)-CO-1	Design, Develop & Deploy real-world applications in the cloud computing platforms they have learnt
MCA-253 (CC2)-CO-2	Demonstrate the ability to access the various cloud platforms used.
MCA-253 (CC2)-CO-3	Describe the standardization process of cloud platform and various API's
MCA-253 (CC2)-CO-4	Describe the methods for managing the data in cloud and demonstrate the concepts of automation, provisioning using puppet tool
MCA-253 (CC2)-CO-5	Develop Applications in the cloud platform

Semester- II	
Course Name: Virtualization Lab	
Course Code (CC): MCA-253 (CC3)	
MCA-253 (CC3)-CO-1	Categorize the levels of abstraction in a computer system correspond to implementation layers in both hardware and software.
MCA-253 (CC3)-CO-2	Apply and design the procedure used for concurrency and memory management.
MCA-253 (CC3)-CO-3	Comprehend the basics of virtualization and to differentiate types of Virtualization.
MCA-253 (CC3)-CO-4	Develop and provision server and desktop virtualization.
MCA-253 (CC3)-CO-5	Analyze the inner-working of a Virtual Machine and its

Management.

Semester- II

Course Name: Mini Project-II

Course Code (CC): MCA-S254

MCA-S254-CO-1	Conceptualize, design and implement solutions for specific problems.
MCA-S254-CO-2	Communicate the solution through presentations and technical reports.
MCA-S254-CO-3	Apply resource management skills for projects.
MCA-S254-CO-4	Synthesis self-learning, team work and ethics.
MCA-S254-CO-5	Produce entrepreneurs who can develop customized solutions for small to large Enterprises.

Semester- III

Course Name: Application Development Using .Net Technology Framework

Course Code (CC): MCA-C301

MCA-C301-CO-1	Understand the basic concept of programming. To develop problem analysis and problem solving skills for real time problem using .NET framework technology.
MCA-C301-CO-2	Identify and analyze the existing problems in real time environment and develop the new solution using the programming concept using .net framework technology.
MCA-C301-CO-3	Develop critical thinking, analytical skills to develop new window and web application for existing problems using .net framework technology.
MCA-C301-CO-4	Implement validation controls on web based application using ASP.NET validation, standard and rich controls.
MCA-C301-CO-5	Develop technical knowledge of ADO.net, Asp.net and window programming so that student can meet the current industry, academic and research requirement.

Semester- III

Course Name: Research Methodology and IPR

Course Code (CC): MCA-C302

MCA-C302-CO-1	Understand the various types of research methodologies used to identify/analyze a problem and thus formulate the problem statement using various research components.
MCA-C302-CO-2	Develop technical writing skills and ability to present the inferred knowledge through rigorous literature review using modern tools and soft skills.
MCA-C302-CO-3	Develop competent research skills and thus enhance technical knowledge and make them employable.
MCA-C302-CO-4	Critically analyze the interpreted result of designed model of existing problem using applications of research components and propose alternative solutions.
MCA-C302-CO-5	Demonstrate the awareness to follow plans for learning, documenting new things keeping IPR in consideration and thus enhances employable and competitive skills

Semester- III

Course Name: Advance Java Script

Course Code (CC): MCA-E303[DE1]

MCA-E303[DE1]-CO-1	Develop understanding of fundamental concepts of trending web technologies and implement them to solve real world problems as per IT industry standard
MCA-E303[DE1]-CO-2	Able to analyze the problem and Implement the web technologies concepts along with research oriented approach of problem solving
MCA-E303[DE1]-CO-3	Design and develop solution by using web development frameworks like and gain confidence in developing solutions with critical thinking and analyzing skills
MCA-E303[DE1]-CO-4	Able to accomplish any web development project, applying collaborated web technologies and gain project planning, analyzing, validating and reporting skills
MCA-E303[DE1]-CO-5	Enhance web development skills and confidence by understanding concepts and implement trending technologies to solve problems which lead to increase employability skills and opportunities.

Semester- III

Course Name: Advance Java

Course Code (CC): MCA-E303[DE2]

MCA-E303[DE2]-CO-1	Understand the concepts of Advance Java for rapid was application development using JSP
MCA-E303[DE2]-CO-2	Understand the concept of Java Server Faces Framework to design real time web application
MCA-E303[DE2]-CO-3	Understand the concept of Hibernate to implement Modern database supported application using Hibernate
MCA-E303[DE2]-CO-4	Understand the concept of Spring Framework to develop the Software as per current industry requirement
MCA-E303[DE2]-CO-5	Understand the concept of Spring Boot Framework to develop the Software as per current industry requirement

Semester- III

Course Name: Organizational System and Management

Course Code (CC): MCA-304[GE1]

MCA-304[GE1]-CO-1	Understand the meaning of management, organization and organization culture.
MCA-304[GE1]-CO-2	Analyze the roles and responsibilities of different people at hierarchy.
MCA-304[GE1]-CO-3	Understand the role of staffing and controlling in an organizational system.
MCA-304[GE1]-CO-4	Understand various processes involved in different functional areas.
MCA-304[GE1]-CO-5	Understand and analyse the role of Information systems in a business and provide IT solutions to it.

Semester- III

Course Name: Business Case Studies

Course Code (CC): MCA-304[GE2]

MCA-304[GE2]-CO-1	Understand working of Inventory Control System.
MCA-304[GE2]-CO-2	Understand working of Payroll Management System.
MCA-304[GE2]-CO-3	Understand working of Insurance Sector.
MCA-304[GE2]-CO-4	Understand Banking Operations.
MCA-304[GE2]-CO-5	Understand Market Management, Supply Chain Management, Logistics, and Advertising.

Semester- III

Course Name: Big Data

Course Code (CC): MCA-305[G1]

MCA-305[G1]-CO-1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
MCA-305[G1]-CO-2	Learn how to navigate the Hadoop ecosystem and understand how to optimize its use.
MCA-305[G1]-CO-3	Able to access and process data on Distributed File System.
MCA-305[G1]-CO-4	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data.
MCA-305[G1]-CO-5	Apply the knowledge of Hive, PIG, YARN, Sqoop, Flume and HBase in different IT Solutions.

Semester- III

Course Name: Cloud Application Development

Course Code (CC): MCA-305[G2]

MCA-305[G2]-CO-1	Design, Develop & Deploy real-world applications in the cloud computing platforms they have learnt.
MCA-305[G2]-CO-2	Demonstrate ability to access various common cloud services.
MCA-305[G2]-CO-3	Describe the standardization process of cloud platform and various API's.
MCA-305[G2]-CO-4	Describe the methods for managing the data in the cloud and demonstrate the concepts of automation, provisioning using puppet tools.
MCA-305[G2]-CO-5	Analyse the significance of virtualization in Cloud Computing.

Semester- III

Course Name: Computer Vision

Course Code (CC): MCA-305[A1]

MCA-305[A1]-CO-1	Apply the basic image enhancement operation for object recognition.
MCA-305[A1]-CO-2	Understand the pattern recognition and classification approaches for implementing the visual system.
MCA-305[A1]-CO-3	Identify and apply computer vision and machine learning techniques in various real-time Interdisciplinary projects.
MCA-305[A1]-CO-4	Developed the practical skills necessary to build computer vision applications.
MCA-305[A1]-CO-5	Implement object and scene recognition and categorization from images.

Semester- III

Course Name: Predictive Analytics

Course Code (CC): MCA-305[AI2]

MCA-305[AI2]-CO-1	Understand the process of formulating business objectives, data selection/collection, preparation and process to successfully design, build, evaluate and implement predictive models for a various business application.
MCA-305[AI2]-CO-2	Compare the underlying predictive modeling techniques
MCA-305[AI2]-CO-3	Select appropriate predictive modeling approaches to identify cases to progress with
MCA-305[AI2]-CO-4	Developed the technical skills necessary to apply forecasting and prediction models in real life applications.
MCA-305[AI2]-CO-5	Apply predictive modelling approaches on real life data.

Semester- III

Course Name: Cloud Storage Technologies

Course Code (CC): MCA- 305[CC1]

MCA- 305[CC1]-CO-1	Propose a plan to store, maintain, and deliver the massive amounts of media, software, documents, and other digital objects
MCA- 305[CC1]-CO-2	Create a comparative report on how to Store/ access data using different cloud storage technologies for a range of applications.
MCA- 305[CC1]-CO-3	Explain the various architectures of different cloud storage.
MCA- 305[CC1]-CO-4	Describe approaches to virtualize and integrate multiple storage platforms
MCA- 305[CC1]-CO-5	Devise a plan to secure and manage the storage infrastructure.

Semester- III

Course Name: Web Services

Course Code (CC): MCA- 305[CC2]

MCA- 305[CC2]-CO-1	Understand the concepts of web services and how service-oriented architectures are driving the virtualization of cloud resources.
MCA- 305[CC2]-CO-2	Recognize meaning of web enterprise architecture and SOA.
MCA- 305[CC2]-CO-3	Describe the micro services and enterprise application patterns.
MCA- 305[CC2]-CO-4	Analyze the various semantic web services
MCA- 305[CC2]-CO-5	Design, Develop & Demonstrate web services.

Semester- III

Course Name: Application Development Using .Net Technology Framework Lab

Course Code (CC): MCA-C351

MCA-C351-CO-1	Understand the working of visual studio IDE with the fundamentals concepts of programming using C# .NET.
MCA-C351-CO-2	Develop the fundamentals of Object-oriented programming to create console application using C#.net.
MCA-C351-CO-3	Analysis the critical problems of the real time environment and able to design new windows application using windows programming constructs through c#.net.
MCA-C351-CO-4	Learn to create web application and implement validation controls on web-based application using ASP.NET validation, standard and rich controls.
MCA-C351-CO-5	Develop technical knowledge of ADO.net, Asp.net and window programming so that student can meet the current industry, academic and research requirement.

Semester- III

Course Name: Advance Java Script Lab

Course Code (CC): MCA-C352(DE1)

MCA-C352(DE1)-CO-1	Implement the understood concepts of Node.js to develop interactive web applications.
MCA-C352(DE1)-CO-2	Implement form validation using express-validator module in Node.js
MCA-C352(DE1)-CO-3	Learn and demonstrate the basic concepts of client side scripting and various validations constructs using JavaScript, AJAX and Angular
MCA-C352(DE1)-CO-4	Learn and demonstrate the fundamental concepts of server side scripting and basic programming concepts using Angular framework.
MCA-C352(DE1)-CO-5	Develop technical knowledge of database connectivity and validation of web application through MongoDB, Angular and Node.js so that student can meet the current industry, academic and research requirement.

Semester- III

Course Name: Advance Java Lab

Course Code (CC): MCA-352 (DE2)

MCA-352 (DE2)-CO-1	Design and Develop Web applications with database connectivity using Java Server Pages
MCA-352 (DE2)-CO-2	Design and Develop Web application to fulfill current industry requirement using Java/Server Faces and Maven

MCA-352 (DE2)-CO-3	Implements advanced database enabled Web applications using Hibernate as per current industry requirement.
MCA-352 (DE2)-CO-4	Develop the solutions of real time problems using Spring Framework.
MCA-352 (DE2)-CO-5	Develop dynamic web applications using Spring Boot to solve real time industry problems.

Semester- III

Course Name: Big Data Lab

Course Code (CC): MCA-353 (G1)

MCA-353 (G1)-CO-1	Understand and apply the Perform setting up and Installing Hadoop in its three operating modes
MCA-353 (G1)-CO-2	Implementing the basic commands of LINUX Operating System and the file management tasks in Hadoop.
MCA-353 (G1)-CO-3	Understand Map Reduce Paradigm by applying Map Reduce program that mines weather data, matrix multiplication with Hadoop MapReduce.
MCA-353 (G1)-CO-4	Understand the installation of PIG, Pig Latin scripts sort, group, join, project, and filter your data.
MCA-353 (G1)-CO-5	Understand the installation of HIVE and able to apply Hive to create, alter, and drop Databases, tables, views, functions, and indexes.

Semester- III

Course Name: Cloud Application Development Lab

Course Code (CC): MCA-353 (G2)

MCA-353 (G2)-CO-1	Design, Develop & Deploy real-world applications in the cloud computing platforms they have learnt.
MCA-353 (G2)-CO-2	Demonstrate the ability to access the various cloud platforms used.
MCA-353 (G2)-CO-3	Develop an application by using various API's.
MCA-353 (G2)-CO-4	Demonstrate and implement the concepts of automation, provisioning using puppet tool.
MCA-353 (G2)-CO-5	Design Applications using different web app frameworks.

Semester- III

Course Name: Computer Vision Lab	
Course Code (CC): MCA-353 (AI1)	
MCA-353 (AI1)-CO-1	Implement fundamental image processing techniques required for computer vision.
MCA-353 (AI1)-CO-2	Implement the Image formation and Pre-processing.
MCA-353 (AI1)-CO-3	Implement object recognition, vision and motion related techniques.
MCA-353 (AI1)-CO-4	Identify and apply computer vision techniques in medical image analysis.
MCA-353 (AI1)-CO-5	Identify and apply computer vision and machine learning techniques in various real-time interdisciplinary projects.

Semester- III	
Course Name: Predictive Analytics Lab	
Course Code (CC): MCA-353 (AI2)	
MCA-353 (AI2)-CO-1	Developed the practical skills necessary to apply forecasting and prediction models in real life applications.
MCA-353 (AI2)-CO-2	Apply supervised and unsupervised learning for predictive analysis
MCA-353 (AI2)-CO-3	Devise different prediction algorithms for weather forecasting and medical data.
MCA-353 (AI2)-CO-4	Identify and Compare the underlying predictive modelling techniques.
MCA-353 (AI2)-CO-5	Apply predictive modeling approaches using a suitable package in real life applications.

Semester- III	
Course Name: Cloud Storage Technologies Lab	
Course Code (CC): MCA-353 (CC1)	
MCA-353 (CC1)-CO-1	Propose a plan to store, maintain, and deliver the massive amounts of media, software, documents, and other digital objects
MCA-353 (CC1)-CO-2	Create a comparative report on how to Store/ access data using different cloud storage Technologies for a range of applications.
MCA-353 (CC1)-CO-3	Explain the various architectures of different cloud storage.
MCA-353 (CC1)-CO-4	Describe approaches to virtualize and integrate multiple storage platforms

MCA-353 (CC1)-CO-5 Devise a plan to secure and manage the storage infrastructure.

Semester- III

Course Name: Web Services Lab

Course Code (CC): MCA-353 (CC2)

MCA-353 (CC2)-CO-1	Understand the concepts of web services and how service-oriented architectures are driving the virtualization of cloud resources.
MCA-353 (CC2)-CO-2	Recognize meaning of web enterprise architecture and SOA.
MCA-353 (CC2)-CO-3	Describe the micro services and enterprise application patterns
MCA-353 (CC2)-CO-4	Analyze the various semantic web services
MCA-353 (CC2)-CO-5	Design, Develop & Demonstrate web services.

Semester- III

Course Name: Mini Project-III

Course Code (CC): MCA-S354

MCA-S354-CO-1	Define the problems in various domains that can be solved using computer applications.
MCA-S354-CO-2	Develop the ability to identify alternative solutions and plan the project.
MCA-S354-CO-3	Analyze and Design the software development process.
MCA-S354-CO-4	To develop coding and testing skills for software development
MCA-S354-CO-5	Build technical presentation skills and Create project documentation of the complete process.

Semester- III

Course Name: Summer Internship Program

Course Code (CC): MCA-S355

MCA-S355-CO-1	Prepare graduates who can communicate effectively.
MCA-S355-CO-2	Prepare graduates to be productive contributors in professional practice and some other career path.
MCA-S355-CO-3	Prepare graduates with a broad knowledge of industry.
MCA-S355CO-4	Prepare graduates with key knowledge and skills in applied software design, analysis.
MCA-S355-CO-5	Students gain more experience in accomplishing a long-term project, and managing and completing the projects in the industry.

Semester- III

Course Name: Research Paper Presentation

Course Code (CC): MCA-S356

MCA-S356-CO-1	Develop a protocol for a literature review of a research topic.
MCA-S356-CO-2	Discuss the implications of the report.
MCA-S356-CO-3	Demonstrate competent verbal and written skills.
MCA-S356-CO-4	Comprehensively search the literature using appropriate keywords and databases.
MCA-S356-CO-5	Critically appraise literature relevant to a research topic or question.

Semester- IV

Course Name: Industrial Training

Course Code (CC): MCA-C401

MCA-C401-CO-1	Enhance the presentation and communication skills of an individual by project presentation to face a prospective technical interview and able Create technical documentation of the required project.
MCA-C401-CO-2	Identify, formulate, and solve various project planning strategies, including the Pert chart, Gantt chart, specification, design and implementation of software systems that meet performance, maintenance and quality requirements.
MCA-C401-CO-3	Enhance project-based learning skills, such as to define the problem, identify alternative solutions, plan the project, execute the plan, monitor and control the project progress for successful designing.
MCA-C401-CO-4	Develop the critical analysis skills and able to apply various testing tools like Unit testing, System testing, Black Box testing, Alpha testing and Beta testing techniques on the project.
MCA-C401-CO-5	Become employable/entrepreneurs who can analyze the problem and develop customized solution using programming language for small to large Enterprises.