

MAHONING COUNTY CAREER & TECHNICAL CENTER

Applications of Artificial Intelligence

Syllabus & Curriculum Map · ODE Subject Code 145130

AI Automation & Software Development | Senior Year, Semester 1

2026–2027 · September 8, 2026 – January 29, 2027 · WebXam Code JSLO

Version 2.0 · Six-Module Structure · Instructor: Michael Sekol

CONCEPT What this course is

Applying artificial intelligence to real workflows and real problems. Constructing prompts, rigorously evaluating what comes back, understanding what the law requires, and building something that works.

You will finish able to build an AI-integrated application, defend every legal and ethical choice you made building it, and explain to a non-technical person why it works and where it fails.

NOTE Two things to know up front

This course replaced 145070 Visual Programming in the senior sequence beginning 2026–2027. Unlike the other three courses in this program, it is not currently CTAG-eligible for statewide college credit.

It is delivered in six self-contained three-week modules rather than continuous units. Each module stands alone.

Course Overview

Official course description

This course will prepare students to apply artificial intelligence, machine learning, and neural networks to common workflows, processes, and problems in programming and design. Students will analyze the broader societal, technological, and ethical impacts and implications of its usage and development. Students will learn how to construct prompts and queries and how to critically analyze generated responses.

— Ohio Department of Education & Workforce, Information Technology Career Field

What you bring into this course

You have completed two years of programming. You write Python and C#, use Git without thinking about it, have deployed a database-backed web application, and have built an interface that reads live data off a physical machine. None of that is re-taught here.

YEAR	SEMESTER 1	SEMESTER 2	LANGUAGE
Junior	145060 Programming	145065 Object-Oriented Programming	Python → Python + C#
Senior	145130 Applications of AI	145010 Web Design + Capstone	C# + Python → Web

Why six modules

Each module is three weeks, self-contained, with its own entry check, performance task, and exit criteria. Three modules per grading period.

- A module can be missed and made up without unraveling the sequence
- A module can be re-ordered if a schedule change forces it
- A module can be delivered asynchronously, or handed to another teacher, without the rest of the course
- Each module maps to a defined share of the WebXam blueprint, so instructional time follows assessment weight rather than instructor preference

What the assessment weights

The WebXam 145130 blueprint distributes 95 items. Module length follows those weights.

STRAND	NAME	ITEMS	SHARE
2	IT Fundamentals (2.14 Artificial Intelligence alone is 21)	46	48.4%
1	Business Operations / 21st Century Skills	18	18.9%
8	Databases	12	12.6%
7	Digital Media	7	7.4%

STRAND	NAME	ITEMS	SHARE
5	Programming & Software Systems	6	6.3%
9	Cybersecurity Law	6	6.3%

CONCEPT Read the weights honestly

Programming is six items. Law, ethics, and privacy together are roughly twenty-four. The state built this as a responsible-practice course with an AI focus, not a coding course. The outline literally stops at 5.6.9 review the design, with no competency for developing, deploying, or maintaining anything.

This course meets that assessment and then goes well past it. Being able to evaluate an AI output is not a job. Having built and shipped an AI-integrated application is.

Assessments and hard dates

ASSESSMENT	WINDOW
WebXam 145130 Pretest (JSLO)	Week 3 — September 21–25. Fall window closes October 2.
Congressional App Challenge	October 26, 12:00 pm ET
BPA Regional pre-submission	November 24
BPA Regional coding events (MCCTC)	December 7–9
BPA Regional presentation events	December 11
BPA State pre-submission	February 4, after this course ends
WebXam 145130 Post-test	Week 19 — January 25–29

BPA alignment

EVENT	SUPPORTED BY
V16 Virtual Artificial Intelligence Team	Outcome 2.14 in full — the flagship event for this course
455 User Experience Design Team	Module 6, outcomes 2.15.2 and 2.15.3
345 SQL Database Fundamentals	Module 4, Strand 8
390 Digital Technology Concepts	Modules 1 and 6, outcome 2.4
320 Computer Security	Module 3, outcome 2.1

How Class Runs

The daily block

Periods 4/5B–7, 10:56 a.m. – 1:32 p.m. 149 working minutes. Period 8, 1:34–2:20, is self-directed.

MIN	SEGMENT	WHAT HAPPENS
10	Bell ringer & standup	A question on the board, then three questions: finished, working on, blocked by.
15	Instruction	One concept. Demonstrated live, including a deliberate failure.
50	Build 1	Hands-on.
5	Reset	Stand, walk, reset.
55	Build 2	Continuation, pair work, or individual conferencing.
14	Demo & close	One team demos. Commit and push.

Period 8 carries no new content. It is BPA preparation, credential work, side quests, and capstone groundwork, graded under BPA / Credential / Capstone.

The three gates

GATE	AI USE	IN THIS COURSE
Gate 1 — Closed	None	Timed reps, and in this course they are as often analytical as technical: evaluate this claim, identify this bias, find the fabricated citation.
Gate 2 — Adversarial	AI is the opponent	The weekly core. You score AI output on validity, relevance, authenticity, bias, and hallucinations.
Gate 3 — Open	Full tooling	Build with AI. Every build carries a decision log and a written legal and ethical analysis.

WARNING Where the models come from

Commercial AI developer APIs require users to be 18 or older. This course runs against locally hosted models on lab hardware and Raspberry Pi, which carry no such terms and send no data outside the building.

Local models are slower and less capable than cloud models. That constraint is instructional. You will feel directly what model size costs and what it buys.

The architecture you will build against

Python serves the model. C# consumes it. A small Flask service wraps a locally hosted language model, and your C# application calls it over HTTP. That is how production AI systems are actually structured, with the machine learning layer and the application layer separated.

Grading

CATEGORY	WEIGHT	WHAT COUNTS
Projects	35%	Module performance tasks, the AI-integrated build, team sprints.
Written & Documentation	20%	Gate 2 evaluations, AI usage logs, decision logs, ethics and licensing analyses.
Lab & Practice	20%	Gate 1 reps, bell ringers, dailylabs, problem drops, case analyses.
Quiz & Exam	15%	Module exit assessments and WebXam-aligned quizzes.
BPA / Credential / Capstone	10%	Period 8 work. Competition, credentials, side quests, capstone groundwork.

CONCEPT Why Documentation carries 20%

In this course the written analysis often IS the competency. Analyzing societal impact, evaluating output, critically analyzing scenarios, and adhering to licensing law are all assessed by what you write, not what you build.

Policies

- No work is graded that is not in a repository. Every period ends with a commit.
- Every project includes an AI usage log: prompt, response, what you changed, why.
- Every project includes a licensing statement: what you used, under what license, what you owe.
- No personal information, real names, or school data enters any AI tool, local or otherwise.
- Any project may be revised once within two weeks of return if the original was on time.
- When stuck: struggle 10 minutes, ask a peer, ask an AI, then ask me.
- The only way to fail outright is to submit work you cannot explain.

The Six Modules

Each module is three weeks. Each has an entry check, a performance task, and exit criteria. Modules 1 through 3 are Grading Period 1. Modules 4 through 6 are Grading Period 2, with Week 19 reserved for assessment and demonstration.

MODULE 1 Foundations of Artificial Intelligence

WEEKS 1–3

DATES Sept 8 – Sept 25

EXAM ITEMS ~10

Focus: Strip the mystery. What these systems are, how they differ from what came before, and where they sit in the marketplace.

Students will:

- Describe how machine learning and neural networks operate differently than standard decision trees
- Describe the fundamental architectures of emerging technologies and how they integrate into existing IT systems
- Identify emerging technologies applicable to the marketplace including LLMs, machine learning, IoT, and mixed reality
- Explain tokens, context windows, training, and inference in plain language
- Run a language model locally and measure what it costs in time and hardware

Performance task:

- A local model running on your workstation, benchmarked against a classmate's on identical prompts
- Written explainer: how a language model produces text, for a reader who knows nothing
- The Infographic Autopsy: score a polished, widely shared, factually wrong AI diagram
- WEBXAM 145130 PRETEST — Week 3

Exit criteria — you have completed this module when you can:

- Explain to a non-technical adult what a language model does, without using the word "magic"
- State three things a language model cannot do, and why
- Run inference locally and report tokens per second

COMPETENCIES 2.14.1, 2.4.1, 2.4.2, 2.4.4, 5.1.1, 1.2.1

MODULE 2 Prompt Engineering & Output Evaluation

WEEKS 4–6

DATES Sept 28 – Oct 16

EXAM ITEMS ~18

Focus: The highest-weighted skill in the course. Write a prompt, revise it, and rigorously evaluate what comes back.

Students will:

- Write and revise a prompt to generate a desired response
- Evaluate an AI result on validity, relevance, authenticity, potential bias, and hallucinations
- Critically analyze scenarios involving AI usage
- Extract relevant valid information from materials and cite sources
- Apply problem-solving and critical-thinking skills when formulating solutions

Performance task:

- Prompt Autopsy: one task, five materially different prompts, documented comparison of what each produced and why
- Hallucination Hunt: produce, document, and verify three fabricated citations under controlled conditions
- Problem drop #1 — timed, ambiguous, individual

Exit criteria — you have completed this module when you can:

- Take a vague request and produce a prompt that gets usable output on the second try
- Score any AI artifact on all five parameters and defend each score
- Identify a fabricated citation without being told one is present

COMPETENCIES 2.14.3, 2.14.4, 2.14.6, 1.2.1, 1.2.5, 1.1.7, 1.1.9

MODULE 3 Law, Licensing, Ethics & Privacy

WEEKS 7–9

DATES Oct 19 – Nov 6

EXAM ITEMS ~24

Focus: The largest cluster on this exam and the one most AI curricula skip entirely. Who owns AI output, what you may legally use, what you must protect, and what you owe.

Students will:

- Adhere to licensing and intellectual property laws including copyright, trademark, and digital-rights management
- Identify intellectual property rights and controls related to interactive media
- Verify compliance with computer and intellectual property laws and regulations
- Describe privacy security compliance frameworks including HIPAA, PCI, SOX, ADA, GDPR, and EUDPR
- Explain the need for confidentiality, integrity, and availability of information
- Identify how consumer protection laws affect products and services
- Identify conflicts of interest between personal, organizational, and professional ethical standards
- Analyze how AI technology impacts society and the ethical implications of its usage

Performance task:

- Licensing audit: trace every asset, model, and dataset in an existing AI project to its actual license
- Position paper arguing the side of a contested AI issue you personally disagree with
- Privacy impact assessment for a proposed AI feature using a real school workflow
- CONGRESSIONAL APP CHALLENGE submission — October 26
- GP1 ENDS November 6

Exit criteria — you have completed this module when you can:

- State who owns the output of a generative model, and why the answer is unsettled
- Read any license and say what it permits, requires, and forbids
- Name which privacy framework governs a given category of data

COMPETENCIES 9.6.1, 7.1.7, 7.1.4, 1.3.3, 1.3.4, 1.3.8, 1.3.9, 1.7.13, 2.1.1, 2.1.12, 2.14.2, 1.5.7, 3.2.1

MODULE 4 Data Foundations for AI

WEEKS 10–12

DATES Nov 9 – Nov 24

EXAM ITEMS ~22

Focus: AI runs on data. Sourcing it, storing it, moving it between formats, and reporting on it. The second-largest strand on the exam.

Students will:

- Identify database types including relational, NoSQL, graph, vector, and AI databases

- Compare database structures including flat file, relational, data lakes, and multi-modal
- Describe database elements: table, record, field, relationships, schema, normalization, keys
- Import large data sets using bulk command, SQL script, or CSV file
- Preserve, convert, or migrate existing data files to a new format
- Generate forms, reports, and query results using calculated fields and functions
- Implement data integrity, security, encryption, and regulatory restrictions including FERPA

Performance task:

- Data pipeline: ingest a messy real dataset, clean it, migrate the format, load it, and report on it
- Database comparison memo: which structure fits which AI workload, and why
- Document ingestion for retrieval: chunk a document set and make it queryable
- BPA PRE-SUBMISSION — November 24

Exit criteria — you have completed this module when you can:

- Choose a database structure for a stated workload and defend the choice
- Move data between three formats without losing fidelity
- Explain why retrieval beats fine-tuning for most practical problems

COMPETENCIES 2.8.1, 2.8.2, 2.8.3, 2.8.4, 2.8.8, 2.8.9, 8.2.3, 8.3.1, 8.3.2, 8.5.4, 2.6.4, 1.4.3, 1.4.6

MODULE 5 Building With AI**WEEKS** 13–15**DATES** Nov 30 – Dec 18**EXAM ITEMS** ~11

Focus: The build module. A C# application calling a locally hosted model through a Flask service. Weeks 14 and 15 carry the regional competition.

Students will:

- Describe how programs and scripts solve problems across desktop, mobile, enterprise, AI, and cloud
- Model a solution using flowcharts, IPO charts, UML, decision trees, and pseudocode alongside AI
- Identify constraints, system processing requirements, and input and output requirements
- Design system inputs, outputs, and processes, and document the design
- Select and apply troubleshooting methodologies, then document the problem and verified solution
- Review a design through peer walkthrough

Performance task:

- AI-INTEGRATED APPLICATION: a C# front end calling a local model through a Flask service, with structured output parsing and full failure handling
- Design documentation: dataflow diagram, I/O specification, constraint list
- BPA REGIONAL CODING EVENTS December 7–9 · PRESENTATIONS December 11

Exit criteria — you have completed this module when you can:

- Wire an application to a model and handle the model failing, timing out, or returning garbage
- Parse unstructured model output into something your program can rely on
- Explain why the model layer and the application layer are separate

COMPETENCIES 5.1.1, 5.1.2, 5.1.3, 5.6.2, 5.6.5, 5.6.6, 5.6.7, 5.6.8, 5.6.9, 2.11.1, 2.11.2, 2.11.5, 2.11.8

MODULE 6 Human-Centered AI & Automation**WEEKS** 16–18**DATES** Jan 4 – Jan 22**EXAM ITEMS** ~11

Focus: AI nobody can use is not a product. Research with real users, then automate what should be automated.

Students will:

- Conduct and analyze research including focus testing and beta testing with the end user in mind
- Design user tasks and evaluate results through use-case scenarios and wireframe testing
- Identify major applications for interactive media across marketing, education, training, and entertainment
- Select media elements to be used including sound, video, graphics, text, and animation
- Identify and analyze opportunities to apply AI across business, industry, and society
- Research the value of emerging technologies on the marketplace
- Identify alternative actions when goals are not met

Performance task:

- Usability study on your Module 5 application with five real users outside the class
- Wireframe iteration in Figma driven by what testing revealed, and a revised interface
- Working automation in n8n: scheduled trigger, four or more nodes, real error path
- Opportunity analysis: pick an industry, find three workflows AI could change, estimate the value

Exit criteria — you have completed this module when you can:

- Run a usability test without leading the participant
- Change your own design because a user struggled, not because you preferred it
- Identify a workflow worth automating and say why it is worth the effort

COMPETENCIES 2.15.2, 2.15.3, 7.1.9, 7.3.1, 2.14.5, 2.4.3, 1.8.4, 1.2.2, 1.2.13, 1.2.14

Week 19 · Assessment & Demonstration · January 25–29

No new content. Acceptance testing, the post-test, and final demonstrations.

- Written acceptance procedure agreed with a stakeholder, with realistic test cases
- Corrections made from test results, and stakeholder acceptance sought
- Final demonstration: what it does, why you built it this way, what you rejected
- WEBXAM 145130 POST-TEST
- GP2 ENDS January 29

Competencies: 2.12.1, 2.12.3, 2.12.5, 2.12.6, 1.2.2, 1.2.12

Semester Calendar

Grading Period 1 • September 8 – November 6 • Modules 1–3

WK	DATES	MODULE	MILESTONES
1	Sept 8–11	M1 Foundations	First day Sept 8. Local model setup. Repository created.
2	Sept 14–18	M1	Infographic Autopsy. Written explainer due.
3	Sept 21–25	M1 exit	WEBXAM 145130 PRETEST. Benchmark due. Module 1 exit.
4	Sept 28 – Oct 2	M2 Prompting	Prompt Autopsy opens. CAC teams form.
5	Oct 5–9	M2	Oct 9 NEOEA Day, no classes. Evaluation rubric drilled daily.
6	Oct 12–16	M2 exit	Oct 16 Waiver Day, no classes. Hallucination Hunt due. Problem drop #1.
7	Oct 19–23	M3 Law & Ethics	Licensing fundamentals. CAC final build.
8	Oct 26–30	M3	CAC DEADLINE Oct 26. Licensing audit due.
9	Nov 2–6	M3 exit	Position paper and privacy assessment due. GP1 ENDS Nov 6.

Grading Period 2 • November 9 – January 29 • Modules 4–6

WK	DATES	MODULE	MILESTONES
10	Nov 9–13	M4 Data	Database types and structures. NASA Space Apps Nov 14–15.
11	Nov 16–20	M4	Pipeline build. Format migration. Nov 19 conferences.
12	Nov 23–24	M4 exit	BPA PRE-SUBMISSION Nov 24. Break Nov 25–27. Two-day week.
13	Nov 30 – Dec 4	M5 Building	Application build opens. Design documentation.
14	Dec 7–11	M5	BPA REGIONAL CODING Dec 7–9. PRESENTATIONS Dec 11.
15	Dec 14–18	M5 exit	Peer walkthrough. Banquet Dec 17. Break begins Dec 21.
16	Jan 4–8	M6 Human-Centered	Return from break. Usability study opens. Figma.
17	Jan 11–15	M6	Wireframe iteration. Revised interface. Problem drop #4.

WK	DATES	MODULE	MILESTONES
18	Jan 18–22	M6 exit	Jan 18 MLK, no classes. n8n automation and opportunity analysis due.
19	Jan 25–29	Assessment	WEBXAM POST-TEST. Acceptance testing. Final demos. GP2 ENDS.

NOTE Two structural notes

Module 3 receives three full weeks because it carries roughly a quarter of the exam. Resist shortening it — it is the cluster most programs skip and the one employers most complain is missing.

Module 5 spans the regional competition window on purpose. A build module absorbs interruption better than a content module, so the weeks eaten by competition cost you the least there.

Module Coverage Map

MODULE	TITLE	WEEKS	ITEMS	SHARE
1	Foundations of Artificial Intelligence	1–3	~10	10.5%
2	Prompt Engineering & Output Evaluation	4–6	~18	18.9%
3	Law, Licensing, Ethics & Privacy	7–9	~24	25.3%
4	Data Foundations for AI	10–12	~22	23.2%
5	Building With AI	13–15	~11	11.6%
6	Human-Centered AI & Automation	16–18	~11	11.6%
—	Assessment & Demonstration	19	~6	6.3%

Outcome coverage

OUTCOME	NAME	ITEMS	MODULE
2.14	Artificial Intelligence	21	1, 2, 3, 6
1.3	Business Ethics & Law	6	3
8.5	Queries & Transactions	6	4
9.6	Cybersecurity Law	6	3
2.1	Security, Risks & Safeguards	5	3
8.3	Data Entry & Access	5	4
2.4	Emerging Technologies	4	1, 6
2.6	Installation & Configuration	4	4
2.11	Troubleshooting	4	5
2.15	UX/UI Design	4	6
5.1	Programming Concepts	4	1, 5
7.1	Interactive Media	4	3, 6
1.2	Leadership & Communications	3	2, 6, 19
1.4	Knowledge Management & IT	3	4
2.8	Databases	3	4
7.3	Production	3	6
1.1	Employability Skills	2	2
1.5	Global Environment	2	3
1.7	Entrepreneurship	2	3

OUTCOME	NAME	ITEMS	MODULE
5.6	Software Development Lifecycle	2	5
2.12	Performance Tests & Acceptance	1	19
8.2	Design & Creation	1	4

CHECKPOINT Where this course exceeds the standard

The Ohio outline stops at 5.6.9 review the design. It contains no competency for developing, deploying, or maintaining an application.

This course requires all three anyway. You arrive having completed two years of programming, and a graduate who can only analyze AI is less employable than one who has shipped something that uses it.

Version 2.0 · August 2026 · Supersedes Version 1.0. Restructured into six portable three-week modules. Pairs with the Course Prompt Guide and Program Style & Reference Guide.