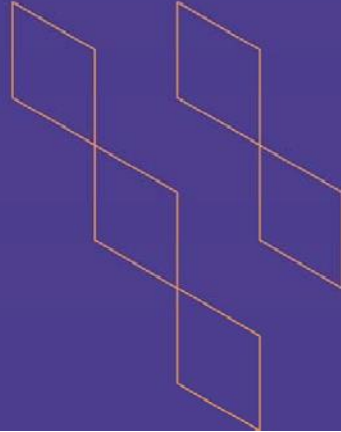




T-104  
2022

## Course Specification



|   |
|---|
| Course Title: <b>Operating Systems</b>      |
| Course Code: <b>SE1005</b>                  |
| Program: <b>Software Engineering</b>        |
| Department: Software Engineering            |
| College: <b>Computing &amp; Information</b> |
| Institution: <b>Al-Baha University</b>      |
| Version: : <b>T104 – V1</b>                 |
| Last Revision Date: : 24/4/2024             |



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## A. General information about the course:

| Course Identification   |  |
|---|--|
| 1. Credit hours:  | 4 Hours  |
| 2. Course type  |  |
| a.  | University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Track <input type="checkbox"/> Others <input type="checkbox"/> |
| b.  | Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>   |
| 3. Level/year at which this course is offered: Level 5 / 2 <sup>nd</sup> Year   |  |
| 4. Course general Description   |  |
| Lecture:<br>This is a first course in operating system theory and design. After successfully completing this course, students understand the core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security.  |  |
| Lab:<br>The lab of this course implements concept learned in operating system course using Linux (Ubuntu) operating system. The labs of this course provide opportunity to students to hands-on experience y on Linux operating systems by learning, its installation, shell commands and scripting.  |  |
| 5. Pre-requirements for this course (if any): CS1256 (Data Structures)  |  |
| 6. Co-requirements for this course (if any): None   |  |
| 7. Course Main Objective(s)   |  |
| At the end of the course students will be able to:  |  |
| <ul style="list-style-type: none"> <li>• Describe the concept of operating system and its structure</li> <li>• Describe process management, including processes, threads, synchronization, scheduling and deadlocks</li> <li>• Describe memory management, including main memory and virtual memory</li> <li>• Define storage management, including mass-storage, file system and I/O system</li> <li>• Define protection and security</li> <li>• Operate across different operating systems environment</li> <li>• Demonstrate hands-on expertise on Linux operating system</li> <li>• Practice on covered topics by solving given assignments periodically</li> <li>• Communicate concepts and techniques in participation and presentations</li> </ul> |  |

### 1. Teaching mode (mark all that apply)

| No | Mode of Instruction  | Contact Hours | Percentage |
|----|--|---------------|------------|
| 1. | Traditional classroom  | 33            | 60%        |
| 2. | E-learning   |               |            |
| 3. | Hybrid <ul style="list-style-type: none"> <li>• Traditional classroom</li> <li>• E-learning</li> </ul> |               |            |
| 4. | Distance learning  |               |            |
| 5. | Other  | 22            | 40%        |





## 2. Contact Hours (based on the academic semester)

| No    | Activity          | Contact Hours |
|-------|-------------------|---------------|
| 1.    | Lectures          | 33            |
| 2.    | Laboratory/Studio | 22            |
| 3.    | Field             |               |
| 4.    | Tutorial          |               |
| 5.    | Others (specify)  |               |
| Total |                   | 55            |

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes  | Code of CLOs aligned with program | Teaching Strategies  | Assessment Methods  |
|------|---|-----------------------------------|--|---|
| 1.0  | Knowledge and understanding   |                                   |  |   |
| 1.1  | Describe the fundamental concepts of process management, memory management, Storage management and inter-process communication in operating system. | K1                                | <ul style="list-style-type: none"> <li>Lectures</li> <li>Multimedia Presentation</li> <li>Discussions/debates</li> <li>Practice Exercises</li> </ul>   | <ul style="list-style-type: none"> <li>Assignments (Using Rubrics)</li> <li>Quizzes</li> <li>Midterm exam</li> <li>Final exam</li> </ul>  |
| 2.0  | Skills  |                                   |  |   |
| 2.1  | Explain storage management, including mass-storage, file system and I/O system  | S1                                | <ul style="list-style-type: none"> <li>Demonstrations</li> <li>Labs Lectures</li> <li>Group Discussion</li> <li>Group Projects</li> <li>Case Studies</li> </ul>                              | <ul style="list-style-type: none"> <li>Homework/Assignments</li> <li>Quizzes</li> <li>Midterm Exam</li> <li>Final Exam</li> <li>Lab exercises (Rubric)</li> <li>Lab exams</li> <li>Project Assessment (Rubric)</li> <li>Report Assessment (Rubric)</li> </ul> |
| 2.2  | Discuss protection and security   | S2                                | <ul style="list-style-type: none"> <li>Demonstrations</li> <li>Debates/Discussions</li> <li>Labs Lectures</li> <li>Group Discussion</li> <li>Group Projects</li> <li>Case Studies</li> </ul> | <ul style="list-style-type: none"> <li>Homework/Assignments</li> <li>Quizzes</li> <li>Midterm Exam</li> <li>Final Exam</li> <li>Lab exercises (Rubric)</li> <li>Project</li> </ul>  |



| Code | Course Learning Outcomes                                  | Code of CLOs aligned with program | Teaching Strategies  | Assessment Methods   |
|------|---|-----------------------------------|--|--|
|      |   |                                   |  | Assessment (Rubric)<br>• Report Assessment (Rubric)  |
| 2.3  | Compare across different operating systems environment    | S3                                | <ul style="list-style-type: none"> <li>• Demonstrations</li> <li>• Debates/Discussions</li> <li>• Labs Lectures</li> <li>• Group Discussion</li> <li>• Group Projects</li> <li>• Case Studies</li> </ul>                       | <ul style="list-style-type: none"> <li>• Homework/Assignments</li> <li>• Final Exam</li> <li>• Lab exercises (Rubric)</li> <li>• Lab exams</li> <li>• Project Assessment (Rubric)</li> <li>• Report Assessment (Rubric)</li> </ul> |
| 2.4  | Implement hands-on expertise on Linux operating system    | S4                                | <ul style="list-style-type: none"> <li>• Demonstrations</li> <li>• Labs Lectures</li> <li>• Group Projects</li> <li>• Case Studies</li> <li>• Practical Exercises</li> </ul>   | <ul style="list-style-type: none"> <li>• Lab exercises (Rubric)</li> <li>• Lab exams</li> <li>• Viva-voce (Rubric)</li> <li>• Project Assessment (Rubric)</li> <li>• Report Assessment (Rubric)</li> </ul>                         |
| 2.5  | Communicate concepts and techniques in oral presentations | S5                                | <ul style="list-style-type: none"> <li>• Slide Presentations</li> <li>• Multimedia Presentations</li> <li>• Demonstrations</li> <li>• Debates/Discussions</li> <li>• Group Projects</li> </ul>                                 | <ul style="list-style-type: none"> <li>• Viva-voce (Rubric)</li> <li>• Presentation Assessment (Rubric)</li> </ul>   |
| 3.0  | Values, autonomy, and responsibility                      |                                   |  |  |
| 3.1  | Work both independently and collaboratively               | V1                                | <ul style="list-style-type: none"> <li>• Presentation</li> <li>• Guest Lectures</li> <li>• Debates/Discussions</li> <li>• Group Projects</li> <li>• Team-based Learning</li> <li>• Case Studies</li> <li>• Seminars</li> </ul> | <ul style="list-style-type: none"> <li>• Rubrics</li> <li>• Note Cards</li> </ul>  |



## C. Course Content

| No           | List of Topics                                      | Contact Hours |
|--------------|---|---------------|
| 1.           | History of operating systems                        | 2             |
| 2.           | Introduction, an overview of operating systems      | 2             |
| 3.           | Operating systems concepts and structure            | 3             |
| 4.           | Processes   | 3             |
| 5.           | Threads   | 3             |
| 6.           | CPU Scheduling                                      | 2             |
| 7.           | Synchronization (Semaphores)                        | 2             |
| 8.           | Synchronization (Deadlocks)                         | 2             |
| 9.           | Memory management                                   | 2             |
| 10.          | Main memory   | 2             |
| 11.          | File systems  | 2             |
| 12.          | Mass-storage systems                                | 2             |
| 13.          | I/O Systems   | 2             |
| 14.          | Multi-Processor systems                             | 2             |
| 15.          | Security and protection                             | 2             |
| <b>Total</b> |   | <b>33</b>     |
| No           | List of Topics - Lab                                | Contact Hours |
| 1.           | Linux/Ubuntu Installation and Introduction to Linux | 3             |
| 2.           | Basic Linux shell commands                          | 1             |
| 3.           | More Linux shell commands and examples              | 2             |
| 4.           | Basic scrip building                                | 3             |
| 5.           | Using structured commands in shell scripting        | 1             |
| 6.           | More structured commands in shell scripting         | 2             |
| 7.           | Advanced shell scripting, creating functions        | 2             |
| 8.           | TCSH: Process system calls                          | 3             |
| 9.           | TCSH: I/O system calls                              | 1             |
| 10.          | TCSH: Process scheduling                            | 3             |
| 11.          | TCSH: Memory Management                             | 1             |
| <b>Total</b> |   | <b>22</b>     |

## D. Students Assessment Activities

| No | Assessment Activities *              | Assessment timing (in week no) | Percentage of Total Assessment Score |
|----|--------------------------------------|--------------------------------|--------------------------------------|
| 1. | Homework Assignments                 | Week 4, 8, 10                  | 5%                                   |
| 2. | Midterm                              | 6                              | 15%                                  |
| 3. | Quiz                                 | 10                             | 15%                                  |
| 4. | Oral presentations and participation | 12                             | 5%                                   |
| 5. | Lab Continuous Evaluation            | Every Two                      | 10%                                  |





| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|----|-------------------------|--------------------------------|--------------------------------------|
|    |                         | Weeks                          |                                      |
| 6  | Lab Final Evaluation    | 12                             | 10%                                  |
| 7  | Final Exam              | 13                             | 40%                                  |
|    | <b>Total</b>            |                                | 100%                                 |

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

## E. Learning Resources and Facilities

### 1. References and Learning Resources

|                          |  |
|--------------------------|--|
| Essential References     | 1. Abraham Silberschatz et al., Operating Systems Concepts (10th edition), Wiley, 2018.  |
| Supportive References    | 1. William Stallings, Operating Systems: Internals and Design Principles (7th edition), Pearson, 2011.<br>2. Thomas W. Doeppner, Operating Systems in depth, Wiley, 2010.  |
| Electronic Materials     | 1. Access to the Saudi Digital Library (SDL).<br><a href="https://sdl.edu.sa/SDLPortal/en/Publishers.aspx">https://sdl.edu.sa/SDLPortal/en/Publishers.aspx</a><br>2. Using the learning management system of the university (Rafid)<br><a href="https://rafid.bu.edu.sa/webapps/login/">https://rafid.bu.edu.sa/webapps/login/</a><br>3. ACM Digital Library <a href="https://dl.acm.org/">https://dl.acm.org/</a> |
| Other Learning Materials | 1. Ubuntu Linux (Required)<br>2. Windows 10 (Optional)<br>3. MAC OS (Optional)   |

### 2. Required Facilities and equipment

| Items  | Resources  |
|--|--|
| facilities<br>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | <ul style="list-style-type: none"> <li>Standard classroom, size depends upon number of students registered</li> <li>Lab computers having Ubuntu installed</li> </ul> |
| Technology equipment<br>(projector, smart board, software)                         | <ul style="list-style-type: none"> <li>AV (Female section)</li> <li>Data show, smart board/white board (Male section)</li> </ul>                                     |
| Other equipment<br>(depending on the nature of the specialty)                      | <ul style="list-style-type: none"> <li>None</li> </ul>   |

## F. Assessment of Course Quality

| Assessment Areas/Issues   | Assessor  | Assessment Methods   |
|---------------------------|---|--|
| Effectiveness of teaching | <ul style="list-style-type: none"> <li>Students</li> <li>Faculty</li> <li>Peer Reviewers</li> <li>Program Leader</li> <li>Course Coordinator</li> </ul> | <ul style="list-style-type: none"> <li>Surveys (indirect).</li> <li>Direct feedback from students (interview between Program leader and students).</li> <li>Course evaluation by Peer Reviewers (indirect).</li> </ul> |





| Assessment Areas/Issues                     | Assessor   | Assessment Methods  |
|---|--|---|
|   |  | <ul style="list-style-type: none"> <li>Class visit by Program Leader</li> <li>Comprehensive Course report (where we can find information about teaching difficulties and action plan, ...)</li> </ul>   |
| Effectiveness of students assessment        | <ul style="list-style-type: none"> <li>Students</li> <li>Faculty</li> <li>Peer Reviewers</li> <li>Course Coordinator</li> <li>Exam Evaluation Committee</li> <li>Course Coordinator</li> </ul> | <ul style="list-style-type: none"> <li>Surveys (indirect).</li> <li>Direct feedback from students (interview between Program leader and students ).</li> <li>Assessment results (direct)</li> <li>Course evaluation by Peer Reviewers (indirect).</li> <li>Comprehensive Course report (where we can find information about assessment difficulties and action plan, ...)</li> <li>Exam evaluation by the Exam Evaluation Committee (indirect)</li> </ul> |
| Quality of learning resources               | <ul style="list-style-type: none"> <li>Students</li> <li>Faculty</li> <li>Peer Reviewers</li> <li>Course Coordinator</li> </ul>  | <ul style="list-style-type: none"> <li>Surveys (indirect)</li> <li>Course evaluation by Peer Reviewers (indirect).</li> <li>Comprehensive Course report (where we can find information about difficulties and challenges about learning resources as well as consequences and action plan, ...)</li> </ul>  |
| The extent to which CLOs have been achieved | <ul style="list-style-type: none"> <li>Faculty</li> <li>Program Leader</li> <li>Course Coordinator</li> </ul>  | <ul style="list-style-type: none"> <li>Student Results (direct)</li> <li>Comprehensive Course report (where we can find the CLO assessment results)</li> </ul>  |
| Other                                       | None   | None  |

**Assessor** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval Data

|                           |                             |
|---------------------------|-----------------------------|
| <b>COUNCIL /COMMITTEE</b> | <b>Curriculum Committee</b> |
| <b>REFERENCE NO.</b>      |                             |
| <b>DATE</b>               | <b>28 April 2024</b>        |





