Title: e-Portfolio Submission – https://helenhelene.github.io/eportfolio/

**Final Reflection** 

(Word count: 1063)

Introduction

This reflection summarises my learning outcomes from the Secure Software

Development (SSD) module. In addition to expanding my theoretical understanding of

secure software, it strengthened my technical abilities and team-oriented skills. The

module offered valuable insights into identifying and managing security risks, designing

robust software, and working in diverse teams.

**Summary of learning outcomes** 

A central aspect of the module involved a Team project – Design Document, where we

designed a secure application for an online retailer. We produced a detailed document

outlining core requirements, security concerns with mitigation strategies, relevant

development methodologies, UML diagrams, and approaches to testing.

The second assignment, Individual Project - Output and Evidence of Testing and

Demonstration, required implementing our prior design in Python. This entailed making

appropriate security decisions, integrating the chosen libraries, and deploying effective

testing techniques. Although the module did not provide an Integrated Development

Environment (IDE), I self-learned Visual Studio Code (VS Code), which I had briefly

explored during a previous module, enabling me to gain additional hands-on experience.

1

Beyond coding, the requirement to demonstrate our work pushed me to think carefully about how to present software to stakeholders, which is an aspect of development often overshadowed by purely technical tasks.

Finally, the third assignment comprised an <u>e-portfolio submission</u> (Appendix 1) and reflection documenting my journey through the MSc Computer Science. My <u>Professional Profile</u> (Appendix 2) originally contained personal life topics, but professor's feedback encouraged me to revise it to highlight professional attributes instead.

Throughout the module, I completed the majority of e-Portfolio tasks compiled in <u>each</u> <u>unit</u> (Appendix 3) and documented in the <u>List of Artefacts</u> (Appendix 4). These included UML and security discussions, various coding exercises that covered recursion, regular expressions, cryptography, and API development.

Several activities stood out. For instance, the first <u>collaborative discussion - UML</u>

<u>Flowchart</u> (Appendix 5), helped me improve an Activity Diagram illustrating a secure login process. Professor's feedback prompted me to enhance both structure and clarity, which proved central to our Design Document and future work.

The <u>Towers of Hanoi exercise</u> in Unit 4 (Appendix 6) introduced me to a mathematical puzzle I had previously seen only as a toy. Implementing a recursive solution was both

stimulating and rewarding. I even acquired a miniature Hanoi Tower for my desk as a lasting reminder of the underlying logic.

Units 7 and 9 emphasised <u>API development</u> (Appendix 7). Configuring multiple terminals and using w3m within a Windows environment proved tricky, yet working through these problems enriched my problem-solving skills. These real-world scenarios mirrored the hurdles one might face in a professional setting.

In Unit 8 <u>Cryptography Programming</u> (Appendix 8), I explored Fernet encryption from the Python cryptography library. Although I had used cryptography tools in a practical sense before, this exercise afforded me a deeper understanding of how best to manage encryption libraries and methods for enhanced software security.

#### **Evidence of Teamwork and Peer Interactions**

Coordinating a multinational team with varied schedules and language backgrounds tested our flexibility. We held <u>regular meetings</u> and drafted a thorough <u>team contract</u> (Appendix 9) that summarised our responsibilities, ensuring that each member's skills were fully utilised. I took charge of documentation, compliance, and administrational tasks, while more coding-focused team members handled library selection and deep technical queries. Employing Trello (Appendix 10) helped us keep track of tasks and maintain clear accountability.

Even after finalising our team project, collective support continued. We shared insights, exchanged ideas, and clarified uncertainties throughout the preparation for Individual Assignment 2. A senior developer in my network offered invaluable help when I encountered setbacks with Python-based libraries. Without their support, relying solely on the coding activities in the module may not have been sufficient to successfully finalise Assignment 2. Whilst there is still room for refinement, seeing the software run reliably without errors confirmed the effort invested.

### **Learning and Changed Actions**

The scale of this module felt vast at first, particularly for a part-time student juggling assignments alongside professional obligations. Nonetheless, the complex workload propelled me to sharpen my time management strategies and acknowledge the need for external support on occasion. I learned to proactively clear hurdles related to IDEs, coding complexities, and international team interactions, all of which boosted my confidence and preparedness for future software projects.

Demonstrating the software to the professor presented another challenge. The mixture of anticipation and apprehension ensured I practised running the programme repeatedly, simplified processes, and rehearsed potential questions. Ultimately, the demonstration's positive reception reinforced my belief in the importance of careful presentation alongside technical competence.

During the <u>Cryptography Programming exercise</u> in Unit 8 (Appendix 8), I initially planned to implement Fernet encryption for password handling in Assignment 2. After greater scrutiny, however, I realised it was not the most suitable approach for password management. This prompted additional research on password-hashing methods and a rewrite of my code, highlighting the importance of fully justifying technical decisions and applying critical thinking throughout a project.

Although my professional role in a management team rarely involves hands-on coding, the broad skills gained have enhanced my capacity to identify, select, and oversee the most suitable development tools for genuine business scenarios. Completing high-pressure group deliverables with tight deadlines and presenting my software to stakeholders proved both transformational and academically enriching.

#### **Professional Skills Matrix**

Level	of competence (Rewo, 2024	1)	
0	No Competence	•	High Competence
•	Low Competence		Expert
	Some Competence	8	Not relevant

Skills Competence		Achievement					
Time		Met strict module deadlines whilst balancing					
Management		professional duties					
Resilience		Overcame challenges posed by cross-cultural					
		teamwork, new tools, and adapted to coding hurdles.					

Critical Thinking		Evaluated security solutions and cryptographic				
and Analysis		methods.				
Problem-		Self-taught IDE usage to complete coding exercises;				
Solving		found workarounds for w3m on Windows.				
Communication		Refined UML diagrams and final demonstration				
and Literacy		delivery.				
skills						
IT and Digital		Integrated libraries in Python, adopted best practices				
		in secure design.				
Interpersonal		Maintained positive team relationships and				
		participated actively in group meetings.				
Teamwork /		Managed documentation while peers addressed				
Global Citizen		technical complexities and contributed to the overall				
and Leadership		success of the team.				
Emotional		Harmonised differing perspectives in team				
Intelligence		discussions.				
Critical		Remained mindful of strengths and weaknesses,				
Reflection		diligently applying lessons to future projects				

## Conclusion

In conclusion, the SSD module has been an invaluable experience, broadening my knowledge of secure software practices, highlighting thorough risk assessment, and refining my project management skills. Overcoming a demanding workload underlines the

importance of teamwork, self-directed learning, and continuous reflection. These talents are directly transferable to my professional environment, ensuring I can champion software security and manage complex technical projects more effectively.

### References

Rewo. (2024) What is a skills matrix. Available from: <a href="https://www.rewo.io/skills-matrix-for-manufacturing/">https://www.rewo.io/skills-matrix-for-manufacturing/</a> [Accessed 14 January 2025].

## **Appendix 1: e-Portfolio Submission**

## **Helen SIU**



View My LinkedIn Profile

View the Project on GitHub HelenHelene/eportfolio

This project is maintained by HelenHelene

Hosted on GitHub Pages — Theme by orderedlist

#### E-Portfolio of

## **Helen SIU**

#### **Professional Profile**

#### **University of Essex Learning Experience**

- Induction Module
- Module 1 Launching in Computer Science
- Module 2 Object Oriented Programming
- · Module 3 Network Security
- Module 4 Information Security Management
- Module 5 Software Engineering Project Management
- Module 6 Secure Software Development
- · Module 7 Research Methods and Professional Practice
- . MSc Computing Project and Dissertation

#### **Appendix 2: Professional Profile**



https://helenhelene.github.io/eportfolio/Aboutme.html

#### **Helen SIU**

#### **Professional Qualification**

PECB ISO/IEC 27001 Foundation

**HKICPA Certified Public Accountant** 

**ACCA Fellow member** 

#### Education

MSc Computer Science (In Progress)

Master of Management Science - Accounting

#### About Me

I am a Certified Public Accountant (CPA) with a Master's degree in Management Science - Accounting. Currently, I am expanding my expertise by pursuing an MSc in Computer Science, which I anticipate completing by 2025. This academic pursuit enriches my role as the **Head of Finance and IT Operation**, where I also serve as the **Data Protection Officer** and **IT Security Officer**. The fusion of finance and technology in my career reflects my commitment to staying at the forefront of industry developments and addressing the complex challenges at the intersection of these fields.

My journey in computer science has been both rigorous and rewarding. I have successfully completed modules in Launching in Computer Science, Object-Oriented Programming, Network Security, Information Security Management, and Software Engineering Project Management. These courses have established a robust foundation in computational theory, programming paradigms, data protection, and strategies for safeguarding organizational information assets. The remaining modules—Secure Software Development and Research Methods and Professional Practice—are enhancing my capability to develop secure applications and conduct professional research, skills that directly apply to my responsibilities in IT operations and data protection.

In my professional capacity, I apply the insights from my studies to formulate strategies, comprehensive policies, and frameworks aimed at strengthening our organization's cybersecurity posture. I am responsible for implementing robust measures that ensure compliance with data protection regulations and safeguard sensitive data. By leveraging advancements in technology, I plan to drive innovation within IT operations, enhancing efficiency and effectiveness across financial and operational processes.

Integrating my accounting expertise with advanced computer science knowledge uniquely positions me to navigate the challenges at the nexus of finance and technology. My goal is to fortify the technological resilience of my organization and contribute meaningfully to the development of secure, innovative systems. As I progress toward completing my MSc in Computer Science, I remain committed to fostering an environment that prioritizes security, innovation, and strategic growth in the ever-evolving landscape of finance and information technology.

### **Appendix 3: List of SSD Units**

https://helenhelene.github.io/eportfolio/SSD/SSD\_main.html

## Module 6 Secure Software Development

In this module, we examine the security risks tied to programming languages through design and architecture strategies, programming paradigms, testing, and the role of operating systems and libraries in development. We also focus on distributed systems, APIs, and emerging trends, all within the framework of the secure software development life cycle.

Throughout the module, we will strengthen our understanding of abstraction, secure development methodologies, and the skills needed for effective analysis, design, construction, and testing. We will explore both classic and modern SDLC models (e.g., TOGAF, Agile), practice collaboration and conflict-resolution within a team, and reflect on our personal growth. By the end, we will be equipped to identify and manage security risks, select suitable development approaches, and build secure software.

There are three assignments in this module. In the first assignment, we participate in a team submission and individual peer assessment. For the team submission, we focus on designing a secure application for an online retailer and submitting a Design Document that outlines how the listed requirements will be met.

The second assignment is an Individual Project, which requires creating Python code based on the design from Assignment 1, along with accompanying test evidence and a live demonstration.

Lastly, we are expected to submit an e-Portfolio, collecting evidence of our work and submitting a reflective piece on personal development. This culminates in a final reflection that summarizes individual learning achievements and experiences.

Assignment 1: Development Team Project ( Pass with Distinction)

Design Document

Assignment 2: Development Individual Project (Work in progress)

Output and Evidence of Testing

Assignment 3: Individual Module e-Portfolio (Work in progress)

Final Reflection

The units presented below serve as a compilation of evidence, showcasing the work accomplished in this module and documenting the learning

**Unit 1: Introduction to Secure Software Development** 

Unit 2: UML Modelling to Support Secure System Planning

Unit 3: Programming Languages: History, Concepts & Design

**Unit 4: Exploring Programming Language Concepts** 

**Unit 5: An Introduction to Testing** 

**Unit 6: Using Linters to Support Python Testing** 

**Unit 7: Introduction to Operating Systems** 

Unit 8: Cryptography and Its Use in Operating Systems

Unit 9: Developing an API for a Distributed Environment

**Unit 10: From Distributed Computing to Microarchitectures** 

Unit 11: Future trends in Secure Software Development

Unit 12: The Great Tanenbaum-Torvalds Debate Revisited

You may also refer to the List of Artefacts for quick access to all artefacts.

## **Appendix 4: List of Artifacts**

♦ https://helenhelene.github.io/eportfolio/SSD/SSD\_ArtefactsSummary.html

## **List of Artefacts for Each Unit**

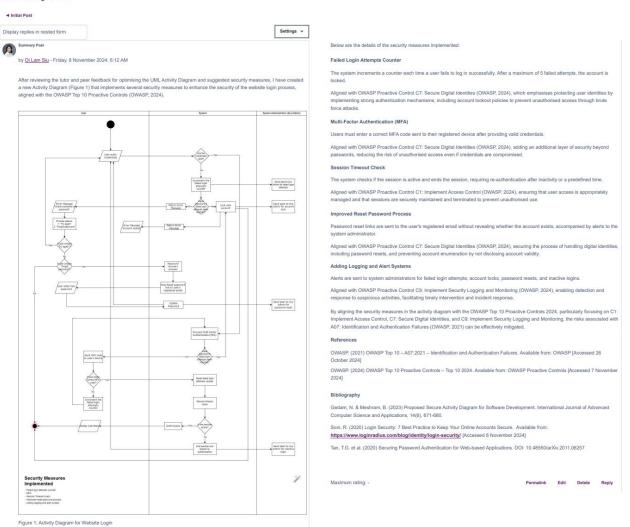
Unit(s)	Component	Artefacts
1-3	Collaborative discussion 1	UML Flowchart: Initial post, Peer Response 1, Peer Response 2, Summary post
2	Seminar Preparation	Scrum Security review
3	Team Activity	What is a Secure Programming Language?
3	Activity	Exploring Python tools and features (Not attempted)
3	Activity	The Producer-Consumer Mechanism
4	e-portfolio Component	Programming Language Concepts
4	Seminar Preparation	Programming exercises - recursion and regex
5	Activity	Equivalence Testing in Python
5	e-portfolio Component	Exploring the Cyclomatic Complexity's Relevance Today
6	Seminar Preparation	Exploring Linters to Support Testing in Python (Attempted but not finished)

io			
ent What	is an Ontology?		
Explor	Exploring a simple Python shell		
	oping an API for a Distributed nment		
ative Initial	ography Case Study - TrueCrypt : post, Peer Response 1, Peer nse 2, Summary post		
ion Crypto	ography Programming Exercise		
API De	emonstrations		
io Facete ent	ed Data		
tivity Debat	e: Microservices and Microkernels		
Micros ion	services and Microkernels Debate		
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Return to Module 6

## **Appendix 5: Collaborative Discussion 1 – Summary Post**

#### **Summary Post**



## Appendix 6: Programming exercises – recursion and regex

https://helenhelene.github.io/eportfolio/SSD/SSD\_Unit04\_Seminar.html

#### **Programming language concepts: Programming exercises - recursion** and regex

#### Requirement

This week there are two programming exercises that will help you understand two valuable language concepts - recursion and regex.

#### Recursion

One of the classic programming problems that is often solved by recursion  $% \left( 1\right) =\left( 1\right) \left( 1\right)$ is the towers of Hanoi problem. A good explanation and walkthrough are provided by Cormen & Balkcom (n.d.). (the code they used for their visual example is provided on their website as well).

Read the explanation, study the code and then create your own version using Python. Create a version that asks for the number of disks and then executes the moves, and then finally displays the number of moves executed.

```
© C:\Program Files (x86)\Micros × + ~
Enter the number of disks: 3
Steps to solve the Towers of Hanoi:
Move disk 1 from A to C
Move disk 2 from A to B
```

#### Regex

The second language concept we will look at is regular expressions (regex). We have already presented some studies on their use, and potential problems, above. The lecturecast also contains a useful link to a tutorial on creating regex. Re-read the provided links and tutorial (Jaiswal, 2020) and then attempt the problem presented below:

· The UK postcode system consists of a string that contains a number of characters and numbers – a typical example is ST7 9HV (this is not valid – see below for why). The rules for the pattern are available from idealpostcodes (2020).

Create a python program that implements a regex that complies with the rules provided above – test it against the examples provided.

M1 1AA

M60 1NW CR2 6XH

DN55 1PT

W1A 1HQ

EC1A 1BB

According to the rules provided by IdealPostcodes (2020) and commonly accepted patterns for UK postcodes:

- Outward Code: 1-4 characters (letters and numbers). Examples: M1,
- Inward Code: A single digit followed by two uppercase letters. Examples: 1AA, 6XH, 1HQ.

General Regex Pattern for UK Postcodes:

^[A-Z]{1,2}[0-9][0-9A-Z]?\s[0-9][A-Z]{2}\$

 $^{A-Z}_{1,2}$ : The outward code starts with 1–2 uppercase letters.

[0-9] : Followed by one digit.

[0-9A-Z]?: Optionally followed by another digit or letter.

 $\slash s$  : There is a mandatory space separating the outward and inward codes.

[0-9]: The inward code starts with a single digit.

[A-Z]{2}\$: Ends with two uppercase letters.

## Appendix 7: Developing an API for a Distributed Environment

https://helenhelene.github.io/eportfolio/SSD/SSD\_Unit07\_Activity2.html

# Developing an API for a Distributed Environment

#### Requirement

In this session, you will create a RESTful API which can be used to create and delete user records. Responses to the questions should be recorded in your e-portfolio.

You are advised to use these techniques to create an API for your submission in Unit 11.

## Create a file named api.py and copy the following code into it:

#### Question 1

Run the API.py code. Take a screenshot of the terminal output. What command did you use to compile and run the code?

I clicked the Start button (or press F5) in **Visual Studio** to compile and run the code.



Below is the output:

```
El Crompostes Selform x 4 = 0 D X

* Serving Flash age 'sgi'

* Marring Flash age 'sgi'

* Serving Flash age 'sgi'

* Shoring on Miss/1927-98-8-1-1800

* Shoring on Flash age 'sgi'

* Debugger Sa sativit

* Debugger Sa sativit

* Debugger Sa: 715-97-968
```

This output shows that the API is running on http://127.0.0.1:5000.

#### Question 2

Run the following command at the terminal prompt, what happens when this command is run, and why?

w3m http://127.0.0.1:5000/user/Ann

I am using Windows and Visual Studio (VS). For convenience, I run the Flask app in the VS terminal and use the Windows Command Prompt with curl to execute the HTTP commands.

```
BE Comparations towns | - - - - X |
Serving Tlass pay "gi"
- Oblog reduction September 1.
Serving Tlass pay "gi"
- Oblog reduction September 1.
Serving Tlass pay "gi"
- Oblog reduction September 1.
Serving Tlass pay "gi"
- Oblog pay Tlass pay "gi"
- Oblog pay Tlass pay "gi"
- Oblog pay Tlass pay "GET /user/Ann HTTP/1.1" 280 -
```

## **Appendix 8: Cryptography Programming exercise**

https://helenhelene.github.io/eportfolio/SSD/SSD\_Unit08\_Seminar.html

## Cryptography Programming Exercise

#### Requirement

Read the Cryptography with Python blog at tutorialspoint.com. Select one of the methods described / examples given and create a python program that can take a short piece of text and encrypt it.

## Select one of the methods described / examples given.

Before selecting a method and creating the Python program, I created a table to review all the methods described on Tutorialspoint.com.

Method	Туре	Key Management	Use Case	GDPR Compliance	Performance	Weakness	Ease of Implementation
Reverse Cipher	Substitution Cipher	No key required	Simple encryption for educational purposes	No	High (Fast)	Extremely weak; easily reversible (not secure)	Very Easy
Caesar Cipher	Substitution Cipher	Single key (shared)	Encoding small text, educational purposes	No	High (Fast)	Vulnerable to brute force (only 25 possible keys)	Very Easy
ROT13 Algorithm	Substitution Cipher	No key required (fixed shift of 13)	Simple encoding, educational purposes	No	High (Fast)	Fixed shift makes it easily reversible; not secure	Very Easy
Transposition Cipher	Rearrangement Cipher	Single key (shared)	Securing small text by rearranging characters	No	Moderate	Vulnerable to frequency analysis; not suitable for modern secure communication	Moderate
Base64 Encoding	Encoding (Not Encryption)	No key required	Encoding binary data into text for transmission	No	High (Fast)	Not encryption; easily decoded by anyone	Easy

# Create a python program that can take a text file and output an encrypted version as a file in your folder on the system .

Create *fernet.py* using Fernet encryption (from the cryptography module) to take a plaintext file, encrypt its contents, and save the encrypted version as a new file in the same folder.

```
| Tensor | T
```

Create a plaintext file named *plaintext.txt* in the same folder as Input File. Add text "This is a test file for encryption." to it.

## **Appendix 9: Team Contract and Meeting Recordings**

https://helenhelene.github.io/eportfolio/SSD/SSD\_A1\_MoM.html

#### **Team Contract**

28 October 2024

Group - GAZHA

## **Meeting Recordings**

#### 2 November 2024

First meeting for member introductions, project outline, and strategy.



SSD Group Project: Meeting #1

#### 17 November 2024

Regular meeting to provide updates and follow up on missing tasks.



SSD Group Project: Meeting #2

#### 24 November 2024

Regular meeting to provide updates and follow up on missing tasks.



SSD Group Project: Meeting #3

#### 26 November 2024

We have scheduled a meeting with the professor to discuss the design document and clarify any questions.

#### 28 November 2024

A small group meeting is scheduled to follow up on the points discussed during the meeting with the professor.

#### 1 December 2024

Final meeting to agree on the design document and submission arrangement.



Return to Assignment 1 - Design Document Return to Assignment 3 - e-Portfolio Return to Module 6

## Appendix 10: Trello Dashboard

