Artificial Intelligence (AI) – Specialist

Deep Learning, Generative AI, Robotics & Advanced AI Development

Target Audience
High School Students (Grades 9–12) and learners who have completed AI Practitioner or have basic knowledge of Python, Machine Learning, data preparation, and AI development.

Program Pathway
Specialist

Total Duration
96 Hours

Delivery
Cohort-Based + Instructor-Led + Hands-On Labs

Program Goal
The AI Specialist program builds on the AI Practitioner pathway and introduces students to advanced AI technologies including Deep Learning, Neural Networks, Computer Vision, Natural Language Processing, Generative AI, Large Language Models, Robotics, and Autonomous Systems. Students develop advanced AI applications and prepare for AI Engineering projects.

Program Structure

Module	Topic	Hours
Module 1	Deep Learning & Neural Networks	20
Module 2	Advanced Computer Vision & NLP	20
Module 3	Generative AI & Large Language Models	18
Module 4	Robotics & Autonomous Systems	18
Module 5	AI Specialist Project	20
Total		**96 Hours**

Curriculum

Module 1 – Deep Learning & Neural Networks

Students learn how neural networks and Deep Learning are used to recognize patterns, make predictions, and solve complex AI problems.

Topics:
Deep Learning Fundamentals, Neural Networks, Artificial Neurons, Layers, Weights & Biases, Activation Functions, Forward Propagation, Backpropagation, Loss Functions, Model Training, Training & Validation, Overfitting & Underfitting, Model Optimization, Convolutional Neural Networks, TensorFlow, Keras.

Module 2 – Advanced Computer Vision & NLP

Students learn how advanced AI systems process images, video, and human language to understand and classify information.

Topics:
Computer Vision, Image Classification, Image Processing, Object Detection, Feature Extraction, Convolutional Neural Networks, Transfer Learning, Video Intelligence Fundamentals, NLP Fundamentals, Text Processing, Tokenization, Text Classification, Sentiment Analysis, Text Similarity, Embeddings, Transformers Fundamentals.

Module 3 – Generative AI & Large Language Models

Students learn how modern Generative AI and Large Language Models are used to create content, understand information, and develop intelligent applications.

Topics:
Generative AI Fundamentals, Large Language Models, Tokens, Context Windows, Embeddings, Prompt Engineering, Zero-Shot & Few-Shot Prompting, AI APIs, AI Chatbots, AI Assistants, Document Question Answering, Retrieval-Augmented Generation (RAG) Fundamentals, AI Agents Fundamentals, Hallucinations, Generative AI Limitations, AI Safety.

Module 4 – Robotics & Autonomous Systems

Students learn how AI enables robots and autonomous systems to sense their environment, process information, make decisions, and perform tasks.

Topics:
Introduction to Robotics, Physical AI, Robot Components, Sensors, Actuators, Controllers, Robotics Programming Fundamentals, AI-Based Perception, Computer Vision for Robotics, Sensor Data, Sensor Fusion Fundamentals, Robot Decision-Making, Path Planning, Navigation, Obstacle Detection & Avoidance, Autonomous Systems, AI-Based Control, Human-Robot Interaction, Autonomous Vehicles & Drones, Robotics Safety.

Module 5 – AI Specialist Project

Students apply the concepts learned throughout the program to design and develop an advanced AI-powered solution.

Topics:
Problem Identification, AI Solution Design, Data Selection & Preparation, Model Selection, Deep Learning Integration, Computer Vision or NLP Integration, Generative AI Integration, LLM Integration, Robotics & Autonomous System Concepts, AI Application Development, API Integration, Testing, Evaluation, Responsible AI Review, Documentation, Final Presentation.

Final Project:
Build and present an advanced AI-powered solution using one or more Specialist-level AI technologies.

Hands-On Learning

Students learn through instructor-led lessons, Python exercises, Deep Learning experiments, Computer Vision and NLP activities, Generative AI labs, LLM application development, Robotics simulations, autonomous system activities, mini-projects, assessments, and a final AI Specialist project.

What Students Build

Students develop practical experience with Deep Learning models, neural network applications, Computer Vision solutions, NLP applications, Generative AI applications, LLM-powered applications, AI assistants, basic AI agent workflows, robotics applications, autonomous system simulations, and advanced AI projects.

Recommended Lab Requirements

Each student should ideally have:

- Windows or Mac desktop/laptop
- 8 GB RAM minimum
- 16 GB RAM recommended
- 10 GB+ free storage

Windows/Mac systems are recommended. Chromebooks are not preferred.

Cloud-based environments may be used for intensive Deep Learning activities, so a dedicated GPU is not required.

Next Step

Students who complete AI Specialist can progress to the **AI Engineering Capstone**, exploring AI system architecture, advanced AI application development, model deployment, cloud AI, APIs, MLOps, Edge AI, advanced AI agents, robotics, autonomous AI, and end-to-end AI engineering projects.