

Summer 2023 Training Course:
Artificial Intelligence Applications in Structural Engineering
Week 1: Introduction & Syllabus - 00

Ahmed A. Torky – Civil Engineering Department



Instructors

- **Dr. Shady Salem** (*Specialized in Theory of Structures*)
- **Dr. Ahmed A. Torky** (*Specialized in AI implementation in Structural Engineering*)

Brief Weekly Content

- *Week 1: Introduction to Python and SAP2000 (maybe OpenSEES)*
- *Week 2: Integrating Python with SAP2000*
- *Week 3: AI algorithms and Implementation*
- *Week 4: Structural Engineering Project powered by AI*

Typical Week

- *Sunday, Monday, Wednesday, Thursday (Tuesday Self-Study)*
- *Morning Session 10 am - 12 am (**Lecture**)*
- *Afternoon Session 1pm - 3pm (**Hands-on Training**)*

Purpose of this training course

Why is this important

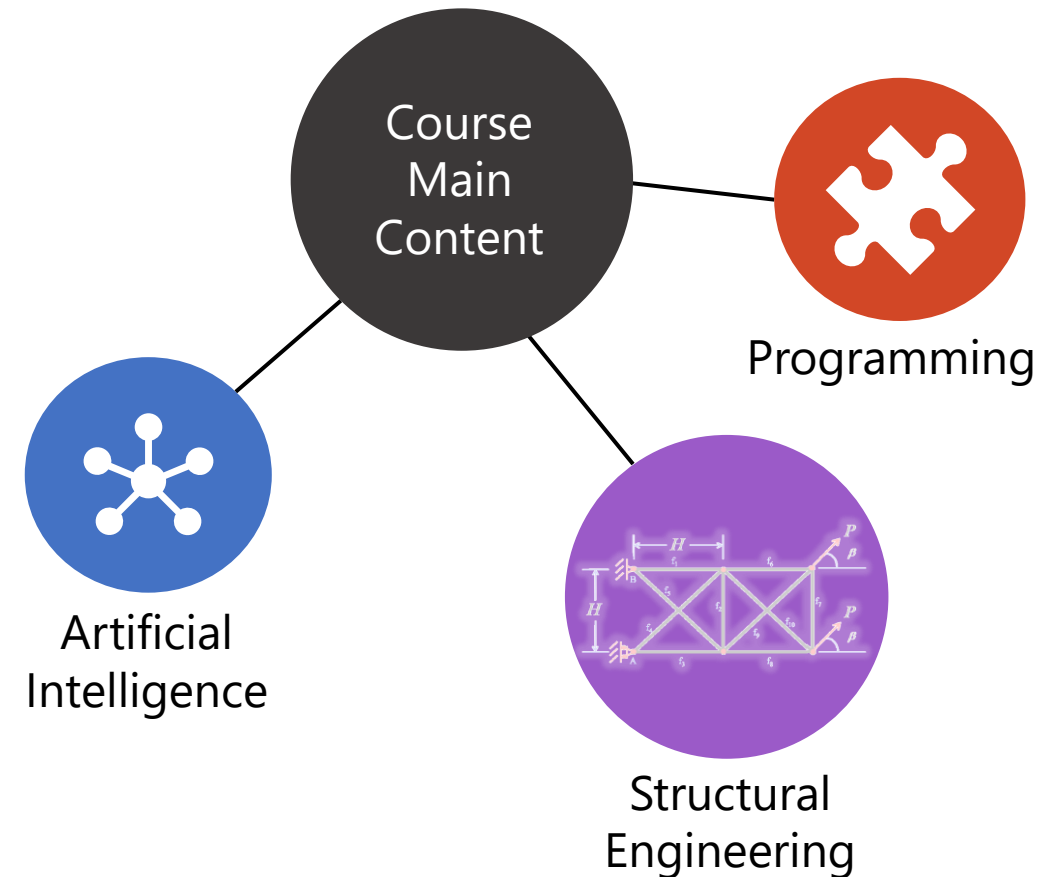
- *You will learn about the modern artificial intelligence algorithms.*
- *Programming provides engineers with a lot of automation support.*
- *AI is here to stay, better learn how to make use of it.*

Learning outcomes

- *Python programming skills.*
- *Problem solving with AI algorithms.*
- *Optimize parameters using structural analysis tools via Python.*

Prospects

- *Project supervised by the instructors.*
- *Publication of Journal/Conference paper.*
- *Not just structural engineering ... other applications are viable.*



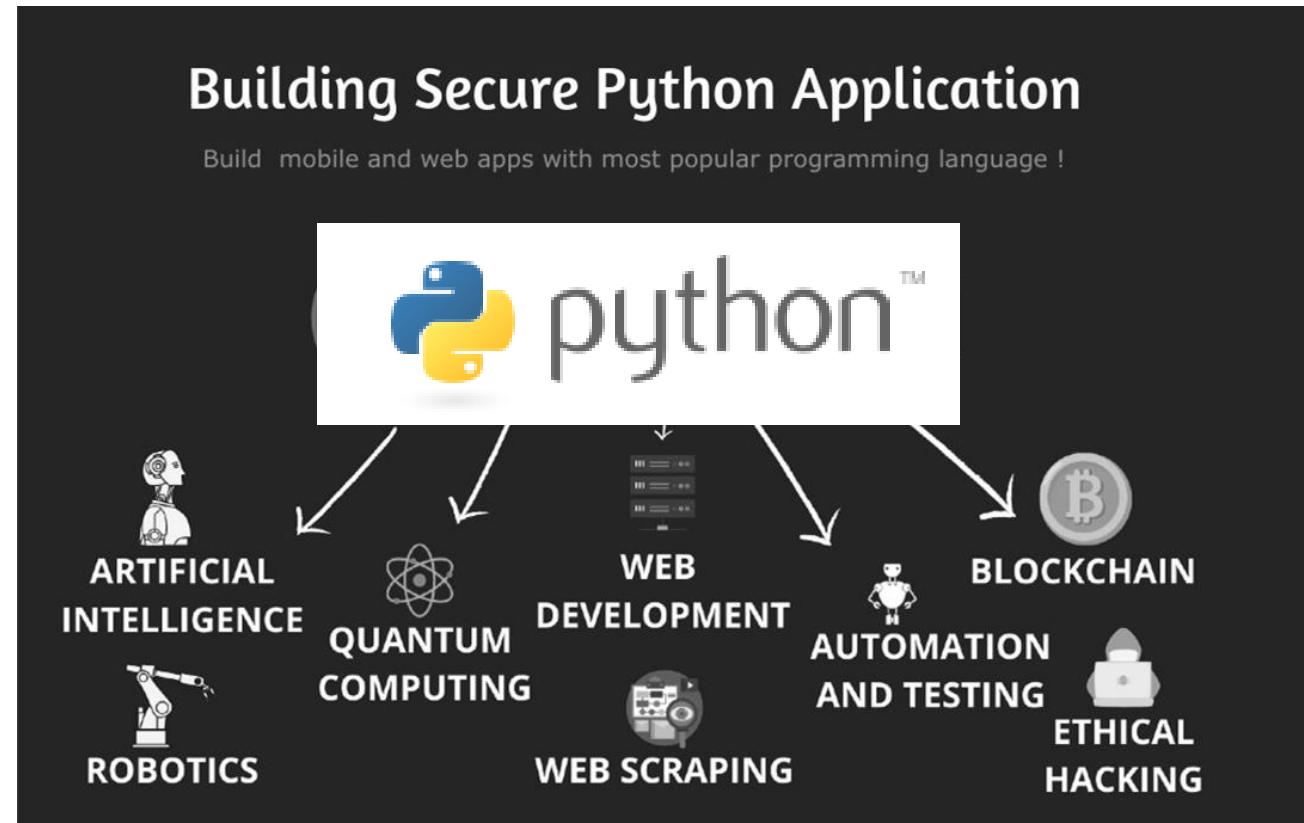
Programming – Python

Python is an easy to learn, **powerful programming** language. It has efficient **high-level** data structures and a simple but effective approach to object-oriented programming.

Python's ***elegant syntax and dynamic typing***, together with its interpreted nature, make it an ideal language for scripting and rapid application development.

The Python **interpreter** and the extensive standard library are freely available in source or binary form for all major platforms from the Python web site, <https://www.python.org/>, and may be freely distributed.

Python is used in many application domains.

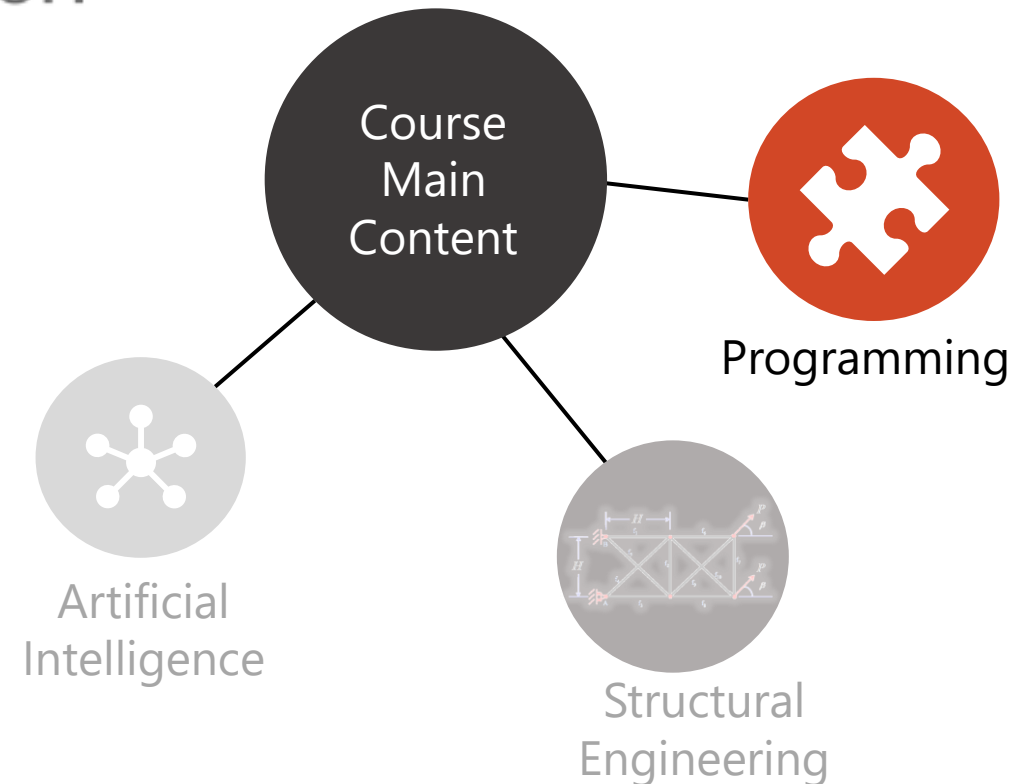


Week 1 – Day 1 and Day 2



Programming with Python:

1. Python installation instructions
2. Language Basics: Data Types, Loops, If-statements
3. Simple Operations and Matrix Operations
4. Plotting
5. Functions/Classes
6. Modules and Online Libraries
7. Best Practices – Type-hinting and Doc-strings



Python – Create an Environment



Python -----> **Anaconda** (Spyder & Jupyter)

Download Link: <https://www.anaconda.com/download>

- **Jupyter**, is excellent for learning the language. It is a **web application** that allows you to create interactive documents that combine live code, visualizations, and narrative text.
- **Spyder** is a more traditional **IDE** that is easy to use and offers a range of features that are specifically designed for scientific computing and data analysis. It is excellent for making Python **scripts/packages**.

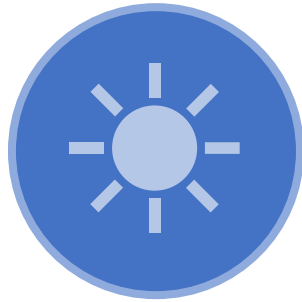
Try it out – Install Anaconda!

- 1 Install **Anaconda** executable.
- 2 Make sure you add it to **Path**.
- 3 Open **Anaconda Prompt**
- 4 Open **Spyder/Jupyter**.
- 5 Start **coding**!



**Road to Data Science
and Machine Learning**

Questions?



- Coding questions?
- Concept questions?
- What to do next?