Robotic Process Automation Orchestration and AI Integration

Duration: 2 Weeks

Week 1: RPA Foundations, Bot Development & Orchestration

Day 1: RPA Landscape & Platform Setup

Module 1: RPA Concepts & Enterprise Automation Landscape

- RPA fundamentals: attended, unattended, and hybrid automation models
- RPA platform landscape: UiPath, Automation Anywhere, Power Automate, Blue Prism
- Process suitability assessment: identifying automation candidates using APQI scoring
- RPA vs traditional integration: when to use RPA, API, or ETL
- Enterprise automation governance: CoE structure, roles, and standards

Lab Exercises:

1. Score 5 business processes using an APQI framework; rank by automation suitability and justify recommendations
2. Map the enterprise automation landscape for a given organisation: identify CoE roles, tool stack, and governance model

Module 2: Platform Setup & Development Environment

- UiPath Studio / Power Automate Desktop: installation and configuration
- Orchestrator setup: cloud vs on-premise, tenant configuration, machine connections
- Robot types: attended robot, unattended robot, and Orchestrator-managed robot
- Project structure: sequences, flowcharts, state machines, and reusable libraries
- Source control integration: Git with UiPath Studio for version-managed automation

Lab Exercises:

3. Install UiPath Studio and connect to Orchestrator; configure a robot machine and verify connectivity
4. Create a structured RPA project in Studio with Git integration; commit and push initial project scaffold

Day 2: Core Bot Development – UI & Application Automation

Module 3: UI Automation & Selectors

- UI automation approaches: selector-based, image-based, and computer vision
- Selector types: full selectors, partial selectors, and dynamic selectors
- Anchor-based automation for unstable UI elements
- Web automation: browser activities, data scraping, and table extraction
- Desktop application automation: Win32, WPF, Java, and SAP applications

Lab Exercises:

5. Automate a multi-step web form submission with dynamic selectors; handle pop-ups and page navigation
6. Extract a paginated data table from a web application; save extracted records to an Excel file

Module 4: Data Manipulation & File Automation

- Excel and CSV automation: read, write, filter, merge, and format operations
- PDF data extraction: text reading, field scraping, and structured data parsing
- Email automation: read, filter, reply, and move emails via Outlook and IMAP
- File and folder management: copy, move, rename, archive, and delete operations
- DataTable operations: filter, sort, join, and lookup within RPA workflows

Lab Exercises:

7. Build a bot that reads an Excel report, filters rows by criteria, and emails the filtered output to a distribution list
8. Automate PDF invoice data extraction: extract vendor, amount, and date fields; write results to a structured spreadsheet

Day 3: Error Handling, Logging & Robustness

Module 5: Exception Handling & Retry Logic

- Exception types: business exceptions vs application exceptions
- Try-Catch-Finally patterns in RPA workflows
- Retry scope: configuring retry count and delay for transient failures
- Global exception handler: process-level fallback and graceful degradation
- Screenshot capture and diagnostic logging on failure

Lab Exercises:

9. Refactor a fragile bot using Try-Catch and Retry Scope; test with intentional failures and verify recovery behaviour
10. Implement a global exception handler that captures a screenshot, logs the error, and sends an alert email on failure

Module 6: Logging, Monitoring & Bot Reliability

- Structured logging: log message levels, custom fields, and Orchestrator log integration
- Custom log fields: transaction ID, process stage, input values, and outcome
- Orchestrator monitoring: robot heartbeat, job status, queue item tracking
- SLA monitoring: tracking job duration and alerting on breach
- Bot reliability patterns: idempotency, resumable transactions, and audit trails

Lab Exercises:

11. Add structured logging with custom fields to an existing bot; verify logs appear correctly in Orchestrator
12. Configure Orchestrator SLA alerts for a scheduled job; simulate a breach and verify alert notification

Day 4: Orchestration, Queues & Scheduling

Module 7: Orchestrator Queues & Transaction Processing

- Queue concepts: queue items, status lifecycle, priorities, and deadlines
- Dispatcher-Performer pattern: separating data loading from processing
- Queue item retry: automatic retry on application exception with configurable attempts
- Business exception handling in queues: marking items as failed with reason codes
- Queue throughput optimisation: parallel robot processing and item prioritisation

Lab Exercises:

13. Implement a Dispatcher bot that loads 50 records into an Orchestrator queue from an Excel file
14. Build a Performer bot that processes queue items one-by-one with retry logic and business exception handling

Module 8: Scheduling, Triggers & Multi-Bot Orchestration

- Time-based scheduling: cron expressions and calendar-based triggers in Orchestrator
- Event-based triggers: queue triggers, API triggers, and file watcher triggers
- Multi-bot coordination: sequential and parallel job execution across robots
- Process dependencies: chaining jobs – Job A triggers Job B on completion
- Orchestrator API: triggering and monitoring jobs programmatically via REST

Lab Exercises:

15. Schedule a bot with a cron trigger; configure a queue trigger that fires automatically when items are added

16. Chain two jobs via Orchestrator API: Job A completes and triggers Job B with output data passed as input argument

Day 5: Reusable Libraries, Governance & Week 1 Review

Module 9: Reusable Component Libraries & Standards

- Reusable library design: common activities, shared utilities, and cross-project components
- NuGet package publishing: versioning and distributing libraries via Orchestrator feeds
- Coding standards: naming conventions, modular workflow design, and documentation
- Process Definition Document (PDD) and Solution Design Document (SDD) standards
- RPA testing: unit testing workflows with UiPath Test Suite or manual test cases

Lab Exercises:

17. Build a reusable library containing 3 shared utilities (email sender, Excel writer, logger); publish to Orchestrator feed
18. Write a PDD and SDD for an existing automated process; document inputs, outputs, exceptions, and design decisions

Module 10: RPA Governance & Week 1 Capstone Review

- Change management for RPA: version control, deployment pipeline, and rollback
- Bot access control: role-based permissions in Orchestrator for robots and users
- Audit trail and compliance logging for regulated processes
- CoE performance metrics: automation ROI, FTE savings, error reduction
- Week 1 review: consolidating dispatcher-performer pattern with scheduling and libraries

Lab Exercises:

19. Deploy a bot through a 3-stage pipeline (dev → test → prod) using Orchestrator environments and package versioning
20. Build an ROI tracker: calculate FTE hours saved, error rate reduction, and cost savings for 3 automated processes

Week 2: AI Integration, Intelligent Automation & Enterprise Deployment

Day 6: AI-Powered Document Processing

Module 11: Intelligent Document Processing (IDP) Fundamentals

- IDP architecture: OCR → classification → extraction → validation → export
- Document types: invoices, forms, contracts, IDs, and structured vs unstructured documents
- OCR engines: Tesseract, Azure Document Intelligence, Google Document AI
- Template-based vs ML-based extraction: choosing the right approach
- UiPath Document Understanding / Power Automate AI Builder integration

Lab Exercises:

21. Set up an IDP pipeline using Tesseract OCR; extract key fields from 10 invoice PDFs and validate output accuracy
22. Compare template-based vs ML-based extraction on the same document set; document accuracy and failure cases

Module 12: OCR, NLP & Entity Extraction in RPA

- OCR post-processing: noise removal, deskewing, and confidence score filtering
- Named Entity Recognition (NER): extracting dates, amounts, names, and addresses
- Regular expression patterns for structured field extraction from OCR output
- Azure Document Intelligence: pre-built models for invoices, receipts, and IDs

- Validation rules: cross-checking extracted values against business rules and lookup tables

Lab Exercises:

23. Integrate Azure Document Intelligence into an RPA bot; extract invoice fields and store to a database with confidence scores
24. Build NER-based entity extraction for unstructured text documents; apply regex post-processing for date and amount fields

Day 7: AI Model Integration in RPA Workflows

Module 13: Calling AI APIs from RPA Bots

- REST API calls from RPA: HTTP Request activity, headers, authentication, and response parsing
- Integrating OpenAI / Azure OpenAI API: prompt design and response handling in bots
- Sentiment analysis, text classification, and summarisation via AI API calls
- Computer vision APIs: image classification, object detection, and form recognition
- Error handling for AI API calls: timeouts, rate limits, and fallback logic

Lab Exercises:

25. Build a bot that calls the OpenAI API to classify customer email intent; route to the correct queue based on classification
26. Integrate an image classification API into an RPA workflow; process uploaded images and tag them automatically

Module 14: AI-Assisted Decision Making in Automation

- Human-in-the-loop: escalating low-confidence AI decisions to human review
- Confidence threshold routing: auto-approve high confidence, escalate low confidence
- Action Centre / attended bot integration for human validation tasks
- Feedback loop: capturing human corrections to improve AI model accuracy over time
- Audit trail for AI-assisted decisions: logging model output, confidence, and human override

Lab Exercises:

27. Implement confidence threshold routing: auto-process high-confidence extractions, escalate low-confidence to Action Centre
28. Build a feedback loop: capture human corrections from Action Centre and log to a training data store for model improvement

Day 8: Process Mining, Discovery & Hyperautomation

Module 15: Process Mining & Automation Discovery

- Process mining concepts: event log analysis, process discovery, and conformance checking
- Process mining tools: UiPath Process Mining, Celonis, Microsoft Process Advisor
- Task mining: capturing desktop activity logs to discover automation candidates
- Process variant analysis: identifying the most common and most expensive process paths
- Automation opportunity prioritisation from process mining output

Lab Exercises:

29. Import an event log into a process mining tool; discover the as-is process map and identify top 3 inefficiencies
30. Run task mining on a sample desktop recording; identify repetitive task patterns suitable for RPA automation

Module 16: Hyperautomation & Integration Patterns

- Hyperautomation: combining RPA, AI, process mining, and integration platforms
- RPA + API integration: using bots as a bridge where APIs are unavailable
- RPA + BPM integration: triggering RPA from workflow engines like Camunda or Power Automate
- Event-driven automation: Kafka / Service Bus events triggering RPA bots

- Low-code integration: Power Automate cloud flows calling UiPath Orchestrator jobs

Lab Exercises:

31. Build an event-driven automation: Azure Service Bus message triggers an unattended bot via Orchestrator API
32. Integrate Power Automate cloud flow with UiPath Orchestrator: cloud flow adds queue item, bot processes and updates SharePoint

Day 9: Security, Compliance & Enterprise Deployment

Module 17: RPA Security & Credential Management

- Credential management: Orchestrator credential store, CyberArk, and Azure Key Vault integration
- Bot account management: dedicated service accounts with least-privilege access
- Secure coding practices: no hardcoded credentials, encrypted config files
- Network security: bot communication over TLS, proxy configuration, and firewall rules
- Audit logging for compliance: capturing all bot actions for regulatory review

Lab Exercises:

33. Migrate hardcoded credentials in an existing bot to Orchestrator credential store; verify secure retrieval at runtime
34. Integrate CyberArk / Azure Key Vault for bot credential retrieval; test rotation and verify bot continues running

Module 18: Enterprise Deployment & High Availability

- Production deployment checklist: environment promotion, smoke testing, and rollback plan
- High availability for unattended robots: robot pools and failover configuration
- Orchestrator high availability: load balancer, clustered nodes, and database redundancy
- Disaster recovery for RPA: backup of Orchestrator DB, packages, and credentials
- Bot performance monitoring in production: dashboards, alerts, and SLA tracking

Lab Exercises:

35. Deploy a bot to production through a formal promotion process: package versioning, environment config, and smoke test
36. Configure a robot pool with 3 robots for an unattended process; test failover by disabling one robot mid-run

Day 10: Capstone Project – Intelligent Automation Prototype

Module 19: End-to-End Intelligent Automation Build

- Capstone scenario: end-to-end business process with document input, AI processing, and system update
- Process flow: receive email → extract attachment → OCR + AI extraction → validate → update system → notify
- Integration points: email server, document AI API, database or ERP system, notification service
- Error handling, logging, and queue-based transaction management
- Orchestrator deployment: scheduled trigger, monitoring dashboard, and SLA configuration

Lab Exercises:

37. Build the full capstone bot end-to-end: email trigger → document extraction → AI classification → database update → notification
38. Deploy to Orchestrator with scheduling, queue management, monitoring alerts, and SLA; run with a live test dataset

Module 20: Capstone Project – Review, Optimisation

- Performance review: throughput, accuracy, exception rate, and SLA compliance
- Bot optimisation: selector stability, retry tuning, and AI confidence threshold adjustment
- Documentation handover: PDD, SDD, deployment guide, and operational runbook

- Roadmap: next automation candidates, AI model improvement, and CoE scaling plan

Lab Exercises:

1. Optimise the capstone bot based on test run results; tune selectors, retry logic, and AI thresholds for production readiness
2. Present the completed intelligent automation to the cohort: live demo, performance metrics, and CoE expansion roadmap