DEGREE: Computer Science and Digitisation

Module: Algorithms and Problem Solving using Python

Assignment Title: Transforming an algorithm into Python Program
Assignment Type: Individual report

Word Limit: 1500 words (+/- 200)

Weighting: 50%

Issue Date: 21/05/2025

Submission Date: 26/06/2025

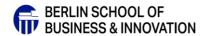**Feedback Date: 17/07/2025**

Plagiarism:

When submitting work for assessment, students should be aware of the InterActive/Canvas guidance and regulations in concerning plagiarism. All submissions should be your own, original work. Please note that you must not submit the same assignment for two different modules within your course.

You must submit an electronic copy of your work. Your submission will be electronically checked.

Learner declaration
I certify that the work submitted for this assignment is my own and research sources are fully acknowledged. **Student signature:**   **Date:**

Harvard Referencing:

The Harvard Referencing System must be used. The Wikipedia, UKEssays.com or similar websites must **not** be used or referenced in your work.

BERLIN SCHOOL OF BUSINESS & INNOVATION

University for the Creative Arts

Introduction

Learning Outcomes:

LO1. Demonstrate an understanding and examine how different data structures and algorithm design methods including lists, stacks, queues, trees, and graphs impact the performance of programs

LO2. Implement the algorithms for problem solving using Python code

LO3. Implement and execute Python programs using functions, modules, libraries and classes

Assessment Criteria: Weighting 100%

2000 words

Tasks (All tasks are equally weighted):

Objective:

The objective of this assignment is to demonstrate proficiency in algorithms, data structures, and problem-solving techniques using Python. Through practical implementations, you will explore various data structures, algorithm design methods, and Python programming features to solve real-world problems effectively.
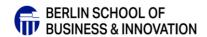
Tasks:

Data Structures and Algorithm Design Methods:

Task 1: Implement and analyse the efficiency of Selection Sort and Insertion Sort algorithms for sorting small to medium-sized datasets.

- **Deliverables:**

    o Implement Selection Sort and Insertion Sort in Python.
    o Analyse and compare the time and space complexity of both algorithms using datasets of varying sizes.

Implementation of Object-oriented programming (OOPs):

Task 2: Implementation and details Object oriented programming:

A great real-world problem for students to solve using Object-Oriented Programming (OOP) is **a Library Management System**. This project covers all the fundamental OOP concepts:

Problem Statement:

Many small libraries or schoolbook clubs struggle with keeping track of borrowed and returned books. A simple software system can help manage book inventory, track borrowed books, and maintain user records.

OOP Concepts Used:

- **Class and Object Creation:**

    o Create classes like **Book, Member, and Library** to represent real-world entities.

- **Inheritance and Polymorphism:**
    o **LibraryMember** as a parent class with **StudentMember** and **TeacherMember** as subclasses.
    o Method overriding for different borrowing limits (e.g., a teacher can borrow more books than a student).
- **Encapsulation and Data Hiding:**
    o Use private attributes (e.g., _borrowed_books) and public methods to enforce controlled access.
    o Prevent direct modification of book availability without proper checks.

Python Programming Techniques:

Task 3: Utilize Python lists to implement a stack data structure and demonstrate its usage in solving a simple problem, such as reversing a string.

- **Deliverables:**
    o Implement a stack data structure using Python lists.

o Demonstrate the usage of the stack in reversing a string.

Submission Guidelines:

- Submit a well-documented Python script (in the form of a listing or appendix) containing your implementations, analysis, and explanations.
- Ensure that your code is properly commented to explain the logic and algorithms used.
- Include any additional documentation or insights gained during the implementation process.
- Prepare a document using the BSBI assignment template available in Canvas.
- Use Harvard referencing style for your bibliography.
- Refer to the Essay-Guide available in Canvas for further instructions.
- Submit your assignment electronically by the specified deadline.

GUIDANCE ON ASSESSMENT

All materials must be properly referenced under Harvard conventions. The length required is 1500 with tasks equally weighted. The writing style should be formal academic / report writing style with in-text referencing to support your comments and observations. Originality, quality of argument and good structure are required. The report should demonstrate sound understanding and ability to apply knowledge and theory of Transforming an algorithm into Python Program. Additional marks being awarded for juxtaposition and insight of issues.

Grading Criteria

	Generic Criteria	90 - 100	80 - 89	70 - 79	60 - 69	50 - 59	40 - 49	30 - 39	0 - 29
Level 4	**Knowledge of contexts, concepts, technologies and processes** The extent to which knowledge is demonstrated: *relevant contextual or theoretical issues are identified, defined and described* *historical or contemporary practices are identified, defined and described* *appropriate technologies, methods and processes are identified, defined and described*	Outstanding breadth of knowledge of fundamental contextual and theoretical issues and critical concepts and their relationship to historical and contemporary practices Extensive knowledge of relevant and specialist technologies and processes	Extensive knowledge of fundamental contextual and theoretical issues and critical concepts and a widening appreciation of historical and contemporary practices In depth and broadening knowledge of appropriate technologies and processes	Significant knowledge of fundamental contextual and theoretical issues and critical concepts and a widening appreciation of historical and contemporary practices Significant knowledge of appropriate technologies and processes	Confident familiarity with fundamental contextual and theoretical issues and critical concepts Thorough knowledge of appropriate technologies and processes	Familiar with fundamental contextual and theoretical issues and critical concepts Sound knowledge of appropriate technologies and processes	Adequate knowledge of fundamental contextual and theoretical issues and critical concepts Adequate knowledge of appropriate technologies and processes	Limited knowledge of fundamental contextual and theoretical issues and critical concepts Limited knowledge of appropriate technologies and processes	Little or no knowledge of fundamental contextual and theoretical issues or critical concepts Little or no knowledge of appropriate technologies or processes
	Understanding through application of knowledge The degree to which research methods are demonstrated: *relevant knowledge and information is compared, contrasted, manipulated, translated and interpreted* *knowledge and information is selected, analysed, synthesized and evaluated in order to generate creative ideas, practices, solutions, arguments or hypotheses*	Relevant knowledge is explored and interpreted when proposing solutions to projects and problems which demonstrate evidence of independent thought Outstanding ability to analyse and synthesise knowledge to produce own creative practice in standard situations and to evaluate results	Deep level of comprehension and exploration of relevant knowledge in seeking solutions to projects or problems Outstanding ability to analyse and synthesise knowledge in order to produce creative practice in standard situations and to evaluate the results	Deep level of comprehension of relevant knowledge in seeking solutions to projects or problems Strong ability to apply and analyse knowledge to produce creative practice in standard situations, with some evaluation of the results	Strong comprehension of relevant knowledge in seeking solutions to projects or problems Sound ability to apply knowledge to produce creative practice in standard situations	Sound comprehension of relevant knowledge in seeking solutions to projects or problems Sound ability to apply knowledge to produce creative practice in standard situations	Surface-level comprehension of relevant knowledge in seeking solutions to projects or problems Competent application of knowledge to the production of creative practice in standard situations	Incomplete comprehension of relevant knowledge in seeking solutions to projects or problems Limited ability to apply knowledge to produce creative practice in standard situations	Little or no comprehension of relevant knowledge in seeking solutions to projects or problems Little or no ability to apply relevant knowledge to produce creative practice in standard situations

Application of technical and professional skills								
Application of technical and professional skills The degree to which: *appropriate materials and media are selected, tested and utilised to realise and present ideas and solutions* *appropriate technologies, methods and processes are demonstrated* *transferable, professional skills are effectively demonstrated* *self management and independent learning are demonstrated*	Accomplished and fluent application of appropriate practical and technical skills Outstanding application of appropriate transferable and professional skills Significant ability to learn independently and critically evaluate own progress using a wide range of feedback sources	Relevant, accomplished and fluent application of basic practical and technical skills Outstanding application of fundamental transferable and professional skills Substantial ability to work independently and use feedback to reflect critically on own progress	Relevant and accomplished application of basic practical and technical skills Highly effective application of fundamental transferable and professional skills Strong ability to work independently and use feedback to plan future tasks effectively	Strong application of basic practical and technical skills Strong application of fundamental transferable and professional skills Evidence of developing well as an independent learner	Sound application of basic practical and technical skills Sound application of fundamental transferable and professional skills Evidence of beginning to develop as an independent learner	Competent application of practical and technical skills Competent application of fundamental transferable and professional skills Adequate evidence of beginning to develop as an independent learner	Rudimentary application of basic practical and technical skills Limited application of fundamental transferable and professional skills Limited evidence of ability to learn independently	Scant application of basic practical and technical skills Ineffective application of fundamental transferable and professional skills Little or no evidence of ability to learn independently