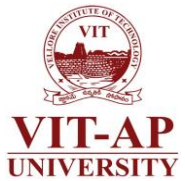
CSE2008: Operating Systems

L0: Introduction



Dr. Subrata Tikadar

SCOPE, VIT-AP University

Outline

- Instructor’s Intro
- Course’s Intro
- Rubric for Evaluation/Assessment
- Q&A and Discussion

Instructor's Intro

Dr. Subrata Tikadar

Designation: Assistant Professor Sr. Grade 1

Affiliation: SCOPE, VIT-AP University

Educational Qualification: B.E., M.Tech., Ph.D.

Work Experience (Academic):

KEC, Kolkata, India;
BCET, Durgapur, WB, India;
Aliah University, Kolkata, India;
MAKAUT (WBUT) Kolkata, India;
CIT Kokrajhar, BTAD, Assam, India;
IIT Guwahati, India.

Research Domain

Human-Computer Interaction

Areas of Interest:

Affective Computing, Learning Technology, User-Centric Computing, Ubiquitous Computing, AR&VR, Brain-Computer Interaction

Course's Intro

Course Code: CSE2008	**Course Title: Operating Systems**	**TPC**	**3**	**2**	**4**
Version No.	1.2				
Course Pre-requisites/ Co-requisites	None				
Anti-requisites (if any).	SWE2007				

Course's Intro

- Course Objectives:
  1. To study fundamentals of Operating Systems
  2. To understand concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization.

Course's Intro

- Expected Outcome (**COs**): [On completion of the course, you will have the ability to]

  CO1: Understand and implement basic services and functionalities of the operating system using system calls.

  CO2: Use modern operating system calls and synchronization libraries in software/ hardware interfaces.

  CO3: Understand the benefits of thread over process and implement synchronized programs using multithreading concepts.

  CO4: Analyze different CPU Scheduling Algorithms.

  CO5: Implement memory management schemes and page replacement schemes.

  CO6: Simulate file allocation and organization techniques.

  CO7: Understand the concepts of deadlock in operating systems and implement them in multiprogramming system.

Course's Intro

- Programme Outcomes (PO):

  After successful completion of the program a student is expected to have abilities to:

  - **PO1.** Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
  - **PO2.** Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
  - **PO3.** Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
  - **PO4.** Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
  - **PO5.** Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course's Intro

- Programme Outcomes (PO):

  After successful completion of the program a student is expected to have abilities to:

  - **PO6.** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.
  - **PO7.** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
  - **PO8.**Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
  - **PO9.** Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
  - **PO10.** Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
  - **PO11.** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
  - **PO12.** Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course's Intro

- CO's Mapping with PO's and PEO's

Course Outcomes	Course Outcome Statement	PO's	PSOs	PEOs
CO1	Understand and implement basic services and functionalities of the operating system using system calls.	PO1, PO2	PSO1	PEO1
CO2	Use modern operating system calls and synchronization libraries in software/ hardware interfaces	PO1, PO2, PO4	PSO1, PSO2	PEO2, PEO3
CO3	Understand the benefits of thread over process and implement synchronized programs using multithreading concepts.	PO1, PO2, PO3, PO5	PSO1, PSO2, PSO4	PEO1, PEO3
CO4	Analyse different CPU Scheduling Algorithms	PO2, PO5	PSO1, PSO2, PSO3, PSO4	PEO4
CO5	Implement memory management schemes and page replacement schemes.	PO2, PO3, PO4, PO7, PO10, PO11	PSO1, PSO2, PSO3, PSO4	PEO3
CO6	Simulate file allocation and organization techniques.	PO2, PO5,PO8,PO10,PO11	PSO1, PSO2	PEO3, PEO4
CO7	Understand the concepts of deadlock in operating systems and implement them in multiprogramming system.	PO2, PO3, PO4, PO10, PO12	PSO1, PSO3, PSO4	PEO1

Course's Intro (contd…)

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- Syllabus (tentative)

Module No. 1	**Introduction**	**05 Hours**
What operating systems do, Computer System Organization, Operating system operations – Process Management, Memory Management, Storage Management, I/O Systems, Protection & Security, Types of Operating Systems – Batch O.S., Multi programmed O.S., Time Sharing O.S., Distributed O.S., Virtualization, Real Time Embedded Systems, Open source O.S., System calls & Overview on Types of System calls.		
Module No. 2	**Process and threads**	**07 Hours**
Process and programs, process states, process concept, process scheduling, operations on processes, IPC, concurrency, interacting processes, multithreading models		
Module No. 3	**Process Coordination and Deadlock**	**10 Hours**
Process synchronization, critical-section problem, Peterson's solution, synchronization hardware, semaphores, monitors, classic problems of synchronization. System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.		
Module No. 4	**Memory Management**	**09 Hours**
Product Metrics, Metrics for the Requirements Model, Metrics for the Design Model, Architectural Design Metrics, Metrics for Software Quality.		
Module No. 5	**Virtual Memory and File Management**	**08 Hours**
Virtual memory basics, demand paging, page replacement policies, memory allocation to a process, page faults. File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance		
Module No. 6	**Storage management and security**	**06 Hours**
Secondary-storage structure: disk structure, disk scheduling algorithm, Protection mechanism: protection domain, access control list.		

Course's Intro (contd…)

- Syllabus (tentative)
  - Lab Component

1	Study of Basic Linux Commands	
2	Basic Shell Programs	
3	Implementation of System Calls	
4	Implementation of Scheduling Algorithms	
	A.	FCFS Algorithm
	B.	CPU Scheduling Using SJF
	C.	CPU Scheduling Using Priority
	D.	CPU Scheduling Using Round Robin
5	Implementation of Multithreading	
	A.	Multithreading Using JAVA
	B.	Multithreading Using PTHREAD
6	Implementation of Interprocess Communication	
	A.	IPC Using Semaphore – Producer and Consumer Problem
	B.	IPC Using Semaphore – Readers and Writers Problem
	C.	IPC Using Semaphore – Dining Philosopher Problem
	D.	IPC Using Pipes
7	Implementation of Deadlock Prevention Using Banker's Algorithm	
8	Implementation of Memory Management Using Paging	
9	Implementation of Memory Management Using Segmentation	
10	Implementation of Page Replacement Algorithms	
	A.	First Come First Serve (FCFS) Page Replacement
	B.	Least Recently Used (LRU) Page Replacement Algorithm
	C.	Optimal Page Replacement Algorithm

Course's Intro (contd…)

- Books and References
  - Text Book:

    1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", Addison-Wesley, 10th edition, 2018.
  - References:

    1. Andrew Tanenbaum, "Modern Operating Systems", Prentice Hall, Fourth Edition, 2015..

    2. William Stallings, "Operating Systems", Pearson Education, Ninth edition, 2018.

Rubric for Evaluation/Assessment

- Mode of Evaluation (Rubrics):
  - Cumulative Lab Assessment — 25%
  - Continuous Assessment Test-1 — 20%
  - Continuous Assessment Test-2 — 20%
  - Final Assessment Test — 20%
  - Practical & **Regular** Assessment — 15%
    - Effective Classroom Interaction
    - Engagement Level
    - Attention and Understanding Level
    - Punctually and Attendance
    - Behavior and Ethics
    - Teamwork

    5%
    - Individual Performance (Problem solving, Design process, Creative thinking) – Assignment, Quiz, SurpriseQuiz…

    10%

Rubric for Evaluation/Assessment

- Mode of Evaluation (Rubrics) – In case of single CAT:
  - Cumulative Lab Assessment 25%
  - Continuous Assessment Test 20%
  - Final Assessment Test 30%
  - Practical & **Regular** Assessment 25%
    - Effective Classroom Interaction
    - Engagement Level
    - Attention and Understanding Level
    - Punctually and Attendance
    - Behavior and Ethics
    - Teamwork

    10%
    - Individual Performance (Problem solving, Design process, Creative thinking) – Assignment, Quiz, SurpriseQuiz…

    15%

Q&A and Discussion

- You may ask question(s), if you have any.

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Thank You