

Python with AI & SQL with AI Course Curriculum

- [Python with AI & SQL with AI](#)
 - [3-Month Course Curriculum for School Students \(Grades 8-12\)](#)
 - [1. Course Overview](#)
 - [2. Learning Objectives](#)
 - [3. Month 1 — Python Fundamentals + Intro to AI Thinking \(Weeks 1-4\)](#)
 - [4. Month 2 — Applied Python + AI-Assisted Development \(Weeks 5-8\)](#)
 - [5. Month 3 — SQL Fundamentals + AI-Powered SQL \(Weeks 9-12\)](#)
 - [6. Assessment Plan](#)
 - [7. Suggested Tools & Resources](#)
 - [8. Notes for Instructors](#)

Python with AI & SQL with AI

3-Month Course Curriculum for School Students (Grades 8-12)

1. Course Overview

Item	Detail
Target Audience	Students in Grades 8-12 (age 13-18)
Duration	12 weeks (3 months)
Session Frequency	2 sessions/week, 60-75 minutes each (24 sessions total)
Mode	In-person / Online / Hybrid
Prerequisites	Basic computer literacy; no prior coding experience required
Tools Used	Python 3.x, Thonny/Replit/Google Colab, ChatGPT/Claude/Copilot (AI assistants), SQLite/MySQL, DB Browser for SQLite, VS Code

Course Split: - **Month 1:** Python Programming Fundamentals + Intro to AI Thinking - **Month 2:** Applied Python + AI-Assisted Development & Basic Machine Learning - **Month 3:** SQL Fundamentals + AI-Powered SQL & Capstone Project

2. Learning Objectives

By the end of this course, students will be able to: 1. Write, debug, and run Python programs confidently. 2. Understand core programming concepts: variables, loops, functions, data structures. 3. Use AI tools (like ChatGPT/Claude) responsibly to assist with coding, debugging, and learning — not as a shortcut, but as a collaborator. 4. Understand basic AI/ML concepts: what AI is, how models “learn,” and build a simple

AI-powered mini project. 5. Write SQL queries to create, read, update, and delete data in a relational database. 6. Use AI tools to generate, explain, and optimize SQL queries (text-to-SQL). 7. Combine Python + SQL + AI to build one capstone project.

3. Month 1 — Python Fundamentals + Intro to AI Thinking (Weeks 1-4)

Week 1: Getting Started

- **Session 1:** What is programming? Installing Python, setting up Thonny/Replit. Writing your first program (`print()` , comments).
- **Session 2:** Variables, data types (int, float, string, boolean), taking user input with `input()` .
- *Mini AI Tie-in:* Introduce what “AI” means in everyday life (Siri, Netflix recommendations, ChatGPT) — no coding yet, just discussion.

Week 2: Control Flow

- **Session 3:** Operators (arithmetic, comparison, logical), if/elif/else statements.
- **Session 4:** Loops — `for` and `while` , `break` / `continue` .
- *Project:* Simple number-guessing game.

Week 3: Data Structures

- **Session 5:** Lists and list operations (indexing, slicing, append, sort).
- **Session 6:** Dictionaries, tuples, and sets.
- *Project:* Student grade tracker using a dictionary.

Week 4: Functions & Intro to AI Assistants

- **Session 7:** Defining functions, parameters, return values, scope.
 - **Session 8: Using AI tools as a coding partner** — how to write good prompts to ask an AI to explain code, fix errors, or suggest improvements. Ground rules for academic honesty when using AI.
 - *Milestone Project 1:* A calculator or quiz app built using functions, with students using an AI assistant to debug one intentional error.
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4. Month 2 — Applied Python + AI-Assisted Development (Weeks 5-8)

Week 5: File Handling & Modules

- **Session 9:** Reading/writing text and CSV files.
- **Session 10:** Using Python modules/libraries (`random` , `math` , `datetime`); installing packages with `pip` .

Week 6: Intro to Data with Python

- **Session 11:** Introduction to `pandas` — reading a CSV, viewing rows/columns, basic filtering.
- **Session 12:** Introduction to `matplotlib` — creating simple bar/line charts from data.
- *Project:* Analyze a small dataset (e.g., class marks or weather data) and chart it.

Week 7: What Is AI & Machine Learning?

- **Session 13:** Concepts — AI vs. Machine Learning vs. Deep Learning; how a model “learns” from data (in plain language, no heavy math).
- **Session 14:** Hands-on: Using a pre-built simple ML model (e.g., a scikit-learn classifier on a small,

friendly dataset like Iris flowers or a fruit classifier) — students run and interpret it, not build the math from scratch.

Week 8: Build a Mini AI Project

- **Session 15:** Guided project — a simple text-based chatbot in Python (rule-based, or using an API call to an AI model with teacher-provided keys) OR a basic image/number classifier demo.
- **Session 16:** Project polishing, code review, and presentation prep.
- *Milestone Project 2:* Mini AI project (chatbot or classifier) presented to class.

5. Month 3 — SQL Fundamentals + AI-Powered SQL (Weeks 9-12)

Week 9: Database & SQL Basics

- **Session 17:** What is a database? Tables, rows, columns, primary keys. Setting up SQLite/DB Browser.
- **Session 18:** CREATE TABLE , INSERT INTO , SELECT , WHERE clause.

Week 10: Intermediate SQL

- **Session 19:** ORDER BY , GROUP BY , aggregate functions (COUNT , SUM , AVG , MAX , MIN).
- **Session 20:** UPDATE , DELETE , JOIN (INNER JOIN basics across two tables, e.g., Students + Marks).

Week 11: AI-Powered SQL

- **Session 21:** Using AI tools to convert plain English questions into SQL queries (“text-to-SQL”), then verifying and understanding the generated query rather than blindly trusting it.
- **Session 22:** Using AI to explain complex queries, optimize slow queries, and catch logical errors in student-written SQL.

Week 12: Capstone Project & Presentations

- **Session 23:** Capstone work session — students build a small end-to-end project: a Python script that reads/writes to a SQL database, with at least one feature built using AI assistance (e.g., a “library management” or “student result” mini-system with a simple report generated via AI-assisted SQL query + Python chart).
- **Session 24:** Final presentations, peer feedback, course wrap-up, and certificates.

6. Assessment Plan

Component	Weight
Weekly in-class exercises & participation	20%
Milestone Project 1 (Python + AI debugging)	20%
Milestone Project 2 (Mini AI project)	20%
SQL exercises (Weeks 9–11)	15%
Capstone Project + Presentation	25%

Grading emphasis: Understanding of concepts and correct/responsible use of AI tools (i.e., can the student explain *why* the AI-suggested code/query works) matters as much as final output.

7. Suggested Tools & Resources

- **Python IDEs:** Thonny (beginner-friendly, local), Replit or Google Colab (browser-based, no install)
 - **AI Assistants:** ChatGPT, Claude, or GitHub Copilot (teacher-supervised accounts recommended for younger students)
 - **SQL Tools:** DB Browser for SQLite (free, GUI-based, great for beginners), SQLiteOnline.com (browser-based)
 - **Datasets for practice:** Kaggle “starter” datasets, or teacher-created sample CSVs (class marks, weather, sports stats)
 - **Libraries:** `pandas` , `matplotlib` , `scikit-learn` (Week 7–8 only, pre-built models)
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8. Notes for Instructors

- Grade 8–9 students may need slower pacing on Weeks 2–3 (loops, data structures); consider extending Month 1 by a week and compressing Month 3’s advanced JOIN content for younger cohorts.
- Grade 11–12 students can be pushed further: add basic API calls (`requests` library), simple linear regression math, or multi-table JOINS.
- Emphasize **AI literacy alongside AI usage** — students should learn to question, verify, and understand AI-generated code/queries, not just copy-paste them.
- Keep sessions hands-on (70% coding, 30% concept explanation) — this age group learns best by building, not just listening.