CH-9: Files and Exception Handling in Python

December 23, 2025

Learning Objectives

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- Learn exception handling mechanisms
- Apply finally clause and custom exceptions

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- A **file** is a collection of data stored permanently
- Used for storing large data and program output
- Python treats files as **objects**

Types of Files

- **Text files** (`.txt`, `.csv`)

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(We'll focus mainly on text files as per syllabus)

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- They behave like file objects
- By default, they are connected to the command line

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- `input()` and `print()` handle this implicitly

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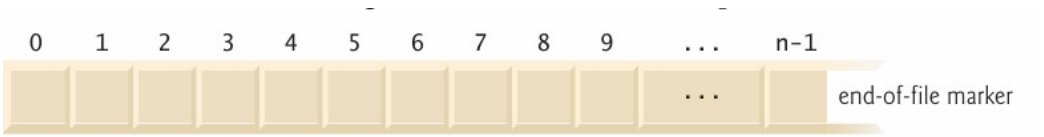

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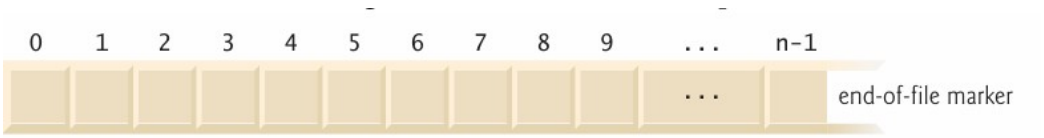

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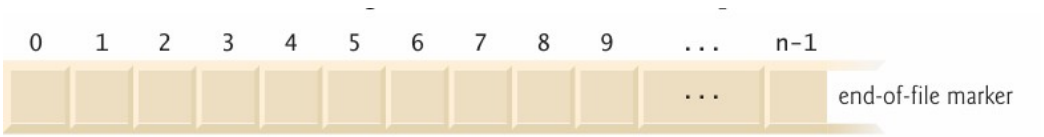

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- Python hides OS-level EOF details from the programmer

Opening and Closing a File

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- `"w+"` : Read and write (erases existing content)
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Text File Processing – Reading

```
file = open("data.txt", "r")
content = file.read()
print(content)
file.close()
```

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with open("grades.txt", "r") as f:
    content = f.read()     # whole file as one string
    print(content)
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with open("grades.txt", "r") as f:
    line1 = f.readline()   # first line
    line2 = f.readline()   # second line
    print(line1, line2)
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```
with open("grades.txt", "r") as f:
    lines = f.readlines()
    print(lines)
```

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with open("grades.txt", "r") as f:
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    print(lines)
```

```
['1 Alice A\n', '2 Bob B\n', '3 Charlie A\n']
```

Writing into a Text File

```
file = open("output.txt", "w")
file.write("Hello Python\n")
file.write("File Handling")
file.close()
```

Additional Notes Regarding Files

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```
with open('output1.txt', 'w+') as f:
    f.write('This is first line.')
    f.write('This is second line.')
    f.seek(0) # reset pointer to start of file
    r = f.read()
    print(repr(r))
```

Additional Notes Regarding Files

- Always close files to avoid data loss
- Prefer using the `with` statement
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with open('output1.txt', 'w+') as f:
    f.write('This is first line.')
    f.write('This is second line.')
    f.seek(0) # reset pointer to start of file
    r = f.read()
    print(repr(r))
```

```
OUTPUT: 'This is first line.This is second line.'
```

Using with Statement

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    data = file.read()
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- Automatically closes the file

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- Original record: `300 White 0.00`

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- Reason: records and fields have **variable length**
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Example:

- Original record: `300 White 0.00`
- Updating to `Williams` corrupts the record

Safe Method to Update a Text File

- Create a temporary file

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```
import os

# Step 1: Open original file for reading
grades = open('grades.txt', 'r')

# Step 2: Open temporary file for writing
temp_file = open('temp_file.txt', 'w')
```

```
# Step 3: Use context manager to ensure both files close automatically
with grades, temp_file:
    for record in grades:
        serial, name, grade = record.split()

        if name != 'Bob':
            # Write unchanged record
            temp_file.write(record)
        else:
            # Replace Bob with David
            new_record = ' '.join([serial, 'David', grade])
            temp_file.write(new_record + '\n')

# Step 4: Replace old file with updated one
os.remove('grades.txt')
os.rename('temp_file.txt', 'grades.txt')

print("Update complete. Bob has been replaced by David.")
```

Handling Exceptions

- Runtime errors disrupt program flow

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- Exception handling avoids program crash

try–except Block

```
try:
    x = int(input("Enter a number: "))
    print(10 / x)
except ZeroDivisionError:
    print("Division by zero not allowed")
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```
except (ValueError, ZeroDivisionError):
```

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```
f = None
try:
    f = open("grades.txt", "r")
    data = f.read()
except FileNotFoundError:
    print("File not found.")
else:
    print("File read successfully.")
    print(data)
finally:
    if f is not None:
        f.close()  # cleanup resource
    print("File closed.")
```

```
File read successfully.
1 Alice A
2 Bob B
3 Charlie A

File closed.
```

Explicitly Raising an Exception

- Programmer-defined exceptions

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- Enforce logical constraints

raise Keyword

```
age = int(input("Enter age: "))
if age < 18:
    raise ValueError("Age must be 18 or above")
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age = int(input("Enter age: "))
if age < 18:
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```

```
INPUT: 17
OUTPUT:
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[2], line 3
      1 age = int(input("Enter your age: "))
      2 if age<18:
----> 3     raise ValueError("Age must be 18 or above!")

ValueError: Age must be 18 or above!
```

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- Fields are separated by commas

Writing to a CSV File

- Use the `csv` module to write CSV files

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```
import csv

with open("data.csv", "w", newline="") as file:
    writer = csv.writer(file)
    writer.writerow(["ID", "Name", "Marks"])
    writer.writerow([1, "Alice", 85])
    writer.writerow([2, "Bob", 90])
    writer.writerow([3, "Devid", 80])
```

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    reader = csv.reader(file)
    for row in reader:
        print(row)
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OUTPUT:
['ID', 'Name', 'Marks']
['1', 'Alice', '85']
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OUTPUT:
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