

# Hydroinformatik II

## ”Prozesssimulation und Systemanalyse”

### Hydroinformatik II Übungen © 2020

Olaf Kolditz

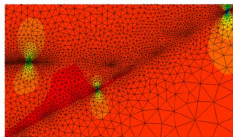
\*Helmholtz Centre for Environmental Research – UFZ

<sup>1</sup>Technische Universität Dresden – TUDD

<sup>2</sup>Centre for Advanced Water Research – CAWR

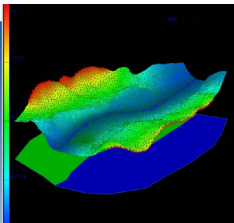
17.04.2020 / 05.06.2020 - Dresden

$$\frac{d\psi}{dt} = \frac{\partial\psi}{\partial t} + \mathbf{v}^E \nabla \psi$$

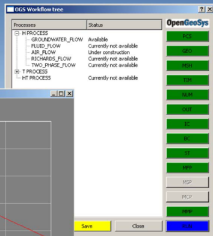


Basics  
Mechanik

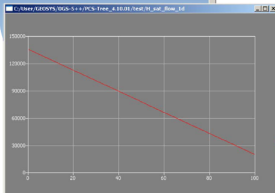
Anwendung



Numerische  
Methoden



Programmierung  
Visual C++



Prozessverständnis

### Professur für Angewandte Umweltsystemanalyse an der TU Dresden

#### Hydroinformatik II (BHYWI 08)

Notfall-Mobile: 0151 52739034

*Liebe Studentinnen und Studenten, unsere Vorlesung findet zunächst als Web-Vorlesung statt. Wir werden das Konferenz-Tool "GoToMeeting" verwenden. Bitte loggen Sie sich 5 Minuten vor Beginn der Vorlesung bei <https://www.gotomeet.me/OlafKolditz> ein. Sinnvoll wäre auch die Einrichtung einer Mailingliste (natürlich ist das freiwillig). Wenn Sie in die Mailingliste aufgenommen werden wollen, schicken Sie mir bitte eine Email an [olaf.kolditz@tu-dresden.de](mailto:olaf.kolditz@tu-dresden.de) (Betreff: Hydroinformatik II). Erstmal soweit, beste Grüße und bleiben Sie gesund, Olaf Kolditz*

#### Sommersemester 2020

Vorlesung: Freitags, 2. DS. 09:20 - 10:50 Uhr, Web-Vorlesung

#### Vorlesungsplan

- 🔗 <https://www.gotomeet.me/OlafKolditz>
- 📎 17.04.2020: V1 Einführung in die Lehrveranstaltung (663.9 KB)
- 📎 17.04.2020: E01 Tools (1.9 MB)
- 📎 24.04.2020: V2 Einführung in die Kontinuumsmechanik (1 MB)
- 📎 08.05.2020: V3 Einführung in die Hydromechanik (856.6 KB)
- 📎 15.05.2020: V4 Einführung in Partielle Differentialgleichungen (900.4 KB)
- 📎 22.05.2020: V5 Einführung in Python (658 KB)
- 📎 22.05.2020: E03 Elliptische PDG (36.4 KB)
- 📎 29.05.2020: Übersicht Übungen (956.5 KB)
- 🔗 29.05.2020: Download Übungen (GitHub)
- 📎 29.05.2020: V6 Einführung in Näherungsverfahren (855.2 KB)

Wir verwenden ein "Repository"  
für die Archivierung unserer  
Übungen.

Hierzu ist eine Anmeldung bei  
GitHub erforderlich.

---

ggfs. Alternativen

### Exercise: Get example files from GitHub

- <https://github.com/envinf/Hydroinformatik-II>

- Per Git:

```
git clone https://github.com/envinf/Hydroinformatik-II
```

- Or as ZIP

envinf / Hydroinformatik-II

Watch 0 Star 0 Fork 0

Code Issues Pull requests Projects Wiki Insights Settings

Professur für Angewandte Umweltsystemanalyse an der TU Dresden, Übungen BHYWI 08 <https://www.ufz.de/index.php?de=40425> Edit

Manage topics

2 commits 1 branch 0 releases 1 contributor

Branch: master New pull request Create new file Upload files Find File Clone or download

bilke Initial. **Git URL** Clone with HTTPS Use SSH Use Git or checkout with SVN using the web URL. <https://github.com/envinf/Hydroinformatik-II>

Open in Desktop Download ZIP

BHYWI-08-01-E	Initial.
BHYWI-08-02-E	Initial.
BHYWI-08-03-E	Initial.
BHYWI-08-04-E	Initial.
BHYWI-08-05-E	Initial.



### Projekt konfigurieren

Für das Projekt **BHYWI-08-02-E** können die folgenden Kits verwendet werden:

Das Projekt **BHYWI-08-02-E** ist noch nicht konfiguriert.

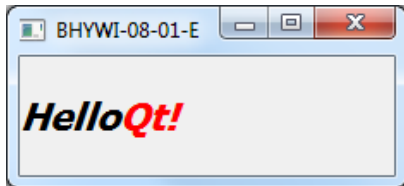
Qt Creator verwendet das Kit **Desktop**, um das Projekt auszuwerten.

Kits nach Namen filtern...

Alle Kits auswählen

<input type="checkbox"/>  Desktop Qt 5.0.2 MSVC2010 32bit	Details ▾
<input type="checkbox"/>  Desktop Qt 5.0.2 MSVC2010 32bit OpenGL	Details ▾
<input type="checkbox"/>  Desktop Qt 5.0.2 MSVC2012 64bit	Details ▾
<input checked="" type="checkbox"/>  Desktop Qt 5.0.2 MinGW 32bit	Details ▾
Build importieren von...	Details ▾

Projekt konfigurieren

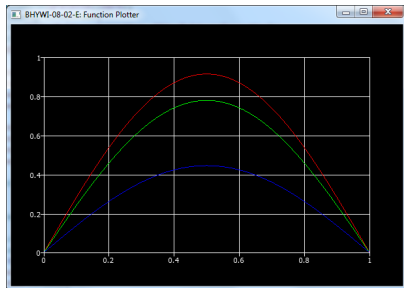


- Qt: Grafische Programmierung in C++
- Dialog - Plots

```
#include <QApplication>
#include <QLabel>
int main(int argc, char *argv[])
{
    QApplication app(argc, argv);
    QLabel *label =
        new QLabel("<h1><i>Hello<!i>""<font color=red>Qt!</font></h1>");
    label->show();
    return app.exec();
}
```

# E2: Funktionssimulator

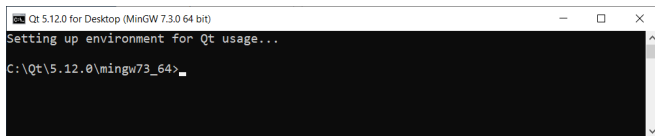
BHYWI-08-02-E



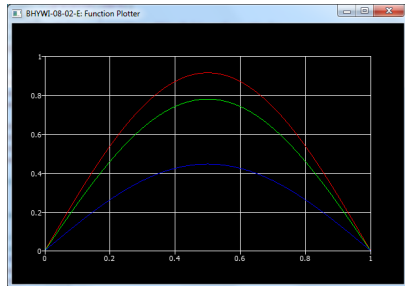
- Darstellung einfacher Funktionen
- Analytische Lösungen
- x-y Plots

# Qt: Compile a Qt project from command Line

BHYWI-08-02-E



```
Qt 5.12.0 for Desktop (MinGW 7.3.0 64 bit)
Setting up environment for Qt usage...
C:\Qt\5.12.0\mingw73_64>
```



- 1 `cd /your_project_folder/`
- 2 `qmake -project` (creates pro-file)
- 3 `qmake` (creates makefile)
- 4 `mingw32-make` (creates exe-file)



# Python

## Installation

The screenshot shows the Python.org website with the following elements:

- Navigation:** Python, PSF, Docs, PyPI, Jobs, Community
- Header:** python logo, Donate button, Search bar, Socialize button
- Secondary Navigation:** About, Downloads, Documentation, Community, Success Stories, News, Events
- Main Content:**
  - Code Snippets:**

```
# Python 3: List comprehensions
fruits = ['Banana', 'Apple', 'Lime']
loop_fruits = [fruit.lower() for fruit in fruits]
print(loop_fruits)
["BANANA", "APPLE", "LIME"]

# List and the enumerate function
for i, fruit in enumerate(fruits):
    print(i, fruit)
```
  - Compound Data Types:** Lists (known as arrays in other languages) are one of the compound data types that Python understands. Lists can be indexed, sliced and manipulated with other built-in functions. [More about lists in Python 3](#)
  - Buttons:** 1, 2, 3, 4, 5
- Text:** Python is a programming language that lets you work quickly and integrate systems more effectively. [Learn More](#)

**Building the PSF: the Q2 2019 Fundraiser** [Donate Now](#)

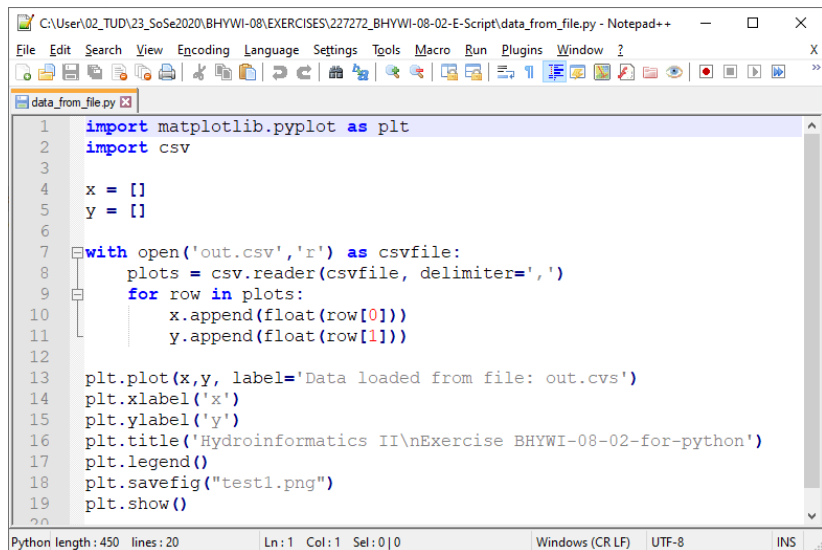
Get Started	Download	Docs	Jobs
Whether you're new to programming or an experienced developer, it's easy to learn and use Python. <a href="#">Start with our Beginner's Guide</a>	Python source code and installers are available for download for all versions! Latest: Python 3.7.3	Documentation for Python's standard library, along with tutorials and guides, are available online. <a href="#">docs.python.org</a>	Looking for work or have a Python related position that you're trying to hire for? Our <a href="#">retouched community-run job board</a> is the place to go. <a href="#">jobs.python.org</a>

Latest News	Upcoming Events
2019-05-15 <a href="#">Russell Keith-Magee: Python On Other Platforms</a> <a href="#">» More</a>	2019-05-25 <a href="#">Django Girls Groningen</a> <a href="#">» More</a>

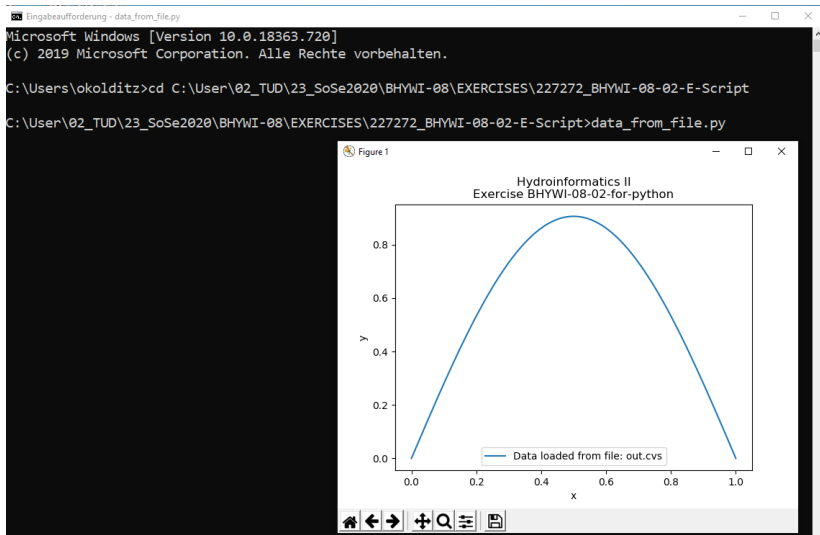
```
Eingabeaufforderung
Microsoft Windows [Version 10.0.18363.720]
(c) 2019 Microsoft Corporation. Alle Rechte vorbehalten.

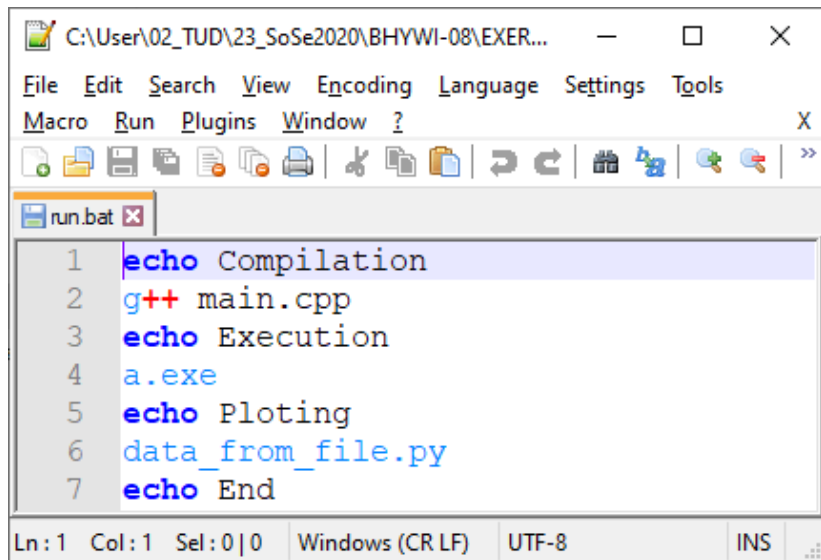
C:\Users\okolditz>PATH
PATH=C:\Python27\;C:\Python27\Scripts;C:\Program Files (x86)\Common Files\Oracle\Java\javapath;C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System32\Wbem;C:\WINDOWS\System32\WindowsPowerShell\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\TEC80\BIN;C:\Program Files (x86)\QuickTime\QTSystem\;C:\Program Files (x86)\Yarn\bin\;C:\Program Files\nodejs\;C:\ProgramData\chocolatey\bin;C:\Program Files\CMake\bin;C:\Program Files (x86)\Sennheiser\SoftphonesDK\;C:\Users\okolditz\AppData\Local\Programs\Python\Python37\Scripts\;C:\Users\okolditz\AppData\Local\Programs\Python\Python37\;C:\Users\okolditz\AppData\Local\Programs\Python\Python37-32\Scripts\;C:\Users\okolditz\AppData\Local\Programs\Python\Python37-32\;C:\Users\okolditz\AppData\Local\Conan\conan;C:\Users\okolditz\AppData\Local\Microsoft\WindowsApps;C:\Program Files\MiKTeX 2.9\miktex\bin\x64\;C:\Users\okolditz\AppData\Local\Programs\MiKTeX 2.9\miktex\bin\x64\;C:\Users\okolditz\AppData\Local\Programs\Git\cmd;C:\tools\;C:\Users\okolditz\AppData\Local\GitHubDesktop\bin\;C:\Users\okolditz\AppData\Local\Microsoft\WindowsApps;C:\Users\okolditz\AppData\Local\Yarn\bin\;C:\Users\okolditz\AppData\Local\Pandoc\;C:\Users\okolditz\AppData\Roaming\npm;

C:\Users\okolditz>python
Python 2.7.17 (v2.7.17:c2f86d86e6, Oct 19 2019, 21:01:17) [MSC v.1500 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
^C
C:\Users\okolditz>
```



```
C:\User\02_TUD\23_SoSe2020\BHYWI-08\EXERCISES\227272_BHYWI-08-02-E-Script\data_from_file.py - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
data_from_file.py
1 import matplotlib.pyplot as plt
2 import csv
3
4 x = []
5 y = []
6
7 with open('out.csv','r') as csvfile:
8     plots = csv.reader(csvfile, delimiter=',')
9     for row in plots:
10         x.append(float(row[0]))
11         y.append(float(row[1]))
12
13 plt.plot(x,y, label='Data loaded from file: out.csv')
14 plt.xlabel('x')
15 plt.ylabel('y')
16 plt.title('Hydroinformatics II\nExercise BHYWI-08-02-for-python')
17 plt.legend()
18 plt.savefig("test1.png")
19 plt.show()
20
Python length: 450 lines: 20 Ln: 1 Col: 1 Sel: 0|0 Windows (CR LF) UTF-8 INS
```





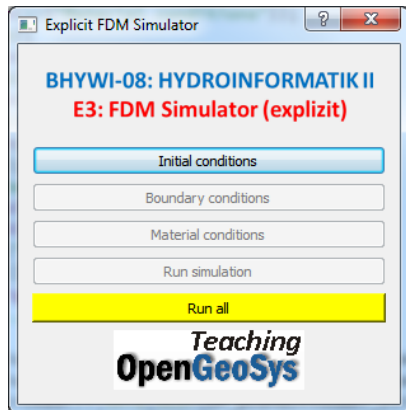
The image shows a Notepad++ window titled "C:\User\02\_TUD\23\_SoSe2020\BHYWI-08\EXER...". The menu bar includes File, Edit, Search, View, Encoding, Language, Settings, Tools, Macro, Run, Plugins, Window, and ?. The toolbar contains various icons for file operations and editing. The active tab is "run.bat". The text content of the file is as follows:

```
1 echo Compilation
2 g++ main.cpp
3 echo Execution
4 a.exe
5 echo Ploting
6 data_from_file.py
7 echo End
```

The status bar at the bottom shows "Ln: 1 Col: 1 Sel: 0 | 0", "Windows (CR LF)", "UTF-8", "INS", and a small logo for Technische Universität Dresden.

# E3: FDM Simulator (explizit)

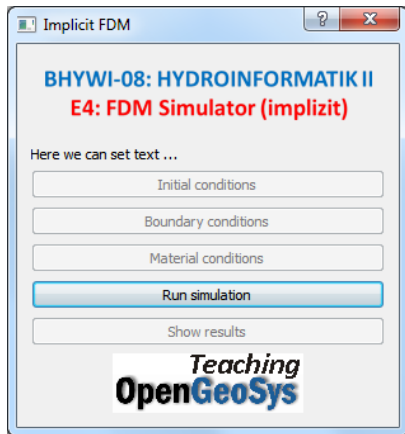
BHYWI-08-03-E



- Finite-Differenzen-Methode (explizit)
- Diffusionsprozesse
- Parametervariationen
- x-y Plots

# E4: FDM Simulator (implizit)

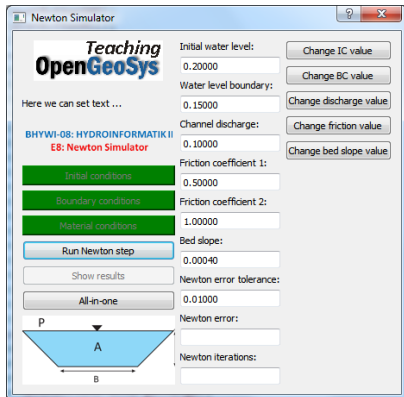
BHYWI-08-04-E



- Finite-Differenzen-Methode (implizit)
- Diffusionsprozesse
- Parametervariationen
- x-y Plots

# E5-8: Newton Simulator

BHYWI-08-05:08-E



- Gerinnehydraulik
- Newton-Verfahren
- 05-E: QAD
- 06-E: OOP
- 07-E: Parameter
- 08-E: Interaktiv
- x-y Plots