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| **SN** | **Course Code**  **20CST-313** | **Operating Systems** | **L** | **T** | **P** | **S** | **C** | **CH** | **Course Type** |
|  |  | 3 | 0 | 0 | 0 | 3 | 3 | CR |
|  | |  | | | | Course Code(s)  **20CST-313** | | | |
| **PRE-REQUISITE** | | 20CST-252 | | | |  | | | |
| **CO-REQUISITE** | | 20CSP-314,20CST-315,20CST-316,20CST-319,20CSP-321 | | | |  | | | |
| **ANTI-REQUISITE** | | 20CST-463 | | | |  | | | |

**Course Objectives**

* To grasp a fundamental understanding of operating systems and its functionalities.
* To understand process management, various scheduling algorithms, concurrency and synchronization.
* To understand memory management and virtual memory concepts in modern Operating systems.

**Course Outcomes**

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| --- | --- |
| CO1 | Explain the structure of the operation system and illustrates the process management mechanism and applications |
| CO2 | Identify and solve the problems of deadlocks |
| CO3 | Student will be able to outline the various features such as  memory management, device management and file management of operating system |
| CO4 | Categorize the security threats |
| CO5 | Apply the knowledge of distributed and Network Operating Systems on the complex problems related to computer network |

**Syllabus**

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| **Unit-1** | **INTRODUCTION** | **Contact Hours:15** |
| **Introduction to the Operating System** | Introduction to Operating Systems, Operating System Structure, Main Functions and characteristics of Operating Systems, Types of Operating Systems, System calls, Types of system calls, System programs. | |
| **Process Management** | Process Concept, Process Control Block, Process Scheduling, Threads, CPU Scheduling : Preemptive/ Non Preemptive Scheduling, Scheduling Criteria, Scheduling Algorithms, inter-process communication, remote procedure calls, Process Synchronization | |
| **Deadlocks** | Deadlock characterization and conditions for deadlock, deadlock prevention, Deadlock avoidance-safe state, resource allocation graph algorithm, Banker’s algorithms-Safety algorithm, Deadlock detection, Recovery from deadlock. | |
| **Unit-2** | **MEMORY AND DEVICE MANAGEMENT** | **Contact Hours:15** |
| **Memory Management** | Address binding, logical versus physical address space, dynamic loading, Swapping, contiguous memory allocation, Fragmentation, Paging, Segmentation, Segmentation with Paging, Virtual Memory Concept, Demand Paging, Page Replacement, Page Replacement Algorithms | |
| **Device Management** | Disk Structure, Disk formatting, Disk Scheduling Algorithms, RAID structure-RAID levels, problems with RAID. | |
| **File Management** | File Concepts, Access Methods, Directory Structure, Allocation Methods, Free Space Management. | |
| **Unit-3** | **SECURITY AND TYPES OF OS** | **Contact Hours:15** |
| **System Protection and Security** | Goals, principles and domain of protection, Access matrix, implementation of access matrix, the security problem, program threats, system and network threats. | |
| **Distributed and Network Operating Systems** | Overview: Topology, connection strategy, network operating system types: Peer to Peer & Client server, Distributed message passing. | |

**Text Books:**

1. Galvin, Peter B., Silberchatz, A., “Operating System Concepts”, Addison Wesley, 8th Edition.
2. Flynn, “Operating Systems”, Cengage Learning.
3. Dhamdhere, D.M., "Operating System: A Concept Based Approach", Tata Mc-Graw-Hill.

**Reference Books:**

1. Madnick , Stuart E., Donovan, John J. “ *Operating System*”, McGrawHill.
2. Stalling, William, “*Operating Systems*”, Pearson Education, Fifth Edition.

**Mode of Evaluation: The performance of students is evaluated as follows:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Theory** | | |
| **Components** | | **Continuous Internal Assessment (CAE)** | **Semester End Examination (SEE)** | |
| **Marks** | | 40 | 60 | |
| **Total Marks** | | 100 | | |
| **Mapping Between COs and Pos** | | | | | | |
| **SN** | | **Course Outcome (CO)** | | | **Mapped Programme Outcome (PO)** | |
| 1 | |  | | |  | |
| 2 | |  | | |  | |
| 3 | |  | | |  | |
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**CO-PO Mapping**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Course Outcome** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| CO1 | 3 | 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 | 2 | 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 | 3 |  |  | 3 |  |  |  |  |  |  |  |  | 2 |  |
| CO4 |  | 8 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO5 |  |  | 3 |  |  |  |  |  |  |  |  |  |  | 3 |

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|  |  | **Engineering Knowledge** | **Problem analysis** | **Design/development of solutions** | **Conduct investigations of complex** | **Modern tool usage** | **The engineer and society** | **Environment and sustainability** | **Ethics** | **Individual or team work** | **Communication** | **Project management and finance** | **Life-long Learning** |
| Course Code | Course Name | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **1**  **0** | **1**  **1** | **12** |
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| **Subject Code**  **CSP-328/ITP-328** | | **Operating Systems Lab** | | **L** | **T** | **P** | **C** |
| Total Contact Hours : 45Hours | | **0** | **0** | **2** | **1** |
| Common to all Specializations of CSE 2nd  Year | |
| Prerequisite: Studied C/C++ in previous semesters | | | | | |
|  | | | | | |
| **Marks-100** | | | | | | | |
| Internal-60 | | | External-40 | | | | |
| **Course Objectives** | | | | | | | |
| * To understand Computer Hardware and networking. * To execute various commands in LINUX. * To understand the concept of shell programming. | | | | | | | |
| **Unit** | **Course Outcomes** | | | | | | |
| I. | Apply the knowledge to install Linux Operating system. | | | | | | |
| II | Execute various commands in LINUX for specific purpose. | | | | | | |
| III. | Develop scripting using Shell Programming for various complex problems | | | | | | |
| IV. | Investigate various scheduling algorithm. | | | | | | |
| v. | Implement the various algorithms used for operating system's mechanisms like Bankers algorithm for deadlock avoidance and deadlock prevention | | | | | | |

**List of Experiments**

**UNIT I**

1. Installation of Linux operating system.
2. Study of basic Linux commands.
3. Programs using the following system calls of Linux operating system: fork, getpid, getppid, exit, wait, close.
4. Use of Linux file related commands like ls, grep, cat, etc.
5. Programs using the I/O system calls of Linux operating system( open, read, write etc).
6. Study of basics of shell programming.

## UNIT-II

1. Write a program to show the use of echo.
2. Write a program to read the keywords in shell programming.
3. Write a program using arithmetic operators in shell programming.

10.Write a program using relational operators in shell programming.

1. Write a program using Boolean operators in shell programming.
2. Write programs using control structures in shell programming.
3. Write a program to demonstrate the difference between while and until statement.

## UNIT III

1. Simulation of First come first serve CPU scheduling algorithm.
2. Simulation of Shortest job first CPU scheduling algorithm.
3. Simulation of Round Robin CPU scheduling algorithm.
4. Simulation of Priority based CPU scheduling algorithm.
5. Simulate the Bankers algorithm for deadlock avoidance and deadlock prevention.

CO-Po Mapping

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|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** |
| **CO 1** | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **CO2** | -- | -- | 3 | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
| **CO3** | -- | -- | -- | 3 | 3 | -- | -- | -- | -- | -- | -- | -- |
| **CO4** | -- | 3 | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **CO5** | -- | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |

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| **CSP-328/ITP-328** | **Operating Systems Lab** | | | | | | | | | | | | | |
| **Department Teaching the Subject** | **Department of Computer Science and Engineering** | | | | | | | | | | | | | |
| Program Outcome | a | b | | c | D | | E | F | | G | | h | i | j |
| Mapping of Course outcome with Program outcome |  |  | |  |  | |  |  | |  | |  | I,II,III |  |
| Category | BS | | ES | | PD | PC | | | PE | | OE | | Project/Training | |
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| Approval | Date of meeting of the Board of Studies | | | | | | | | | | | | | |