Banasthali Vidyapith-Faculty of Mathematics & Computing

**Course Handout: B.Tech (CS/IT) –V Semester, July-December 2022**

**Date:** 07 July 2022

**Course Code:** **CS 308** **Course Name: Operating Systems**

**Credit Points:** **4 Max. Marks: 100 (CA: 40+ ESA: 60)**

**Course Instructors:**

Dr. Manisha Agarwal (CS Batch A & B)

Mrs. Bhawana Tyagi (CS Batch C)

Dr. Deepak Kumar (IT)

**Learning Outcomes:**

After successful completion of the course students will be able to

• Learn the fundamentals of Operating Systems.

• Learn the mechanisms of OS to handle processes and threads and their communication.

• Learn the mechanisms involved in memory management in contemporary OS.

• Gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.

• Know the components and management aspects of concurrency management with case study of UNIX.

**Syllabus:**

Section A

History of operating systems, OS Functions, OS Goals, OS classification: single user, multiuser, Batch Processing Operating System, Time Sharing, Real Time Operating System (RTOS), Multiprogramming Operating System, Multiprocessing System, Networking Operating System, Distributed Operating System, Operating Systems for Embedded Devices, Introduction to popular operating systems like UNIX, Windows, etc. Process management: Process status, schedulers, scheduling algorithms, Threads Inter process communication: Process Synchronization, Critical Section problem and its solutions, classical problems in concurrent programming. Deadlock: Prevention, Avoidance, Detection and recovery.

Section B

Information Management: Management file supports, access methods, allocation methods, contiguous, linked and indexed allocation, directory system. Memory management: swapping, paging and segmentation demand paging, virtual memory, page replacement algorithms, working set model. Secondary storage: Disks, disk space management, Scheduling algorithms. Input/output: device controllers and device drivers, I/O processor management: I/O scheduler.

Section C

Protection and Security - Accessibility and Capability Lists Multiprocessor Systems: Bus-oriented System, Crossbar-connected System, Hypercube System, Multistage Switch-based System 26 Parallel processing and distributed processing: concept, differences, OS. Case study: Unix (History, Design principles, interface, file system, process management, memory management, I/O management, vi editor, shell.

**Suggested Books:**

S1. Silberschatz, A., Gagne, G., & Galvin, P. B. (2018). Operating system concepts. Wiley Publications.

S2. Kanetkar, Y. P. (1996). UNIX shell programming. BPB Pub.

S3. Godbole, A. S. (2005). Operating systems. Tata McGraw-Hill Education.

S4. Tanenbaum, A. S. (2009). Modern operating system. Pearson Education, Inc.

S5. Deitel, H. M., Deitel, P. J., & Choffnes, D. R. (2004). Operating systems. Delhi.: Pearson Education.

**Suggested E-learning Material:**

E1. Operating Systems

https://nptel.ac.in/courses/106108101/

E2. Linux for Developers

https://www.coursera.org/learn/linux-for-developers

**Evaluation Scheme:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Component** | **Marks** | **Submission Date** | **Allotment** |
| Home assignment I\*\* | 10 | 17 August, 2022 | Topics shall be allotted in the class by 3 August 2022 |
| Periodical test I | 10 | 26-29 August 2022\* | Lec01 to Lec21 |
| Home assignment II\*\* | 10 | 30 September, 2022 | Topics shall be allotted in the class by 14 September, 2022 |
| Periodical test II | 10 | 16-20 October 2022\* | Lec22 to Lec42 |
| Semester Examination | 60 | 1-17 December 2022\* | Entire syllabus |

\*Subject to change

\*\*Assignment marks will be based on written documents, viva voce and any other components decided by the instructors on regular basis

**Course Plan:**

| **Lecture**  **Number** | **Topics to be Covered** | **Suggested Readings** |
| --- | --- | --- |
| 1-5 | History of operating systems, OS Functions, OS Goals, OS classification: single user, multiuser, Batch Processing Operating System, Time Sharing, Real Time Operating System (RTOS), Multiprogramming Operating System, Multiprocessing System, Networking Operating System, Distributed Operating System, Operating Systems for Embedded Devices, Introduction to popular operating systems like UNIX, Windows, etc. | S1 |
| 6-14 | Process management: Process status, schedulers, scheduling algorithms, Threads | S1 |
| 15-21 | Deadlock: Prevention, Avoidance, Detection and recovery | S1 |
| 22-27 | Inter process communication: Process Synchronization, Critical Section problem and its solutions, classical problems in concurrent programming | S1 |
| 28 – 35 | Memory management: swapping, paging and segmentation demand paging, virtual memory, page replacement algorithms, working set model. | S1 |
| 36-40 | Secondary storage: Disks, disk space management, Scheduling algorithms. | S1 |
| 41-46 | Information Management: Management file supports, access methods, allocation methods, contiguous, linked and indexed allocation, directory system. | S1 |
| 47-49 | Input/output: device controllers and device drivers, I/O processor management: I/O scheduler. | S1 |
| 50-52 | Case study: Unix (History, Design principles, interface, file system, process management, memory management, I/O management, vi editor, shell. | S1 and S2 |
| 53 | Parallel processing and distributed processing: concept, differences, OS. | S1 |
| 54-55 | Protection and Security - Accessibility and Capability Lists | S1 |
| 56 | Multiprocessor Systems: Bus-oriented System, Crossbar-connected System, Hypercube System, Multistage Switch-based System | S1 |

(Manisha Agarwal ,Bhawana Tyagi, Deepak Kumar)

Banasthali Vidyapith-Faculty of Mathematics & Computing

**Course Handout: B.Tech. (CS/IT) –V Semester, July-December 2022**

**Date:** 07 July 2022

**Course Code:** **CS 324L** **Course Name: Operating Systems Lab**

**Credit Points:** 1 **Max. Marks: 100 (CA: 40+ ESA: 60)**

**Course Instructors:**  Dr. Manisha Agarwal (CS Batch A & B)

Mrs. Bhawana Tyagi (CS Batch C)

Dr. Deepak Kumar (IT)

**Learning Outcomes:**

After successful completion of the course students will be able to

• Perform various Linux commands.

• Write shell scripts for the various problems using conditional statements and loops.

• Write shell script for the problems based on positional parameters, expressions and basic commands.

**Syllabus:**

• Introduction to Unix/Linux 27

• Working with VI editor

• Commands

♣ Man command

♣ Files and Directory management (Is, chmod, cat etc),

♣ Environmental Commands (who, who am i, pwd etc),

♣ Zipping and Archiving (zip, gzip, tar etc),

♣ Filter commands (head, tail, grep etc),

♣ I/O redirection commands (>, >>, 2>, < etc),

♣ Miscellaneous (bc, expr, echo, read etc.)

• Shell scripting

♣ Introduction to BASH shell.

♣ Problems based on conditional statements (if else, switch).

♣ Problems based on command line arguments.

♣ Problems based on loops (for, while)

**Evaluation Scheme:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Component** | **Marks** | **Submission Date** | **Allotment** |
| Continuous assessment | 40 | Throughout the course | Based on classes taken at the time of assessment |
| Semester Examination | 60 | 01-17 Dec. 2022 | Whole syllabus |

\* Subject to change

**Course Plan:**

| **Lecture**  **Number** | **Topics to be Covered** |
| --- | --- |
| 1-2 | * Introduction to Unix/Linux |
| 3-8 | * Commands * Man command * Files and Directory management (ls, chmod, cat etc), * Environmental Commands (who, who am i, pwd etc) , * Zipping and Archiving (zip, gzip, tar etc), * Filter commands (head, tail, grep etc), * I/O redirection commands (>, >>, 2>, < etc), * Miscellaneous (bc, expr, echo, read etc.). |
| 9 | * Working with VI editor |
| 10-15 | * Shell scripting * Introduction to BASH shell. * Problems based on conditional statements (if else, switch). * Problems based on command line arguments. * Problems based on loops (for, while). |

(Manisha Agarwal ,Bhawana Tyagi, Deepak Kumar)