MERCURY

Computer Science, Artificial Intelligence and Data Systems

14 – 18 February 2027
Manama (Bahrain)



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Computer Science, Artificial Intelligence and Data Systems

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Introduction

This Computer Science, Artificial Intelligence and Data Systems course provides a foundation in computer science principles combined with modern artificial intelligence and data systems. It explores how computational thinking supports the design and development of intelligent systems in real-world environments. Participants will gain a structured understanding of algorithms, data structures, and system architectures. The program introduces key concepts in artificial intelligence, including machine learning and data-driven decision-making. It emphasizes how data systems support scalable AI applications and digital transformation. Learners will understand how computer science, artificial intelligence, and data systems integrate to solve complex technological challenges.

Targeted Groups

This Computer Science, Artificial Intelligence and Data Systems training targets professionals seeking knowledge and skills:

- IT professionals aiming to strengthen core computer science foundations.
- Data analysts transitioning into advanced data systems roles.
- Software developers expanding into AI and machine learning.
- Business analysts work with data-driven decision models.
- Graduates in computer science or related technical fields.
- Engineers involved in digital transformation projects.
- Managers overseeing AI and data infrastructure initiatives.
- Researchers exploring computational intelligence applications.

Course Objectives

Participants will achieve the following objectives by completing the Computer Science, Artificial Intelligence and Data Systems course:

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- Understand core computer science principles, including algorithms, data structures, and computational logic for modern system design.
- Develop the ability to analyze artificial intelligence concepts such as supervised and unsupervised learning models.
- Gain knowledge of data systems architecture, including databases, data pipelines, and distributed systems.
- Learn how machine learning models are trained, evaluated, and optimized for real-world applications.
- Explore cloud computing environments supporting scalable AI solutions and big data processing.
- Strengthen analytical thinking for solving complex computational problems using structured methodologies.
- Understand data science workflows from data collection to interpretation and visualization.
- Build conceptual awareness of the integration of AI models with enterprise data systems.
- Apply theoretical knowledge to evaluate emerging technologies in computer science and artificial intelligence domains.

Targeted Competencies

Participants will gain the following competencies during the Computer Science, Artificial Intelligence and Data Systems program:

- Interpret and apply computer science concepts in data-driven environments.
- Understand artificial intelligence models and their functional mechanisms in problem-solving.
- Competence in evaluating data systems architecture and database design principles.
- Skills in analyzing machine learning workflows and predictive modeling techniques.
- Awareness of big data analytics and distributed computing environments.
- Capacity to assess algorithm efficiency and computational performance.
- Integrate AI systems with structured and unstructured data sources.
- Ability to critically evaluate data science methodologies and AI-driven decision frameworks.

Studying Scenarios

In this Computer Science, Artificial Intelligence and Data Systems training, participants develop skills through the following scenarios:

- Case-based analysis of AI-driven recommendation systems in digital platforms.
- Examination of data system failures and optimization in enterprise environments.
- Conceptual modeling of machine learning applications in predictive analytics.
- Evaluation of cloud-based data processing systems for scalability challenges.
- Theoretical simulation of algorithm design for real-world computational problems.

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Course Content

Unit 1: Foundations of Computer Science and Computational Thinking

- Introduction to computer science principles and modern digital ecosystems.
- Understanding computational thinking for structured problem-solving approaches.
- Study of algorithms as core building blocks in software and AI systems.
- Exploration of data structures, including arrays, lists, trees, and graphs.
- Analysis of problem decomposition and abstraction in system design.
- Overview of programming logic and theoretical execution models.
- Introduction to complexity theory and performance evaluation concepts.
- Relationship between computer science and the foundations of artificial intelligence.
- Application of computational models in real-world digital systems.

Unit 2: Data Systems Architecture and Database Fundamentals

- Overview of data systems and their role in enterprise environments.
- Study of relational database management systems and SQL concepts.
- Introduction to NoSQL databases and unstructured data handling methods.
- Data modeling techniques, including conceptual, logical, and physical design.
- Exploration of data storage mechanisms and retrieval optimization.
- Understanding distributed data systems and scalability principles.
- Role of data pipelines in modern data engineering workflows.
- Data integrity, normalization, and consistency in database systems.
- Integration of databases with artificial intelligence applications.

Unit 3: Artificial Intelligence Principles and Machine Learning

- Introduction to artificial intelligence concepts and intelligent systems.
- Overview of supervised learning, unsupervised learning, and reinforcement learning.
- Study of machine learning algorithms and predictive modeling techniques.
- Understanding training data, feature selection, and model optimization.
- Evaluation of AI models using accuracy, precision, and recall metrics.
- Exploration of neural networks and deep learning architectures.
- Role of pattern recognition in AI-driven decision systems.
- Ethical considerations in artificial intelligence development and deployment.
- Application of AI models in real-world business and industrial contexts.

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Unit 4: Data Science, Big Data Analytics and Cloud Computing

- Introduction to data science workflows and analytical methodologies.
- Exploration of big data concepts and large-scale data processing systems.
- Study of data visualization techniques for insights communication.
- Understanding data mining methods and pattern extraction processes.
- Role of cloud computing in scalable data storage and processing.
- Overview of distributed computing frameworks and architectures.
- Integration of AI models within big data environments.
- Data-driven decision-making in enterprise and research contexts.
- Security and governance in cloud-based data systems.

Unit 5: Integration of AI Systems and Emerging Technologies

- Study of AI system integration with enterprise data architectures.
- Understanding intelligent automation and decision support systems.
- Exploration of edge computing and real-time data processing.
- Role of APIs in connecting AI models with data platforms.
- Overview of digital transformation driven by artificial intelligence.
- Analysis of emerging technologies in computer science innovation.
- Future trends in AI systems and autonomous computing models.
- Integration challenges between legacy systems and modern AI tools.
- Strategic impact of AI and data systems on organizational growth.

Final Insights & Key Takeaways

This course builds a strong theoretical foundation in computer science, artificial intelligence, and data systems for modern digital environments. It enables learners to understand how intelligent technologies and data-driven architectures shape future innovation and decision-making.