MMAE 450 — Software Setup and Chapter 1 Preparation

This course uses **Python** and **Jupyter notebooks** as the primary computational tools. To be fully prepared for the first week of class, complete the setup steps below.

These steps correspond to Section 1.2: Introduction to Python in the course textbook.

Step 0: Create Your Course Workspace Folder (Important)

To keep your files organized all semester, create a dedicated course folder and do all course work inside it.

Windows (recommended location)

Create this folder (in File Explorer or from PowerShell):

`Documents\Projects\MMAE450`

macOS (recommended location)

Create this folder:

`$HOME/Projects/MMAE450` (*example* :`/Users/yourname/Projects/MMAE450`)

Inside your MMAE450 folder, you will create:

- your virtual environment
- your downloaded notebooks (organized by module)
- homework files and scripts

Step 1: Install Python (Before Creating a Virtual Environment)

A Python installation is required before creating a virtual environment.

Windows 11: Install Python from python.org

- Go to: `https://www.python.org/downloads/windows/`
- Click **Latest Python 3 Release**
- On the next page, scroll to **Files**

- Download **Windows installer (64-bit)**
- **Do not download the Python install manager**

After installation, verify:

```
py --version
```

macOS: Check Python, then install via Homebrew if needed

First, check whether Python 3 is available:

```
python3 --version
```

If `python3` is not found:

1. Install Homebrew (one-time installation):

   ```
   /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/
       install/HEAD/install.sh)"
   ```

2. Install Python:

   ```
   brew install python
   ```

3. Verify:

   ```
   python3 --version
   ```

Step 2: Create and Activate a Virtual Environment

All course work should be completed inside a virtual environment. This isolates course packages and avoids conflicts with other software.

Windows 11 (PowerShell)

1) Change to your course folder:

```
cd $HOME\Documents\Projects\MMAE450
```

2) Create the environment:

```
py -m venv my_venv
```

3) Activate the environment:

```
my_venv\Scripts\activate
```

After activation, your prompt should look like:

```
(my_venv) PS C:\Users\YourName\Documents\Projects\MMAE450>
```

macOS (Terminal)

1) Change to your course folder:

```
cd ~/Projects/MMAE450
```

2) Create the environment:

```
python3 -m venv my_venv
```

3) Activate the environment:

```
source my_venv/bin/activate
```

After activation, your prompt should include `(my_venv)`.

Deactivation (Windows or macOS)

To exit the environment:

```
deactivate
```

Step 3: Upgrade pip and Install Required Packages

With the virtual environment activated, first upgrade pip:

```
python -m pip install --upgrade pip
python -m pip --version
```

Then install the core libraries used throughout the course (run these while `(my_venv)` is active):

```
python -m pip install pandas
python -m pip install sympy
python -m pip install notebook
python -m pip install matplotlib
python -m pip install ipykernel
```

(Optional) Verify installed packages:

```
python -m pip list
```

Step 4: Register the Jupyter Kernel (Why This Matters)

Why do this? Jupyter does *not* automatically know which Python environment to use. Registering a kernel links Jupyter to your course virtual environment so notebooks run with the correct Python and the correct installed packages.
Register the virtual environment as a Jupyter kernel:

```
python -m ipykernel install --user \
  --name=my_venv \
  --display-name "Python (my_venv)"
```

Important: If you skip this step, Jupyter may use the wrong Python installation and you may see errors like `ModuleNotFoundError` even after installing packages.

Step 5: Download the Module 1 Notebook and Run Jupyter from that Folder

1. Download the notebook from **Canvas Module 1**.
2. Create a `Module1` folder inside your course workspace.
3. Save the downloaded notebook into your `Module1` folder.

Windows (PowerShell)

```
cd $HOME\Documents\Projects\MMAE450\Module1
jupyter notebook
```

macOS (Terminal)

```
cd ~/Projects/MMAE450/Module1
jupyter notebook
```

A browser window will open. Open the notebook you downloaded.

Select the correct kernel in Jupyter:

- In the notebook menu: **Kernel** → **Change Kernel**
- Select **Python (mmae_venv)**

Optional: Companion Repository and requirements.txt

A public GitHub repository accompanies this textbook and contains supporting materials used throughout the course:

- Jupyter notebooks
- example Python scripts
- data files used in demonstrations and exercises
- a `requirements.txt` file for software installation

Repository:

`https://github.com/gosz450/computational-mechanics-companion`

If instructed, you may install packages from `requirements.txt` (with `(my_venv)` active):

```
python -m pip install -r requirements.txt
```

Getting Help

- Bring your laptop to class during the first week if you encounter issues.
- Questions about setup can be addressed during office hours.
- Do not wait until an assignment deadline to resolve installation problems.

Setup Checklist (Before Week 1)

- Python installed and verified
- Course folder created (`.../Projects/MMAE450`)
- Virtual environment created and activated
- Required packages installed
- Jupyter kernel registered
- Notebook downloaded into `Module1` and runs successfully