Dr. D.Y. Patil Institute of Management and Entrepreneur Development

Master of Computer Application(MCA)

Programme Outcomes (POs)

Sr. No.	Programme Outcomes (Pos)
PO1	(Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
PO2	(Problem Analysis): Identify, review, formulate and analyse problems for primarily focussing on customer requirements using critical thinking frameworks.
PO3	(Development of Solutions): Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.
PO4	(Modern Tool Usage): Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.
PO5	(Individual and Teamwork): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.
PO6	(Project Management and Finance): Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.
PO7	(Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware
PO8	(Life-long learning): Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

Programme Educational Objectives (PEOs)

Sr. No.	Programme Educational Objectives (PEO)
PEO1	Apply the knowledge of computer application to find solutions for real-life application.
PEO2	Ability to analyze, design, develop and maintain the software application with latest technologies.
PEO3	Utilize skills and knowledge for computing practice with commitment to social, ethical, cyber and legal values.
PEO4	Inculcate employability and entrepreneur skills among students who can develop customized solutions for small to large Enterprises

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Course Outcome(CO's)

1. Python Programming

Sr. No.	Course Outcome
CO1	Apply To learn and apply basic constructs of python such as data, operations, conditions, loops, data types.
CO2	Apply To understand advance concepts of python and apply it for solving the complex problems.
CO3	Apply To develop Python programs that incorporate OOPS concept, regular expressions and multithreading for complex problem-solving and performance enhancement.
CO4	Apply To implement various types of database operations in MongoDB.
CO5	Apply To develop comprehensive web applications using Django Framework.

2. Data Structure and Algorithms

CO1	Implement linear data structures and its various real time applications
CO2	Demonstrate linked list data structure and its types
CO3	Demonstrate dynamic linear data structures like stack, queue and analyze their various applications.
CO4	Implement techniques of Non-Linear data structures like Tree and Graph
CO5	Demonstrate and compare various approaches of Searching, Sorting, Hashing and Heaps

3. Advanced DBMS

CO1	Demonstrating the concept of fundamentals of relational database systems include: data models, database & DDBS architectures, and ER features.
CO2	Understand the concepts of transaction concurrency control, Query Processing and Security aspects
CO3	Apply SQL & NoSQL development tools on different types of Schemas.
CO4	Demonstrate database design and Computation techniques for parallel and distributed database Technology.
CO5	Implement Real Time applications using Database tools.

4. Business Statistics

CO1	Understand the role and importance of statistics in business decision-making.
CO2	Apply measures of central tendency and dispersion to summarize data.
CO3	Understand basic probability concepts and rules.
CO4	Apply correlation and regression techniques to analyze relationships between variables
CO5	Apply time series analysis techniques to forecast business trends.

5. Software Engineering and Project Management

CO1	Apply concepts, principles of software engineering to develop comprehensive Software Requirement Specification.
CO2	Use software engineering analysis and design modelling technique to represent systems.
CO3	Illustrate Software Project Management models for effective plan, manage and enhance projects.
CO4	Implement Agile methodologies to enhance project adaptability and responsiveness to changing requirements.
CO5	Employ Agile tools effectively to manage, navigate and facilitate collaboration and streamline project workflows in software development.

6. Fundamentals of Cloud Computing

CO1	Describe the concepts of Cloud Computing, Dockers and Container.
CO2	Explore the various Cloud Service Models and Deployment Models.
CO3	Implement concepts, hypervisors, virtual machines, VMware, Microsoft Hyper-V, and Open-Source Virtualization Manager.
CO4	Describe the Cloud Architecture and relate Cloud to SOA along with SLA management, cloud bursting strategies.
CO5	Compare different Cloud Platforms – AWS, GCP, IBM Cloud

7. Web Development

CO1	Design appropriate user interfaces by implementing new features of HTML5
CO2	Design user interfaces and implement CSS3 features
CO3	Demonstrate the concept of responsive web design and its importance
CO4	Build Dynamic web pages using server-side PHP programming
CO5	Develop and deploy web application

8. Fundamentals of Data Science

CO1	Understand the core concepts, techniques and methodologies used in data science
CO2	Apply Computational Mathematics concepts to solve data-related problems effectively.
CO3	Apply the principles of data collection, cleaning, and pre-processing.
CO4	Perform exploratory data analysis using Numpy and Pandas to derive insights from datasets.
CO5	Apply the strategies for visualizing the data.

9. Introduction to Cyber Security

CO1	Understanding the knowledge of cybercrimes, cyber security and cyber-attacks, vulnerabilities, techniques
CO2	Illustrate the security aspects of social media, network platforms and ethical aspects associated with use of social media
CO3	Articulate the importance of personal data theft, financial frauds and identify data privacy and security
CO4	Apply existing legal framework and laws on cyber security.
CO5	Understand the need of information security, standards and polices

10. Practical based on Python and DS

CO1	Demonstrate Basics of Python and OOPs concepts.
CO2	Demonstrate CRUD Operation using MongoDB.
CO3	Design and Develop web application using DJango.
CO4	Implement Linear data structure like stack, queue and Linked list and demonstrate various searching and sorting techniques
CO5	Implement various operation of non-Linear data structure like Tree and Graph

11. Mini Project

CO1	Apply knowledge of software engineering principles and methodologies in designing and implementing the project
CO2	Demonstrate the ability to develop a functioning software application or solution that meets specified requirements and objectives
CO3	Design comprehensive documentation that includes project requirements, design specifications, implementation details, testing strategies, and user manuals

12. IKS

CO1	Understand about Indianan philosophy, Culture, knowledge in different domains.
CO2	Explore the ethical and moral perspectives within Indian philosophical and spiritual traditions.
CO3	Understand Indian knowledge system and apply in current area and applications.
CO4	Understand the basics of Indian ethics and values
CO5	Explore the Indian traditions and their application in modern contexts.

13. Java Programming

CO1	Apply the concept of Object-Oriented Programming to map and solve simple real world problem
CO2	To design and develop robust, efficient, multithreaded and scalable Java applications using the collection framework, multithreading, and exception handling.
CO3	To develop Web application for solving real life problem using Servlet
CO4	To develop Web application for solving real life problem using JSP, JDBC
CO5	To develop robust web applications using Spring MVC

14. Optimization Techniques

CO1	Understand and formulate linear programming models to solve optimization problems in various business contexts.
CO2	Apply sequential models to make informed decisions in dynamic and uncertain environments.
CO3	Utilize Markov chains and simulation techniques to model
CO4	Apply PERT/CPM techniques to plan, schedule, and control projects effectively, including managing replacement decisions.
CO5	Apply decision-making processes and strategic interactions using decision theory and game theory frameworks

15. Software Testing and Quality Assurance

CO1	Understand the role of software quality assurance in contributing to the efficient delivery of software solutions.
CO2	Understand specific software tests with well-defined objectives and targets.
CO3	Apply the software testing techniques in commercial environments.
CO4	Construct test strategies and plans for software testing.
CO5	Demonstrate the usage of software testing tools for test effectiveness, efficiency, and coverage.

16. Research Methodology

CO1	Understand the basic concepts, purposes, and significance of research methodology in academic and professional contexts.
CO2	Apply various research designs and their appropriateness for different types of research questions and objectives
CO3	Apply suitable data collection and sampling methods to gather reliable and valid data for research studies.
CO4	Use appropriate statistical tools and techniques to demonstrate research data and interpret the results effectively.
CO5	Apply skills in writing clear, coherent, and well-structured research reports that effectively communicate research findings.

17. Cloud Computing Management and Security

CO1	Understand and describe the fundamentals of Cloud Management, Security Concepts, and Quality services.
CO2	Understand and explain the concept of Cloud Database and File System with Cloud Database Services.
CO3	Demonstrate Security Concepts in AWS and security services.
CO4	Recognize the Cloud Backup and Disaster Recovery strategies.
CO5	Use and understand the various Cloud Compute Services.

18. JavaScript

CO1	Utilize Basic JavaScript concepts for writing simple Java script program.
CO2	Design and develop simple application using build-in objects and browser object Model
CO3	Implement the concepts of OOPs , event handling and Asynchronous JavaScript for developing simple real life problem solving web application
CO4	Create interactive web page of application for problem solving
CO5	Demonstrate server-side and client-side aspects of web applications using Node.js and React.

19. Machine Learning Techniques

CO1	Describe the workflow of a machine learning project, including data pre-processing, model training, evaluation, and deployment.
CO2	Apply the various algorithms of supervised and learning
CO3	Apply the various algorithms of unsupervised learning
CO4	Apply the fundamental algorithms in semi-supervised and reinforcement learning.
CO5	Apply real-world applications of supervised and unsupervised learning across diverse domains.

20. Essentials of Cyber Security

CO1	Understand the importance of cybersecurity practices, understand how to secure a network against intrusion tactics, understand types cyber-crime attacks
CO2	Understand how data is sent and received over a network, Incidence response, Disaster Recovery
CO3	Identify common risks, threats, and vulnerabilities, as well as techniques to mitigate them
CO4	Evaluate risk and identify security management tools, apply cyber security technologies
CO5	Understand digital forensics and its needs

21. Essentials of Cloud Computing and Security

CO1	Describe the concepts of Cloud Software Security Fundamentals.
CO2	Discuss and Classify different Programming Environments.
CO3	Define Emerging Trends in Cloud Computing.
CO4	Discuss Resource pooling, Sharing and Provisioning
CO5	Demonstration of various applications in cloud computing.

22. Advance Web Development

CO1	Implement a Web Server in Node
CO2	Apply TypeScript features such as decorators, generics, and modules for creating reusable and maintainable code
CO3	Implement concepts and methods of Angular
CO4	Implement Angular services, dependency injections and Asynchronous operations
CO5	Develop website using Next.js

23. Power BI

CO1	Demonstrate the concepts and importance of data modelling, data source, data cleaning, data transformation in Power BI.
CO2	Analyse data relationships and model data using DAX
CO3	Assess the interactivity of visualizations using slicers, filters, and drill through features.
CO4	Use M Queries to extract, transform, and load data from various sources
CO5	Examine Power BI solutions that solve real-world business problems as outlined in case studies

24. Essentials of Information Security

CO1	Understand the fundamental concepts of cybersecurity, including its importance and various threats in cyberspace.
CO2	Understand the vulnerable to threats in systems
CO3	Design and Apply the need for security architecture and its relevance to systems, service continuity and reliability
CO4	Ability to describe the various auditing tools that can be used in cybersecurity management
CO5	Identifies the needs of users in the field of developing information systems and building secure computer networks.

25. Practical based on Java

CO1	Demonstrate fundamental concepts of Java
CO2	Design and implement classes and objects in Java, applying principles of inheritance, polymorphism, encapsulation, and abstraction
CO3	Establish database connectivity using JDBC, execute SQL queries, handle result sets, and manage database transactions from Java applications
CO4	Develop dynamic web applications using Java Servlets and JSP,
CO5	Use spring MVC framework to build web application.

26. Mini Project

CO1	Apply knowledge of software engineering principles and methodologies in designing and implementing the project
CO2	Demonstrate the ability to develop a functioning software application or solution that meets specified requirements and objectives
CO3	Design comprehensive documentation that includes project requirements, design specifications, implementation details, testing strategies, and user manuals

27. IKS
28. Organizational Behaviour

CO1	Understand how individual behaviour influences organizational performance and culture.
CO2	Apply emotional intelligence and stress management strategies to improve workplace well-being and effectiveness.
CO3	Apply group dynamics and decision-making models to enhance teamwork and organizational outcomes.
CO4	Analyse and apply motivational theories to improve employee’s performance and organizational success.
CO5	Understand and adapt emerging trends in organizational behaviour and culture in a changing work environment.

29. Design and Analysis of Algorithm

CO1	Understand the fundamental concepts of algorithm analysis and complexity.
CO2	Apply Divide and Conquer strategies to solve problems
CO3	Apply Greedy algorithms and other optimization techniques to solve real-world problems.
CO4	Apply advanced algorithmic strategies like Backtracking and Dynamic Programming with real-world applications
CO5	Understand NP-Completeness, polynomial-time reductions, and emerging algorithmic trends

30. Cloud API's and Services

CO1	Understand cloud API concepts, including design, authentication, integration, and best practices for interacting with cloud services
CO2	Integrate and interact with various cloud APIs (e.g., AWS, Google Cloud, Azure) to utilize services like storage, compute, machine learning, and databases
CO3	Integrate and deploy machine learning models using cloud-based AI APIs to solve real-world problems efficiently
CO4	Understand and implement scalable, event-driven applications using serverless computing and microservices architecture
CO5	Apply learned concepts to real-world industry problems through a hands-on capstone project, demonstrating practical expertise

31. Mobile Application Development

CO1	Design the user interface, build a functional Android application using Android Studio.
CO2	Enhance user experience by using interactive tools such as Intents, Adapters, Dialogs, Menus, and Notifications in Android applications.
CO3	Implement data storing and retrieval methods in android using SQLite and Firebase in Android applications
CO4	Create interactive cross-platform mobile applications using React Native.
CO5	Design and build scalable cross-platform mobile apps using Flutter and Dart.

32. Tableau

CO1	Apply data connection, preparation, and visualization techniques in Tableau for effective analysis.
CO2	Apply data management techniques in Tableau to clean, integrate, optimize, and manage data sources for effective visualization and analysis.
CO3	Apply dashboard design and optimization techniques in Tableau to create interactive and shareable visualizations.
CO4	Apply advanced calculations and analytics techniques to enhance Tableau visualizations.
CO5	Apply Tableau Server installation, configuration, and management techniques for efficient data sharing, maintenance, and collaboration

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33. End -Point Security

CO1	Understand and apply the principles of authentication, access control, and data protection on endpoints.
CO2	Implement and configure endpoint protection measures and control
CO3	Use endpoint security tools and techniques to manage, monitor, and analyze endpoint threats.
CO4	Apply best practices for securing various types of endpoints, including workstations, mobile devices, and IoT devices.
CO5	Develop and implement endpoint security policies and strategies for an organization.

34. Cloud Migration and Management

CO1	Understand Fundamental Concepts of Cloud Migration.
CO2	Apply Different Cloud Migration Strategies and Best Practices.
CO3	Analyze Cloud Governance Frameworks and Compliance Strategies.
CO4	Evaluate Cloud Service Providers Based on Quality of Service, Pricing, and Reliability.
CO5	Assess Emerging Trends and Innovations in Cloud Migration.

35. MERN Stack Development

CO1	Build scalable and efficient server-side applications using Node.js and integrate them with MERN stack
CO2	Design schemas, perform CRUD operations, and integrate with Node.js applications using MongoDB
CO3	Develop RESTful APIs, implement middleware, and handle authentication for secure web applications using Express.js.
CO4	Create dynamic, interactive, and state-managed single-page applications (SPAs) with efficient UI components using ReactJS
CO5	Integrate MongoDB, Express, React, and Node.js, and develop, deploy scalable MERN applications.

36. Deep Learning

CO1	Understand the fundamentals of deep learning, neural network architectures, optimization techniques, and deep learning frameworks.
CO2	Develop proficiency in applying Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs) for image classification, object detection, and image segmentation.
CO3	Use RNNs, LSTMs, GRUs, and Transformers for NLP tasks like sentiment analysis, machine translation, and text summarization.
CO4	Design and implement advanced deep learning models, including generative models, reinforcement learning, and hyperparameter optimization techniques.
CO5	Apply deep learning to real-world problems, culminating in a capstone project involving end-to-end model development, deployment, and ethical considerations.

37. Ethical Hacking

CO1	Describe the phases of hacking, hacker types, and ethical/legal aspects of cybersecurity.
CO2	Perform reconnaissance, footprinting, and scanning using Nmap, Google Dorking, and Shodan.
CO3	Exploit vulnerable machines using Metasploit and demonstrate privilege escalation techniques.
CO4	Understand and Appreciate the role of Cryptography in Cybersecurity
CO5	Exploit web applications and learn to crack the passwords

38. Enterprise Resource Planning (ERP)

CO1	Describe the fundamental concepts of ERP and analyze the growth and evolution of ERP systems.
CO2	Demonstrate an understanding of related technologies and evaluate their integration with ERP systems.
CO3	Categorize the functionalities of core ERP modules and demonstrate how they support business processes.
CO4	Examine the ERP implementation life cycle and assess the success and failure factors.
CO5	Outline current trends in ERP and foresee their impact on future organizational structures and processes.

39. E-Commerce

CO1	Understand and Apply Different E-Commerce Business Models
CO2	Design and Manage E-Commerce Websites
CO3	Understand the Digital Marketing Strategies for E-Commerce
CO4	Analyze E-Commerce Data and Make Strategic Decisions
CO5	Navigate Security, Legal, and Ethical Challenges in E-Commerce

40. Social media Marketing

CO1	Explain the principles of Marketing, Digital Marketing, and Social Media Marketing.
CO2	Define social media marketing goals and strategy setting necessary to achieve successful online campaigns.
CO3	Explain the concepts and significance of Social Media and Search Engine Optimization (SEO).
CO4	Compare various channels of social media through which it operates, and its role in marketing strategy
CO5	Describe the significance and function of content management in social media marketing with reference to IT Act

41. Innovation and Entrepreneurship Development

CO1	Demonstrate the ability to generate innovative business ideas and recognize viable entrepreneurial opportunities
CO2	Develop a comprehensive business plan and formulate strategies to achieve business goals effectively.
CO3	Identify appropriate financing options and develop strategies to scale a business sustainably.
CO4	Apply legal knowledge and ethical considerations to make informed business decisions and navigate challenges in entrepreneurship.
CO5	Leverage emerging technologies to create innovative solutions and enhance business growth.

42. Practical based on Electives IV and V(Practical Based on Cloud APIs, Services, Migration and Management)

CO1	Apply cloud services using API's/SDK's of providers like AWS, Azure, and GCP.
CO2	Understand and implement cloud migration strategies for transitioning applications, databases, and workloads from on-premise to cloud environments using different tools.
CO3	Develop and Implement strategies for managing and monitoring cloud resources.
CO4	Apply automation techniques for infrastructure provisioning and scaling using cloud-native and third-party tools.
CO5	Assess and compare cloud deployments by analyzing performance, cost efficiency, reliability, and scalability to optimize operational effectiveness and decision-making.

43. Practical based on Electives IV and V (Practical Based on MAD and MERN Stack Development)

CO1	Design user interfaces and functional components for both mobile and web applications using Android Studio, ReactJS, React Native, and Flutter.
CO2	Implement dynamic and interactive features in mobile and web applications using tools and concepts like Intents, Adapters, Menus, Notifications in Android, and state management, routing, and UI events in ReactJS/React Native.
CO3	Develop secure backend services and RESTful APIs using Node.js and Express.js, including integration of middleware, authentication mechanisms, and server-side logic for both mobile and web environments.
CO4	Perform data handling operations such as CRUD, real-time synchronization, and cloud storage by integrating SQLite, Firebase, and MongoDB across full-stack and mobile applications.
CO5	Build and deploy scalable full-stack and cross-platform applications by integrating technologies like MERN stack, React Native, and Flutter.

44. Practical based on Electives IV and V (Practical Based on Tableau and Deep Learning)

CO1	Import, clean, and visualize data using Tableau to uncover patterns and trends.
CO2	Develop interactive dashboards and storyboards to present analytical insights.
CO3	Apply Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs) to solve image classification and object detection problems
CO4	Analyze the performance of RNNs, LSTMs, and Transformer models for NLP tasks
CO5	Create and evaluate deep learning models for real-world problems

45. Practical based on Electives IV and V (Practical Based on End-Point Security and Ethical Hacking)

CO1	Describe types of threats to end-point systems and their countermeasures.
CO2	Configure and implement endpoint security tools such as antivirus, firewall, and encryption.
CO3	Use ethical hacking tools (e.g., Nmap, Wireshark, Metasploit, Google Dorking, Shodan etc.) to identify vulnerabilities.
CO4	Conduct vulnerability assessments and penetration testing in simulated environments.
CO5	Recommend and implement security best practices based on test results to strengthen system defences.

46. Research Project

CO1	Demonstrate a clear understanding of research concepts, processes, and methodologies, including literature review and research proposal development.
CO2	Compare and contrast quantitative and qualitative research approaches, identify a research interest area, and apply suitable research design.
CO3	Develop strong academic writing and presentation skills for effectively communicating research findings

47. Internship/Project Work (FP/OJT)

CO1	Implement solutions by applying programming skills, development methodologies, and relevant tools in real-world contexts.
CO2	Evaluate and refine software solutions through comprehensive project planning, requirement analysis, design, implementation, testing, and documentation.
CO3	Assess and troubleshoot complex problems through practical project implementation, refining problem-solving strategies.
CO4	Design and present project goals, methodologies, results, and conclusions effectively to peers, faculty, and external stakeholders.
CO5	Innovate and create original software solutions that meet specific requirements and constraints, fostering creativity and problem-solving skills.

48. MOOC-I

CO1	Identify and choose suitable online courses relevant to their field of study from NPTEL, SWAYAM, or other platforms.
CO2	Manage their own learning pace and complete MOOC modules independently using self-discipline and time management.
CO3	Use the knowledge gained from online courses to solve real-world problems in the domain of computer applications.
CO4	Connect interdisciplinary concepts learned through MOOCs with academic or project work for better understanding and innovation.
CO5	Present key learnings from the MOOC experience through reports or discussions and apply them to enhance job readiness.

49. MOOC-II

CO1	Identify and choose suitable online courses relevant to their field of study from NPTEL, SWAYAM, or other platforms.
CO2	Manage their own learning pace and complete MOOC modules independently using self-discipline and time management.
CO3	Use the knowledge gained from online courses to solve real-world problems in the domain of computer applications.
CO4	Connect interdisciplinary concepts learned through MOOCs with academic or project work for better understanding and innovation.
CO5	Present key learnings from the MOOC experience through reports or discussions and apply them to enhance job readiness.