

Course Syllabus: Applied Artificial Intelligence (AI) - Two-Level Program

Level 2: Advanced AI and ML Systems (30-35 hours)

Duration: 30-35 hours (15 sessions, ~2 hours each)

Target Audience: Students who completed Level 1 or equivalent

Course Objectives:

- Deepen understanding of advanced ML algorithms and neural architectures
- Learn to work with sequential data, images, and large language models
- Understand key concepts of training, tuning, and deploying ML systems
- Explore cutting-edge AI paradigms like transformers and AI agents

Prerequisites:

- Completion of Level 1 or prior knowledge of Python and ML basics

Topics Covered:

Session	Topic	Description
1	ML Engineering Mindset	Pipelines, reproducibility, data versioning
2	Deep Learning Refresher	Architecture, activation, optimization
3	Convolutional Neural Networks (CNNs)	Image processing, CNN layers, filters
4	Recurrent Neural Networks (RNNs)	Sequence modeling, time series
5	Long Short-Term Memory (LSTM)	Overcoming vanishing gradients
6	Transformers	Attention mechanism, encoder-decoder
7	BERT and LLMs	Tokenization, pretraining, fine-tuning
8	AI Agents & Autonomous Systems	Multi-agent learning, decision making
9	Model Evaluation at Scale	Metrics, confusion matrix, ROC, F1
10	Hyperparameter Tuning	Grid search, random search, optuna
11	Model Deployment	Flask, FastAPI, Docker basics
12	MLOps Overview	CI/CD, monitoring, retraining

Session	Topic	Description
13	Responsible AI	Bias, fairness, explainability
14	Capstone Project Design	Team-based problem-solving
15	Final Capstone Showcase	Presentations, evaluation, wrap-up

Assessment:

- Assignments: 20%
- Mid-level projects: 30%
- Final Capstone Project: 50%

Final Note:

Success in this course depends on both analytical thinking and hands-on practice. The two-track approach (Science & Engineering) ensures you not only understand **how models work**, but also **how to build and use them in the real world**.