



# Machine Learning — Complete Course Content

WC Skills • World Class Skills Institute

|                        |                                               |
|------------------------|-----------------------------------------------|
| <b>Duration</b>        | 12 Weeks                                      |
| <b>Target Audience</b> | Python developers and analytics professionals |
| <b>Prerequisites</b>   | Python, algebra and basic statistics.         |

## What this document contains

A module-wise training roadmap covering concepts, hands-on labs, project work, assessment checkpoints and interview preparation. The syllabus is designed as a structured course plan for classroom or live-online delivery.

## Course Objectives & Learning Outcomes

By the end of this course, learners should be able to explain the core concepts, perform the practical tasks listed in the labs, troubleshoot common scenarios, document their work and complete the capstone with a professional implementation approach.

- Understand the architecture, terminology and end-to-end workflow of the subject.
- Perform guided hands-on exercises using the relevant tools and development/administration environment.
- Apply troubleshooting, testing, documentation and best-practice techniques.
- Build a portfolio-ready capstone demonstrating practical competency.
- Prepare for technical interviews with scenario-based questions and implementation discussions.

## Detailed Module-wise Curriculum

### Module 1: ML Foundations

- Supervised vs unsupervised learning
- Bias/variance
- Train/validation/test
- Baseline models
- Metrics

**Hands-on Lab:** Lab: establish a baseline classifier.

### Module 2: Regression

- Linear regression
- Regularization
- Feature engineering
- MAE/MSE/RMSE
- Model diagnostics

**Hands-on Lab:** Lab: build and evaluate a regression model.

### Module 3: Classification

- Logistic regression
- KNN
- Decision trees
- Precision/recall/F1
- ROC-AUC

**Hands-on Lab:** Lab: compare classifiers.

### Module 4: Tree Ensembles

- Random forest
- Gradient boosting
- Feature importance
- Hyperparameters
- Cross-validation

**Hands-on Lab:** Lab: tune an ensemble model.

## Module 5: Unsupervised Learning

- K-means
- Hierarchical clustering
- PCA
- Cluster evaluation
- Anomaly awareness

**Hands-on Lab:** Lab: segment customers.

## Module 6: Feature Engineering

- Encoding
- Scaling
- Missing values
- Feature selection
- Pipelines

**Hands-on Lab:** Lab: create a reproducible preprocessing pipeline.

## Module 7: Model Selection & Explainability

- Grid/random search
- Cross-validation
- SHAP awareness
- Error analysis
- Model documentation

**Hands-on Lab:** Lab: conduct structured model review.

## Module 8: Deployment & MLOps

- Serialization
- Inference APIs
- Batch vs real time
- Monitoring
- Retraining

**Hands-on Lab:** Lab: design a production ML lifecycle.

## Module 9: Capstone

- Problem framing
- Modeling
- Evaluation
- Deployment plan
- Interview preparation

**Hands-on Lab:** Lab: deliver a complete ML project.

## Practical Delivery Plan

| Phase | Focus                   | Expected Evidence                                  |
|-------|-------------------------|----------------------------------------------------|
| 1     | Concept + demonstration | Notes, diagrams and guided exercises               |
| 2     | Hands-on practice       | Working configuration/code and screenshots/logs    |
| 3     | Troubleshooting         | Issue reproduction, diagnosis and resolution notes |
| 4     | Mini project            | Functional solution with test cases                |
| 5     | Capstone                | End-to-end project, documentation and presentation |

## Assessment & Certification Readiness

Recommended assessment pattern: module quizzes (20%), practical labs (30%), mini project (20%), capstone (20%) and interview/viva (10%). Completion certificates, placement support and any certification claims should follow the institute's current published policy and the relevant vendor's certification rules.

## Capstone Requirements

- Problem statement and scope
- Architecture/process diagram
- Implementation or configuration
- Test cases and results
- Troubleshooting notes
- User/technical documentation
- Final presentation and interview questions

## Interview Preparation Topics

Learners should be able to answer architecture questions, explain the difference between key concepts, troubleshoot a real scenario, justify design choices, discuss performance/security considerations and walk through the capstone from requirement to deployment/support.

## Recommended Learning Resources

Use official product documentation and current vendor guidance for version-specific commands, configuration steps and certification requirements. Validate training examples in a non-production environment before applying them to customer systems.