جامعة الحسين التقنية
Al Hussein Technical University

# ASSIGNMENT BRIEF

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| **HTU Course No:**<br>40201341 | **HTU Course Name:**<br>Operating Systems |
| **BTEC Unit Code:**<br>R/615/1700 | **BTEC UNIT Name:**<br>Operating Systems |

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| **Student Name/ID Number/Section** | |
| **HTU Course Number and Title** | 40201341 Operating Systems |
| **BTEC Unit Code and Title** | R/615/1700 Operating Systems |
| **Academic Year** | 2023-2024 Summer |
| **Assignment Author** | Sultan Alrushdan |
| **Course Tutor** | Sultan Alrushdan - Mohammad Yahia |
| **Assignment Title** | Operating System management |
| **Assignment Ref No** | 1 |
| **Issue Date** | 04/08/2024 |
| **Formative Assessment dates** | From 05/08/2024 to 22/08/2024 |
| **Submission Date** | 03/09/2024 |
| **IV Name & Date** | Malek Louzi 03/08/2024 |

**Submission Format**

The assignment is divided into parts, and each part should be submitted on the specific date that is shown below, each student should submit his/her work individually.

Part 1:

An in class closed book examination. the Exam will be held on Thursday 15/08/2024 from 08:30 to 10:00.

Part 2:

An individual written report in Word format (.docx) (PDF is **NOT allowed**) that has a solution for all tasks.

A full working source code for tasks that require code implementation, the code should be implemented using C language under Linux OS.

Oral discussion with your instructor (and any other witness) about the submitted work.

A signed declaration form.

The submission deadline of this part will be on Tuesday 03/09/2024 at 23:59.

You are required to:

submit a well formatted Word version report that provides a complete answer for all required report tasks.

Full and clear answers for all required tasks, mention the task number and the subtask number before each answer.

Soft-copy submissions are only allowed, you are required to upload your submission files to the university's eLearning platform through (https://elearning.htu.edu.jo/) within the submission date and time stated above.

NO SUBMISSION by EMAIL and NO LATE SUBMISSIONS WILL BE ACCEPTED.

If you commit any kind of plagiarism, HTU policies and regulations will be applied.

The oral discussion will be scheduled by your instructor after the assignment deadline.

The attendance of the oral discussion is mandatory in the date and time determined by your instructor, the exact discussion schedule will be announced after your submission, and you need to be ready to open your camera from the beginning of the discussion.

**Unit Learning Outcomes**

**LO1** Investigate different Operating Systems, their functions and user interfaces.

**LO2** Explore the processes managed by an Operating System.

**LO3** Demonstrate the use of DOS, Windows, UNIX and Linux.

**LO4** Analyse appropriate techniques and technologies used in distributed and concurrent systems.

**Assignment Brief and Guidance**

**Part 1:**

- An in class closed book examination.
- You are not allowed to use your phone.
- Your answer should be clear, and providing a final answer without showing detailed steps is **NOT** acceptable.
- It will be held on Thursday 15/08/2024 from 08:30 to 10:00.
- The exact classroom will be announced by your instructor.

**Part 2:**

you were assign a task to investigate the importance of operating system in computing environment. your role is to provide answers for below tasks.

**Task 1:** investigate what an operating system is, explain the various structures of OS with examples of current Operating Systems.

**Task 2:** Explain the Paging memory management, then explain the advantages of paging over previous contiguous allocation.

**Task 3:** Discuses the importance of system calls in Operating Systems by:

- Define what systems calls are and how system calls implemented.
- How to access and use services of system calls.
- How parameters passed to system calls.
- Provide an examples of system calls in modern operating systems.

**Task 4:** Illustrate the importance of process management, threads, Shared Memory and synchronization by implementing a shared buffer with a maximum size of 10 slots for integer data. Implement a solution for producer-consumer problem with the following specifications:

- There are two processes: producer and consumer.
- producer has 2 threads that can produce items concurrently, each thread will produce an item every 2 seconds.
- consumer has 3 threads that consume items concurrently, each thread consumes an item every 3 seconds.
- The buffer can hold a maximum of 10 items at a time.
- Producer threads and consumer threads must use appropriate synchronization tool to ensure the correct functioning of the buffer.

Use C under Linux to build your application.

**Task 5:** You have been asked to set up user accounts, groups, and file access controls on a Linux server as the primary system administrator in a corporate setting. A new group of workers called "Project10" a specialized team, is being formed by the organization. The group will work together on a project stored in the "Project10_Files" directory. (you need to provide a screen shot for each part of the following 11 parts).

1. Create the employees "Ahmed" and "Sami" accounts with a strong password and with heightened security configurations.
2. Form a new project team named "Project10" containing "Ahmed" and "Sami".
3. Prepare a dedicated directory called "Project10_Files" for the project, and it must include three files: 'DevOp', 'Test', and 'Documents' within the directory.
4. Verify and set correct group ownership for the "Project10_Files" directory and its contents.
5. Ensure the "Project10" group has necessary access for seamless collaboration while maintaining security standards.
6. Apply the following security policies.
    1. Grant comprehensive permissions to "Ahmed" and "Sami" for full read and write capabilities on files and directories.
    2. for groups and others, implement a restrictive access, allowing only execute permission.
7. Validate implemented permissions to ensure alignment with team's operational requirements.
8. As "Ahmed" verify access to files in the "Project10_Files" directory according to established permissions.
9. Ensure "Sami" has access to a restricted file named "Project_Details.txt" in the "Project10_Files" directory without changing its access rights or revealing its contents to the group owner.
10. Ensure employees can create and modify their own files within the " Project10_Files " directory while preventing them from deleting files owned by other employees.
11. Remove the accounts of "Ahmed" and "Sami" along with their associated directories upon completion of the project.

**Task 6:** Repeat parts from 1 to 4 of the previous task (**Task 5**) under windows using command prompt or MacOS. provide a screenshot for each part.

**Task 7:** Discuss what is a distributed operating system, Distributed Systems (Middleware) and Network Operating Systems, differentiate between these Systems and explain their Structures and model of Operation.

**Task 8:** Discuss the concept of concurrency in operating systems and in distributed system, how the concurrency achieved, and the impact of concurrency on performance.

**Task 9:** Explain what Remote Procedure Call (RPC) in distributed operating systems is. and how RPC facilitate the distributed operating system work in a distributed environment, and explain how parameter passed in RPC.

**Task 10:** cloud computing and data centers are one of the major on-demand technologies in current computing. One of the major operating systems used in data centers is Hypervisor. Discuss what Hypervisor is, what services it provides, and what advantages it provides for cloud computing and datacenters operations.

| Learning Outcomes and Assessment Criteria | | | |
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| **Learning Outcome** | **Pass** | **Merit** | **Distinction** |
| **LO1** Investigate different Operating Systems, their functions and user interfaces. | **P1** Explore what an Operating System is.<br><br>**P2** Research the evolution of Operating Systems. | **M1** Discuss the importance of Operating Systems. | **D1** Critically evaluate the functionality, interface design and processes of a range of operating systems. |
| **LO2** Explore the processes managed by an Operating System. | **P3** Research the process of Memory Management in an Operating System<br><br>**P4** Investigate the process of job scheduling. | **M2** Analyse, with the aid of a diagram, the importance of Resource Management in an Operating System to aid its efficiency. | |
| **LO3** Demonstrate the use of DOS, Windows, UNIX and Linux. | **P5** With an aid of screenshots, prove the use of MS-DOS and Windows.<br><br>**P6** With an aid of screenshots, prove the use of UNIX and Linux and MacOS. | **M3** Justify the security of each operating system discussed in P5 and P6. | |
| **LO4** Analyse appropriate techniques and technologies used in distributed and concurrent systems. | **P7** Discuss distributed Operating Systems.<br><br>**P8** Discuss Concurrent Operating Systems. | **M4** Justify which techniques and technologies you would use in a Distributed Operating system. | **D2** Critically evaluate your work and make some recommendations about current Operating Systems and future advancements. |