# Samsung Innovation Campus: Artificial Intelligence Course Details

**Learning Objectives**

This AI course is intended for students to learn the essential foundations of AI and gain fundamental data science skills through hands-on exercises.

- Understand the foundational math behind data science and machine learning: linear algebra, probability, and statistics.
- Be able to do data preprocessing with the Python libraries (NumPy and Pandas) for the execution of optimal machine learning models and data visualization
- Explore supervised and unsupervised learning and be able to apply the most suitable machine-learning algorithm.
- Learn to process textual data to derive high-quality information from text and apply new insights to real-world business (NLP).
- Build and train deep neural networks, use deep learning libraries such as TensorFlow and Keras to gain proficiency, as well as handle various deep learning techniques.

## Course Modules

| | |
|---|---|
| **Trends & Opportunities of AI** | Introduction to Artificial Intelligence |
| **Linear Algebra & Data Preprocessing** | Mathematics for Data Science |
| | NumPy Arrays for Optimized Numerical Computation and Pandas for Exploratory Data Analysis |
| **Probability/ Statistics & Machine Learning/ Deep Learning** | Probability & Statistics |
| | Machine Learning - Supervised Learning |
| | Machine Learning - Unsupervised Learning |
| | Natural Language Processing & Language Models for Text Mining |
| | Neural Network and Deep Learning |
| | Various Deep Learning Techniques |

# AI COURSE CONTENT

## TOTAL HOURS: 270H

| AI Course Contents | Duration |
|---|---|
| **Chapter 1. Introduction to Artificial Intelligence** | **4H (Total)** |
| - Unit 1. The Concept of Artificial Intelligence | |
| - Unit 2. Applications of Artificial Intelligence | |
| - Unit 3. Techniques in Artificial Intelligence | |
| - Unit 4. Artificial Intelligence: Trends and Markets | |
| - Unit 5. Course Roadmap | |
| **Chapter 2. Math for Data Science** | **33H (Total)** |
| - Unit 1. Introduction | 3H |
| - Unit 2. Basic Math for Data Science | 7H |
| - Unit 3. Understanding Data Science: Vector | 7H |
| - Unit 4. Understanding Data Science: Matrix | 7H |
| - Unit 5. Understanding Deep Learning: Derivatives | 7H |
| - Quiz | 2H |
| **Chapter 3. Exploratory Data Analysis: NumPy Arrays for Optimized Numerical Computation and Pandas** | **33H (total)** |
| - Unit 1. NumPy Array Data Structure for Optimal Computational Performance | 7H |
| - Unit 2. Optimal Data Exploration Through Pandas | 8H |
| - Unit 3. Pandas Data Preprocessing for Optimal Model Execution | 8H |
| - Unit 4: Data Visualization for Various Data Scales | 8H |
| - Quiz | 2H |
| **Chapter 4. Probability and Statistics** | **33H (total)** |
| - Unit 1. Understanding of Probability | 7H |
| - Unit 2. Understanding of Statistics I | 8H |
| - Unit 3. Understanding of Statistics II | 8H |
| - Unit 4. Statistical Hypothesis Testing | 8H |
| - Quiz | 2H |
| **Chapter 5. Machine Learning 1 – Supervised Learning** | **37H (total)** |
| - Unit 1. Machine Learning Based Data Analysis | 4H |
| - Unit 2. Application of Supervised Learning Model for Numerical Prediction | 4H |
| - Unit 3. Application of Supervised Learning Model for Classification | 4H |

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|---|---|
| **Chapter 1. Introduction to Artificial Intelligence** | **4H (Total)** |
| - Unit 1. The Concept of Artificial Intelligence | |
| - Unit 2. Applications of Artificial Intelligence | |
| - Unit 3. Techniques in Artificial Intelligence | |
| - Unit 4. Artificial Intelligence: Trends and Markets | |
| - Unit 5. Course Roadmap | |
| **Chapter 2. Math for Data Science** | **33H (Total)** |
| - Unit 1. Introduction | 3H |
| - Unit 2. Basic Math for Data Science | 7H |
| - Unit 3. Understanding Data Science: Vector | 7H |
| - Unit 4. Understanding Data Science: Matrix | 7H |
| - Unit 5. Understanding Deep Learning: Derivatives | 7H |
| - Quiz | 2H |
| **Chapter 3. Exploratory Data Analysis: NumPy Arrays for Optimized Numerical Computation and Pandas** | **33H (total)** |
| - Unit 4. Decision Tree | 4H |
| - Unit 5. Naïve Bayes Algorithm | 4H |
| - Unit 6. KNN Algorithm | 5H |
| - Unit 7. SVM Algorithm | 5H |
| - Unit 8. Ensemble Algorithm | 5H |
| - Quiz | 2H |
| **Chapter 6. Machine Learning 2 – Unsupervised Learning** | **33H (total)** |
| - Unit 1. Unsupervised Machine Learning Algorithm | 7H |
| - Unit 2. Hierarchical Clustering | 8H |
| - Unit 3. Non-Hierarchical Clustering | 8H |
| - Unit 4. Linear Factor Model for Dimensionality Reduction | 8H |
| - Quiz | 2H |
| **Chapter 7. Natural Language Processing and Language Models for Text Mining** | **33H (total)** |
| - Unit 1. Text Mining | 7H |
| - Unit 2. Text Preprocessing | 8H |
| - Unit 3. Language Model | 8H |
| - Unit 4. Natural Language Processing with Keras | 8H |

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|---|---|
| **Chapter 1. Introduction to Artificial Intelligence** | **4H (Total)** |
| - Unit 1. The Concept of Artificial Intelligence | |
| - Unit 2. Applications of Artificial Intelligence | |
| - Unit 3. Techniques in Artificial Intelligence | |
| - Unit 4. Artificial Intelligence: Trends and Markets | |
| - Unit 5. Course Roadmap | |
| **Chapter 2. Math for Data Science** | **33H (Total)** |
| - Unit 1. Introduction | 3H |
| - Unit 2. Basic Math for Data Science | 7H |
| - Unit 3. Understanding Data Science: Vector | 7H |
| - Unit 4. Understanding Data Science: Matrix | 7H |
| - Unit 5. Understanding Deep Learning: Derivatives | 7H |
| - Quiz | 2H |
| **Chapter 3. Exploratory Data Analysis: NumPy Arrays for Optimized Numerical Computation and Pandas** | **33H (total)** |
| - Quiz | 2H |
| **Chapter 8. Neural Network and Deep Learning** | **32H (total)** |
| - Unit 1. Basics of Neural Network | 10H |
| - Unit 2. Basics of TensorFlow | 10H |
| - Unit 3. Deep Learning Methods with TensorFlow and Keras | 10H |
| - Quiz | 2H |
| **Chapter 9. Various Deep Learning Topics: Deep Learning Techniques for Video and Language Intelligence** | **32H (total)** |
| - Unit 1. CNN Model | 10H |
| - Unit 2. RNN for Sequential Data Modeling | 10H |
| - Unit 3. Generative Adversarial Neural Network to Create Non-Existent Images | 10H |
| - Quiz | 2H |

## AI COURSE ASSESSMENT CRITERIA

The scoring assessments for students will follow the criteria below.

| Assessment | Use of Assessments | Scoring | Timing |
|---|---|---|---|
| Quiz | ▪ A quick test to review each chapter.<br>▪ Scores of each quiz are included in calculating the total grade. | 40% | At the end of each chapter |
| Final Test | ▪ 20 Questions to assess students' overall knowledge of the course.<br>▪ It's to gauge students' progress between pre-test and final test. | | On the last day of the course |
| Capstone Project Results | ▪ The result of the capstone project of each student/ group.<br>▪ Assessment Point<br>1) Creativity and impact of the project idea<br>2) Utilization of coding tools and solutions, including newly researched ones<br>3) Project management and teamwork<br>4) Presentation and final report | 50% | When the project results submitted (presentation) |
| Participation | ▪ Instructors/ learning operators shall give points based on active participation by each student.<br>▪ Assessment Points; Attitude, Responsibility, Interest, Teamwork, Critical thinking mindset, Problem solving attitude. | 10% | During the course period |

## AI COURSE CERTIFICATION CRITERIA

Students will be eligible for certification only if they meet the following qualification criteria.

| Assessment | Use of Assessments | Rate |
|---|---|---|
| Grade | Minimum assessment score required to qualify. | 50% |
| Attendance | Minimum attendance required to qualify. | 90% |

# AI COURSE CAPSTONE PROJECT

## TOTAL HOURS: 80H

## CAPSTONE PROJECT EVALUATION CRITERIA

The capstone project evaluation criteria for the students will be as follows.

| ASSESSMENT | EVALUATION CRITERIA | POINTS |
|---|---|---|
| **IDEA** | Creativity and novelty. | **30 POINTS** |
| | Differentiation from the existing known cases. | |
| | Impact to the public interest. | |
| | Method and technique. | |
| **CODING** | Efficiency. | **30 POINTS** |
| | Organization and coding style. | |
| | Proper utilization of methods learned in the class. | |
| | Utilization of tools and solutions based on own research. | |
| **PROJECT MANAGEMENT** | Evenly shared workload by all team members. | **20 POINTS** |
| | Fluid communication among the team members and demonstrated good team work. | |
| | Ability to adapt to unexpected issues and challenges. | |
| | Reached the desired milestones in a timely manner. (according to the WBS form) | |
| **PRESENTATION & REPORT** | Report was well-written and clearly conveyed the main points. | **20 POINTS** |
| | Slides and supporting material were well prepared. | |
| | Presentation was fluid and successfully communicated the main results. | |
| | Speaker was able to answer the questions that were raised. | |