

Artificial Intelligence | Two-Year Program: Scope & Sequence

Year 1, Semester 1

AI101 Artificial Intelligence I
(18 Weeks, 225 Hours: Class, Lab))

District Pre-Assessment

Unit 1 (3 Weeks, 37.5 Hours: 15 Class, 22.5 Lab)

Introduction to AI, History, and Ethics:

- Define AI, ML, and Deep Learning using clear analogies and simple real-world examples.
- Identify where students see AI every day (recommendations, navigation, voice assistants).
- Explain the difference between automation and AI and evaluate which approach fits a scenario.
- Trace AI history from early computing to neural networks and modern generative AI.
- Describe how hardware, algorithms, and large datasets accelerated modern AI.
- Identify classification, regression, clustering, and reinforcement learning problem types.
- Match sample scenarios to correct ML tasks using reasoning.
- List emerging technologies such as multimodal AI, edge AI, quantum computing, and IoT.
- Explain connections between AI and technologies like AR/VR and blockchain.
- Describe ML, Computer Vision, and NLP domains with simple examples.
- Explain how data powers AI and why high-quality data matters.
- Define fairness, bias, transparency, accountability, and human-centered AI.
- Identify harmful effects of biased datasets and analyze an ethics case study.
- Recognize organizations (NIST, OECD, EU AI Act, IEEE) shaping Responsible AI guidelines.
- Evaluate impacts of AI decisions from a societal and ethical lens.

CTSO Integration (Leadership Skills): Officer Elections

Professional Skills: 1.A, 1.B, 8.D

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 1.1-1.7, 2.1-2.6

Unit 2 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

AI Hardware and Impact on Industry:

- Explain why AI models require strong hardware for parallel computations.
- Define CPU, GPU, TPU, and NPU with beginner-friendly analogies.
- Identify devices using specialized chips (smartphones, consoles, vehicles).
- Explain GPU parallelism and why GPUs accelerate deep learning.
- Describe the purpose of TPUs and Google's design motivations.

- Differentiate cloud AI vs edge AI and classify real-world examples.
- Explain latency and its effect on real-time AI systems.
- Analyze hardware powering products like Tesla Autopilot, iPhone Neural Engine, Alexa.
- Identify at least six industries transformed by AI and describe role-specific examples.
- Analyze business use cases where AI improves efficiency or customer experience.
- Explain basic monetization models (subscriptions, licensing, data services).
- Apply Responsible AI principles to real companies using case studies.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.C, 2.C, 3.C

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 3.1-3.6, 15.1-15.6

Unit 3 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

Data Literacy: Using Excel:

- Identify spreadsheet components including rows, columns, ranges, cells, and tables.
- Format values (text, number, percent) to improve readability.
- Convert raw data into Excel Tables and apply styles for consistency.
- Use sorting, filtering, and data slicing to explore patterns.
- Apply data validation tools to prevent invalid entries and enforce rules.
- Detects duplicates, missing values, and inconsistent formatting.
- Use IF(), ISBLANK(), TRIM(), LEFT(), RIGHT(), VALUE(), CONCAT() to clean messy data.
- Explain how poor-quality data leads to biased ML predictions.
- Engineer new features using formulas and explain why feature clarity matters.
- Create histograms, boxplots, scatterplots, and correlation heatmaps.
- Identify outliers, skewed distributions, and feature relationships.
- Apply anonymization by removing sensitive identifiers.
- Import a raw CSV file and clean it end-to-end for ML readiness.
- Build a small visualization dashboard summarizing dataset insights.
- Explain why the final dataset is considered 'AI-ready.'

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 4.F, 5.A, 6.C, 8.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker, Job Shadow

Technical Standard: 4.1-4.4, 5.1-5.7

Unit 4 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

Foundational Math for AI/ML:

- Represent spreadsheet columns as vectors and tables as matrices.
- Perform basic vector operations (addition, scaling).
- Explain how matrices hold ML features in tabular form.
- Compute mean, median, mode, variance, and standard deviation using Excel.
- Interpret correlations and covariance to understand relationships.
- Analyze scatterplots to identify trends or independence.
- Interpret normal, uniform, and skewed distributions.
- Explain why understanding distribution shapes is essential before training ML models.
- Calculate expected value using SUMPRODUCT and real-world examples.
- Perform normalization and standardization on datasets.
- Use one-hot encoding for categorical features.
- Build a multi-chart summary combining distributions and relationships.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 4.F, 5.A, 6.C, 8.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 5.1-5.7

Unit 5 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

Machine Learning Concepts and Excel:

- Define machine learning and differentiate supervised vs unsupervised learning.
- Identify labels, features, training data, test data, and validation concepts.
- Explain model training, inference, overfitting, underfitting, and generalization.
- Interpret confusion matrices and explain accuracy, precision, and recall.
- Relate model types to Azure AI-900 exam categories.
- Build a regression project (house price prediction).
- Build a classification project (spam detector simulation).
- Simulate clustering (k-means style grouping).
- Use Z-scores for anomaly detection in financial or security datasets.
- Create a simple recommender system using similarity measures.
- Explain how Excel ML maps to real ML concepts.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 4.F, 6.A, 8.D

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 7.1-7.5

Unit 6 (6 Weeks, 75 Hours: 30 Class, 45 Lab)

Python Basics Through Data Analysis:

- Explain Python's role in AI, data processing, automation, and modeling.
- Write beginner-level programs using variables, operators, and text processing.
- Use input/output functions to collect data from users.
- Debug syntax and runtime errors using Python's error messages.
- Write conditionals to make branching decisions.
- Use for and while loops to repeat and iterate tasks.
- Create, modify, and iterate through lists for data analysis problems.
- Build programs combining loops, lists, and conditions to solve mini-projects.
- Define functions to simplify and reuse code within programs.
- Pass parameters and return values to handle data transformations.
- Load CSV files into Pandas DataFrames and explore datasets.
- Clean DataFrames by filling missing values and filtering rows.
- Compute statistics and compare DataFrame operations to Python lists.
- Visualize data using Matplotlib (line, bar, histogram, scatter).
- Combine Pandas filtering with Matplotlib charts to tell a data story.
- Produce a full EDA notebook containing markdown, charts, and insights.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.C 2.B 3.D 4.B 5.A 6.B 8.F

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 6.1-6.10

Unit 7 (1 Week, 12.5 Hours: 5 Class, 7.5 Lab)

AI Careers and Future Pathways:

- Identify 6–10 AI career roles such as Data Analyst, ML Engineer, Cloud Engineer, and AI Product Manager.
- Differentiate job families: data careers, ML engineering, software roles, cloud/DevOps, and AI ethics.
- Research certifications, degrees, internships, and dual-enrollment pathways.
- Explain how AI is used in industries such as healthcare, finance, retail, education, and autonomous systems.
- Prepare resumes, digital portfolios, and project summaries aligned to AI pathways.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 4.C 5.C 7.C

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 13.1-13.7, 15.1-15.6

Semester Final Exam

Year 1, Semester 2

AI102 Artificial Intelligence II
(18 Weeks, 225 Hours: Class, Lab)

Unit 8 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

AI Workloads, Responsible AI, GTM:

- Identify ML, CV, NLP, generative, conversational, and document AI workloads.
- Match workloads to real-world scenarios and Azure AI-900 competencies.
- Explain fairness, inclusiveness, transparency, reliability, privacy, and accountability.
- Identify common risks such as biased datasets, unsafe predictions, and adversarial misuse.
- Analyze responsible vs irresponsible AI examples from real situations.
- Build GTM image classification models using webcam or uploaded images.
- Train models with 3–4 classes and analyze accuracy and confidence scores.
- Compare GTM results with Azure Custom Vision capabilities.
- Document data collection, model setup, evaluation, and limitations.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.B

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker, Resume Writing

Technical Standard: 1.1-1.7, 2.1-2.6, 14.1-14.7

Unit 9 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

Azure Machine Learning Fundamentals:

- Distinguish supervised, unsupervised, and reinforcement learning with examples.
- Identify regression, classification, clustering, and RL in Azure use cases.
- Explain the ML pipeline: data → training → validation → evaluation → deployment.
- Interpret confusion matrices, accuracy, precision, recall, and F1-score.
- Identify overfitting and underfitting using simple metrics.
- Describe Azure ML workspace components: compute, datasets, and jobs.
- Use Azure ML Designer to build drag-and-drop ML workflows.
- Explain AutoML for model selection and hyperparameter tuning.
- Train GTM audio and pose models to compare local vs cloud ML approaches.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.C 2.C 3.C

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker, Resume Writing

Technical Standard: 6.1-6.10, 7.1-7.5

Unit 10 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

Azure Computer Vision:

- Identify CV tasks including classification, detection, segmentation, OCR, and face analysis.
- Explain when each CV task is appropriate in real-world systems.
- Analyze images using Azure Vision for captions, tags, and object detection.
- Train Custom Vision classification models and optimize iterations.
- Use OCR for extracting structured text from photos and documents.
- Use Form Recognizer to extract fields from receipts, forms, and tables.
- Identify Video Indexer capabilities for face detection and content breakdown.
- Build hands-on Vision projects and document outputs.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.C 8.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 9.1-9.8, 11.1-11.10, 14.1-14.7

Unit 11 (3 Weeks, 37.5 Hours: 15 Class, 22.5 Lab)

Azure NLP + GTM Bridge:

- Explain sentiment analysis, key phrase extraction, NER, classification, and translation.
- Run NLP tasks with Azure Language Services and interpret confidence scores.
- Use the Translator API for multilingual workflows.
- Create a simple FAQ-style question-answering model.
- Build CLU models to detect intents and map them to actions.
- Compare simple GTM text inputs with Azure NLP deep-learning models.
- Document dataset differences, model accuracy, and output behavior.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.C 8.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 10.1-10.8, 14.1-14.7

Unit 12 (3 Weeks, 37.5 Hours: 15 Class, 22.5 Lab)

Azure NLP + GTM Bridge:

- Define generative AI and differentiate it from predictive ML.
- Explain LLMs, embeddings, and latent space at a beginner level.
- Identify business uses for generative AI such as drafting, summarizing, and ideation.
- Experiment with GPT models for structured and creative outputs.

- Generate images with DALL-E and analyze strengths and limitations.
- Explain content filtering, prompt safety, and responsible use in Azure OpenAI.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.C 3.C 4.F 8.D

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 11.1-11.10

Unit 13 (2 Weeks, 25 Hours: 10 Class, 15 Lab)

Conversational AI:

- Identify chatbot use cases across industries (retail, education, customer service).
- • Build simple chatbots using Azure Bot Service and Bot Framework Composer.
- • Add intents, responses, and branching logic to chatbot flows.
- • Integrate Language Services for improved accuracy and natural language responses.
- • Deploy bots to the web or Microsoft Teams and test multi-channel interactions.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.C 2.B 3.C 4.F

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 12.1-12.6

Unit 14 (4 Weeks, 48 Hours: 20 Class, 30 Lab)

Capstone, Review, and Career Prep:

- Review all Azure AI-900 workloads including ML, CV, NLP, generative, and conversational AI.
- Practice scenario-based questions matching tasks to Azure services.
- Complete a capstone combining GTM + Azure AI services.
- Document the full ML lifecycle using Standard 14.0 templates.
- Identify AI pathway careers and update resumes, GitHub, and LinkedIn.
- Prepare for mock interviews and capstone presentations.
- Connect skills to Coding & Programming and Data Analysis.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.C 4.C 5.C 8.F

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker

Technical Standard: 13.1-13.7, 14.1-17.7, 15.1-15.6

District Post-Assessment Certification: Microsoft Azure - AI 900

Year 2, Semester 1

AI201 Artificial Intelligence III

(18 Weeks, Hours, Class, Lab)

Unit 1 (3 Weeks, 37.5 Hours: 15 Class, 22.5 Lab)

Intermediate Python for AI/ML:

- Refresh Python fundamentals and transition into intermediate-level programming for AI workflows.
- Use Python to load, clean, filter, and aggregate datasets using Pandas.
- Apply NumPy to perform vectorized operations, broadcasting, and matrix manipulations relevant to ML inputs.
- Create visualizations using Matplotlib to interpret data patterns and prepare for modeling.
- Work with file I/O, JSON, and real-world APIs to gather and process external datasets.
- Organize AI/ML code using Jupyter Notebook/Google Colab structure, Markdown documentation, and modules.
- Apply debugging strategies, error handling, and refactoring for clean, reliable code.
- Build a data-cleaning pipeline using Pandas (missing values, duplicates, transformations).
- NumPy array operations + image-as-array exploration.
- API Data Pull (weather, movies, sports, finance).
- Build a Matplotlib dashboard for dataset insights.
- Debugging challenges using try/except + error inspection.

CTSO Integration (Leadership Skills): Officer Elections, Chapter Meeting

Professional Skills: 1.A, 2.A, 3.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker, Job application

Technical Standard: 6.1-6.10, 14.1, 14.5

Unit 2 (5 Weeks, 62.5 Hours: 25 Class, 37.5 Lab)

Applied Machine Learning with Python:

- Explain supervised, unsupervised, and reinforcement learning with real-world high school-level scenarios.
- Prepare data for ML: feature selection, scaling, encoding, splitting into train/validation/test sets.
- Build ML models using scikit-learn (regression, classification, clustering).
- Evaluate ML using accuracy, precision, recall, F1-score, confusion matrix, ROC curves (conceptually).
- Interpret model errors and diagnose underfitting vs overfitting.
- Apply fairness and responsible AI practices when evaluating ML results.
- Build linear regression model to predict housing prices.
- Classification using logistic regression + confusion matrix analysis.
- k-Means clustering for shopping patterns.
- Random Forest vs Decision Tree comparison.
- Evaluate fairness using biased vs clean dataset.

CTSO Integration (Leadership Skills): Officer Elections, Chapter Meeting

Professional Skills: 4.A 4.B 5.A 5.B 6.A 7.A 8.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-based Learning: Guest Speaker
Technical Standard: 7.1-7.5, 2.1-2.6, 14.1-14.6

Unit 3 (5 Weeks, 62.5 Hours: 25 Class, 37.5 Lab)

Deep Learning Fundamentals: Pretrained Models:

- Describe neural networks, layers, activations, and tensors conceptually without advanced math.
- Understand GPU acceleration and why hardware matters for DL tasks.
- Explore tensors using NumPy, PyTorch, or TensorFlow (basic operations only).
- Apply pretrained DL models for image, text, and audio tasks using HuggingFace or Azure AI.
- Perform beginner-friendly CNN demos (no training from scratch).
- Analyze when DL is appropriate and identify common failure or bias cases.
- Document a deep learning mini-project with model behavior, results, and limitations.
- Explore tensors and reshape operations using NumPy/PyTorch.
- Run a MobileNet image classifier on real student images.
- Use a pretrained transformer for text classification.
- Use Azure AI Vision to detect objects and extract text (OCR).
- Mini DL Project (Vision or NLP).

CTSO Integration (Leadership Skills): Chapter Meeting
Professional Skills: 9 A-C
Academic Standards: ELA.11-12.RI.10, RL.4
Work-Based Learning: Guest Speaker, Workplace Visit
Technical Standard: 8.1-8.7, 3.1-3.6

Unit 4 (5 Weeks, 62.5 Hours: 25 Class, 37.5 Lab)

Computer Vision with Open CV + Azure Vision:

- Explain how computers interpret images through pixels, channels, resolution, and matrices.
- Identify major CV tasks: classification, detection, segmentation, OCR, tracking.
- Apply OpenCV techniques: resizing, filtering, color conversions, thresholding, edge detection.
- Use pretrained CV models (OpenCV, MediaPipe, Azure Vision) to detect, classify, and track objects.
- Interpret CV outputs including bounding boxes, confidence scores, landmarks.
- Evaluate real CV applications for ethics, privacy, and surveillance risks.
- Compare cloud-based vs local CV processing for cost, privacy, and speed.
- Image-as-array pixel manipulation.
- Edge detection + thresholding demo.
- MediaPipe face/pose detection project.
- Azure Vision OCR + object detection.

- CV mini-project (safety detection, accessibility reader, parking detector, etc.).

CTSO Integration (Leadership Skills): Chapter Meeting
Professional Skills: 9 A-C
Academic Standards: ELA.11-12.RI.10, RL.4
Work-Based Learning: Guest Speaker, Workplace Visit
Technical Standard: 4.B 5.A 5.B 6.A 7.A 8.A 9.A

Semester Final Exam

Year 2, Semester 2

AI202 Artificial Intelligence IV
(18 Weeks)

Unit 5 (5 Weeks, 62.5 Hours: 25 Class, 37.5 Lab)

Natural Language Processing (NLP):

- Explain how machines represent language using tokens, embeddings, and vectors.
- Preprocess text using tokenization, stopwords, stemming, and lemmatization.
- Represent text using Bag-of-Words and TF-IDF (concept + library).
- Apply NLP libraries: spaCy, NLTK, HuggingFace transformers.
- Build simple NLP applications such as sentiment analysis or topic classification.
- Generate summaries, translations, and named entity extraction with pretrained models.
- Evaluate NLP outputs using precision, recall, accuracy, F1-score.
- Analyze ethical issues: bias, toxicity, hallucinations, privacy.
- Text preprocessing pipeline.
- Sentiment analysis model.
- TF-IDF + classifier.
- NER using spaCy.
- Summarization/translation with HuggingFace.

CTSO Integration (Leadership Skills): Chapter Meeting
Professional Skills: 1.A 2.A 3.A 4.A 5.A 7.A 8.A 9.A
Academic Standards: ELA.11-12.RI.10, RL.4
Work-Based Learning: Guest Speaker, Workplace Visit
Technical Standard: 10.1-10.8, 2.1-2.6, 14.1-14.6

Unit 6 (5 Weeks, 62.5 Hours: 25 Class, 37.5 Lab)

Generative AI (Images, Text, Audio, and Video):

- Explain prompts, tokens, latent space, embeddings, and generative model behavior.
- Compare discriminative vs generative models.
- Explore major generative model types: diffusion models, transformers, GANs.
- Generate images, video, audio, and text using Azure AI Studio, RunwayML, and OpenAI tools.

- Evaluate generative content for accuracy, bias, originality, and safety.
- Apply structured prompting: role prompting, constraints, examples, temperature control.
- Document generative workflows responsibly.
- Create images with diffusion models.
- Text generation + temperature experiments.
- Audio generation demo.
- Video generation in RunwayML.
- Create a "Generative Art Gallery" portfolio.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.A 4.A 5.A 7.A 8.A 9.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-Based Learning: Guest Speaker, Workplace Visit

Technical Standard: 11.1-11.5, 2.1-2.6

- Conduct debugging, iteration, testing, and performance checks.
- Create project documentation including dataset description, model card, results, and reflections.
- Present project outcomes to technical and non-technical audiences.
- Streamlit or Gradio AI Application.
- Multi-modal app (Vision + Text).
- Testing & debugging sprint.
- Capstone Showcase Presentation.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.A 4.A 5.A 7.A 8.A 9.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-Based Learning: Guest Speaker

Technical Standard: 12.1-12.6, 13.1-13.7, 14.1-14.7, 15.1-15.6

Unit 7 (4 Weeks, 50 Hours: 20 Class, 30 Lab)

Agentic AI Systems:

- Describe what agentic AI is: planning, memory, tool use, reasoning.
- Use agent frameworks such as Azure AI Agents, ChatGPT Agents, or LangGraph Lite.
- Configure tools: web search, file reader, calculator, OCR, image analyzer.
- Build retrieval-augmented agents using PDFs, notes, or structured datasets.
- Implement guardrails and human-in-loop supervision.
- Evaluate risk, safety, and misuse scenarios in agentic workflows.
- Build an agent that reads student notes and answers questions (RAG).
- Build an agent with multi-step reasoning and tool-use.
- Tool configuration (image analyzer, file reader).
- Safety guardrails + allowed/blocked actions.

CTSO Integration (Leadership Skills): Chapter Meeting

Professional Skills: 1.A 2.A 3.A 4.A 5.A 7.A 8.A 9.A

Academic Standards: ELA.11-12.RI.10, RL.4

Work-Based Learning: Guest Speaker, Workplace Visit

Technical Standard: 11.6-11.10, 2.1-2.6, 14.1-14.6

Unit 8 (4 Weeks, 50 Hours: 20 Class, 30 Lab)

AI Application Development and Capstone Project:

- Develop fully functional AI applications integrating ML, CV, NLP, or GenAI models.
- Translate client requirements into technical product documents.
- Apply usability, UI/UX, and accessibility principles in application design.
- Integrate pretrained models via APIs or local libraries (Streamlit, Flask, Gradio).

ADE Technical Skills Assessment

Certification: Certiport Information Technology Specialist:

Python