Department of Information Technology

Operating Systems

III B.Tech -I Sem

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Results Target

Total Strength of the Class: 50

S. No	Class / Division	No. of Students
a.	First Class with Distinction	30
b.	First Class	15
c.	Pass Class	5

Method of Evaluation

a.	Internal Examination	2
b.	Unit Wise Assignments	4
c.	Descriptive Exam	2
d	Objective	2
e.	Final Examination	1

JNTU Syllabus

Unit – I	Operating Systems over view, OS Functions, protection and security, Distributed Systems, Special purpose systems. OS structure, OS services And System calls, System programs , OS generations
Unit – II	Process management, Process concepts and threads, scheduling –criteria, algorithms their evaluation, Threads scheduling, case studies UNIX, Linux , Windows
Unit – III	Concurrency-Process synchronization, the critical section problem, semaphores, Paterson's solution, Synchronization Hardware, classic problems of Synchronization, monitors, synchronization examples, atomic transactions. case studies LINUX,UNIX,WINDOWS
Unit – IV	Memory management – swapping, contiguous memory allocations, paging, structure of the page table, segmentation, virtual memory demand paging, page replacement algorithms, Allocation of frames, thrashing. case studies UNIX, LINUX,WINDOWS
Unit – V	Principles of deadlocks- system model, deadlock characterization ,deadlock prevention ,detection and avoidance, recovery from deadlock.
Unit - VI	File system interface –the concept of file, access methods Directory structure, File system mounting, file sharing and protection, File system implementation File system structure and implementation Directory implementation allocation methods ,free space management, efficiency and performance. Case studies UNIX ,LINUX, WINDOWS
Unit - VII	Mass storage structure – over view of mass storage structure disk structure ,disk attachment, disk scheduling swap-space management, RAID structure, stable- storage implementation, Tertiary storage structure. I/O systems-Hardware, application I/O subsystem, Transforming I/O requests to Hardware operations, STREAMS, performance.
Unit - VIII	Protection- Protection, Goals of Protection, Principles of Protection, Domain of protection Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language-Based Protection. Security- The security problem, program threats, system and network threats cryptography as a security tool, user authentication, implementing security defenses, firewalling to protect systems and networks, computer – security classifications, case studies UNIX, Linux, Windows.

Guidelines to Students

Where will this subject help?

1. xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.

Books / Material

Text Books
1. Operating System Concepts- Abraham Silberchatz, Peter B, Galvin, Greg Gagne, 8th edition, John Wiley. **2.** Operating Systems- A Concept based Approach- D. M. Dhamdhere, 2nd Edition, TMH.

Suggested / Reference Books
1. Operating Systems- Internals and Design Principles, Stallings, sixth Edition-2009, Pearson education. 2. Modern Operating Systems, Andrew S Tanenbaum 2nd edition PHI. 3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition. 4. Operating Systems, A. S.Godbole,2nd Edition, TMH. 5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI. 6. Operating Systems, G. Nutt, N. Chaki and S. Neogy.3rd Edition, Pearson Education. 7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill. **8.** Operating Systems, S. Haldar, A. A. Aravind, Pearson Education

Course Schedule

Number of Hours / lectures available in this Semester / Year 2011-2012 65

Distribution of Hours Unit – Wise

Unit	Topic	Total No. of Hours
I	Operating systems overview	08
II	Process management	07
III	Concurrency	09
IV	Memory management	08
V	Principle of Deadlock	05
VI	File system interface	09
VII	Mass storage structure	08

VIII	Protection and Security	07
	Review of topic question papers	4
	Total	65

Topic wise Coverage:

Unit I: Operating Systems over view

LEARNING OBJECTIVES:

- After Explain the aim of operating system
- Learn the overview of computer system hardware
- Learn about handheld devices and real-time systems
- Learn the operating system functions
- Learn about symmetric and asymmetric multiprocessing
- Learn between client-server and peer-to-peer models of distributed systems
- Analyze essential properties of different types of operating systems
- Learn about major activities of an OS with regard to file management
- Analyze operating system protection and security factors
- Learn about models of inter process communication
- List the various memory hierarchy devices and differentiate them

LECTURE PLAN:

Total no_ of classes: 08

Lecture No.	Unit No.	Topic	Text Book and References
1.	1	Operating Systems over view	T1, R3
2.	1	OS functions,	T1, R3
3.	1	protection and security	T1, R3
4.	1	Distributed Systems,	T1, R3
5.	1	Special purpose systems.	T1, R2
6.	1	And System calls	T1, R2
7.	1	OS services, OS structure	T1, R1
8.	1	System programs , OS generations	T2, R4

ASSIGNMENT-1

1. Define OS and explain about functions of OS briefly
2. Explain about storage structure and I/O structure

3. Explain evolution of OS
4. Explain about protection and security aspects
5. Explain about OS structure
6. Explain about system boot ? Explain about VMware architecture
7. **UNIT-II : Process Management**

LEARNING OBJECTIVES:

After studying this unit, Student should be able to :

- What common events lead to the creation of a process
- List three categories of information in a process control block
- What are the steps performed by an OS to create a new process
- Identify different process states
- Learn about short term , medium term and long term scheduling
- Learn about context and process switching
- Learn about process creation and process states in UNIX, LINUX and WINDOWS
- Distinguish between thread and process
- Learn about benefits of multithreaded programming and their models
- Learn about Pthreads
- Learn about threads in Unix, Linux and Windows
- Learn about types of CPU scheduling and their criteria for being the best with examples

LECTURE PLAN:

Total No_ of Classes: 7

9	2	Process management, Process concepts and threads,	T2, R1
10	2	scheduling –criteria,	T2, R2
11	2	algorithms their evaluation,	T2, R3
12	2	Threads scheduling,	T2, R2
13	2	case studies UNIX,	T2, R2
14	2	case studies Linux , Windows	T2, R2
		(End of Unit II) : Total Classes 7	

ASSIGNMENT-II

1 Differentiate the following i) Process switching versus Context switching
2 Discuss the attributes of a process .describe the typical elements of process control block
3 Discuss the following: a)user-level threads b)kernel-level threads c)multi-threading
4 a) Explain about all the states of a process with a neat diagram b) Explain about all CPU scheduling algorithms with examples
5 Explain about process creation and termination in UNIX

6 Explain about multithreading models
7 Explain about the types of schedulers
8 Explain Fair-share scheduling policy with an appropriate example. Compare its performance with any other scheduling policy.

UNIT-III : Concurrency

LEARNING OBJECTIVES:

Introduction to concept of concurrency and the implication of the execution of multiple concurrent processes

- To cite the basic requirements of mutual exclusion for concurrent processing
- Explain the various software and hardware approaches to achieve mutual exclusion
- Examine about semaphores, monitors and message passing
- Two classic problems in concurrency are used to illustrate the concepts
- Learn about concurrent atomic transactions
- Synchronization in UNIX , LINUX and WINDOWS

LECTURE PLAN: Total no_ of classes: 9

16	3	Concurrency-Process synchronization, the critical section problem,	T2, R1
17	3	semaphores, Paterson's solution, Synchronization Hardware,	T2, R2
18	3	monitors, synchronization examples,	T2, R3
19	3	classic problems of Synchronization, atomic transactions.	T2, R2
20	3	case studies UNIX	T2, R2
21	3	case studies LINUX	T2, R2
		case studies WINDOWS	

ASSIGNMENT-3

1. What are the principles of concurrency and explain the execution of the concurrent process with an example.
2. What is a semaphore? Define the binary semaphore primitives and explain semaphore mechanism with an e.g.
3. What are the requirements for mutual exclusion? Explain in detail
4. What design and management issues are raised by the existence of concurrency? Point out how.
5). a)Write the program for mutual Exclusion using semaphores Explain about infinite buffer producer/consumer problem for concurrent processing which uses binary semaphores the issues of speed independence can be addressed

UNIT-IV: Memory management

LEARNING OBJECTIVES:

After studying this unit, student should be able to :

- Visualize the need to study memory management in operating systems
- List the memory management requirements
- Illustrate about loading programs into main memory
- Discuss about different memory management techniques
- Define what virtual memory is and describe it
- Examine the application of virtual memory
- Define the hardware and control structures
- Explain about OS software
- Page replacement algorithms with examples
- Memory management in UNIX , LINUX and WINDOWS environment

LECTURE PLAN:

Total No_ of Classes: 8

22	4	Memory management – swapping, contiguous memory allocations	T2, R1
23	4	paging, structure of the page table,	T2, R2
24	4	segmentation, virtual memory demand paging,	T2, R3
25	4	Page replacement algorithms, Allocation of frames, thrashing.	T2, R2
26	4	case studies UNIX,	T2, R2
27	4	case studies Linux , Windows	T2, R2
		(End of Unit II) : Total Classes 7	

ASSIGNMENT-4

1. Explain with a neat sketch
   i) Address translation in a segmentation system
   ii) Address translation in a paging system
2. i) Discuss the differences between a pure paging and demand segmentation virtual memory systems. What are the pros and cons of each scheme?
   ii) What are the three main issues of implementing a virtual memory?
   iii) Comment on the relative merits of using a local versus a global page replacement policy
3. State and explain the various page replacement algorithms in detail?
4. a) Differentiate between demand cleaning and pre-cleaning
   b) What is the difference between resident set and a working set
   c) Explain with suitable examples about page replacement algorithms
5. Write short notes on page table structure, Translation look aside buffer, Segmentation, paging.

UNIT-V: Principles of Deadlock

LEARNING OBJECTIVES:

After studying this unit, student should be able to :

- Review the principles of deadlock
- Describe methods that an operating system can use to deal with deadlock problem
- Discuss the conditions for deadlock
- Identify tool in characterizing the allocation of resources to processes i:e R.A.G.
- Analyze the Deadlock detection algorithm
- Learn the dining philosopher's problem
- Learn about I/O hardware, polling and interrupts
- Learn about DMA
- Learn about block , character and network devices Learn about STREAMS

LECTURE PLAN:

Total No_ of Classes:

28	5	Principles of deadlocks	**No. of classes required**
29	5	System model	2
30	5	Dead lock characterization	2
31	5	deadlock prevention	2
32	5	detection and avoidance	2
33	5	recovery from deadlock.	1

ASSIGNMENT-5

1. Explain with a neat sketch i) Address translation in a segmentation system ii) Address translation in a paging system
2. i) Discuss the differences between a pure paging and demand segmentation virtual memory systems. What are the pros and cons of each scheme? ii) What are the three main issues of implementing a virtual memory? iii) Comment on the relative merits of using a local versus a global page replacement policy
3. State and explain the various page replacement algorithms in detail?
4. a) Differentiate between demand cleaning and pre-cleaning
   b) What is the difference between resident set and a working set
   c) Explain with suitable examples about page replacement algorithms
5. Write short notes on page table structure, Translation look aside buffer, Segmentation, paging.

UNIT-VI: File systems interface

34	6	Directory structure, File system mounting, file sharing and protection,	T1, R2
35	6	File system structure and implementation,	T1
36	6	Directory implementation	T1, R2

37	6	,free space management,	T1
38	6	Efficiency and performance	T1
39	6	File system implementation	T1, R2
40	6	Case study UNIX	T1, R2
41	6	Case Study Linux	T1,R2
42	6	Case study windows	T1, R2
43	6	(End of Unit VI) : Total Classes 9	

ASSIGNMENT-6

1. What is deadlock? Prove that an unsafe state is not deadlock state. Explain the necessary conditions for the deadlocks.
2. What is deadlock avoidance? Explain process initiation denial and resource allocation denial in detail with example
3. What are the principles of deadlock? And explain in detail the two categories of resources
4. a)What are the conditions that must satisfy for deadlock occurrence and explain them
   b)Is the deadlocks problem preventable? Justify your answer with example and diagram
5. What is the dining philosophers problem? Device an algorithm to solve the problem using semaphores
6. Write detailed notes on : a) Interrupts b) I/O communication techniques
7. Explain about devices in I/O interface
8. a)Explain about kernel I/O subsystem b)Explain about streams

UNIT-VII: Mass storage structure

LEARNING OBJECTIVES:

After studying this unit, student should be able to :

- Learn about magnetic disk
- Learn about disk scheduling algorithms
- Learn about disk management
- Learn about swap space management in UNIX
- Learn about RAID in detail
- Know about stable storages
- Learn about tertiary storage structure

LECTURE PLAN:

Total No_ of Classes: 8

44	7	Mass storage structure – over view of mass storage structure	**No. of classes required**
45	7	Disk structure	1
46	7	disk attachment, disk scheduling swap-space management	1
47.	7	I/O systems, I/O hardware, sub systems	2
48.	7	disk attachment, disk scheduling swap	2
49.	7	I/O systems	1

50.	7	disk scheduling swap	1
51	7	RAID structure, stable- storage implementation, Tertiary storage structure.	
52	7	Transforming I/O requests to Hardware operations, STREAMS, performance.	

ASSIGNMENT-7

1.(a) Explain various disk performance parameters.
(b) Show that the use buffer can reduce the running time by at most a factor of two.
2. Suppose the head of a moving- head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143 and has just finished a request at track 125. If the queue of requests is kept in FIFO order: 86, 147, 91, 177, 94, 150, 102, 175, 130. What is the total head movement to satisfy these requests for the following disk scheduling algorithms.
(a) FCFS (b) Random (c) PRI (d) SCAN (e) SSTF (f) C- SCAN
3. (a) Discuss about N- step- SCAN policy for disk scheduling.
(b) Explain how double buffering improves the performance than a single buffer for I/O.
(c) Differentiate between logical I/O and device I/O.
4. (a) Bitmaps are not often used for main memory allocation. They are commonly used for disk space allocation. Speculate on why this is so.
(b) Give an example of an application that could benefit from operating system support for random access to indexed files.
5. Explain about RAID technology

UNIT -V111: Protection and Security

LEARNING OBJECTIVES:

After studying this unit, student should be able to :

- Examine the problems of protection and design a model for implementing protection
- To understand types of threats to security
- Identify and understand the different malicious programs
- Learn about access matrix , access control and access capability
- Learn about language based protection(JAVA)
- Learn about security problems
- Learn about security threats(Trojan horse, trap door, logic bomb)
- Learn about viruses
- Learn about network threats(worms, port scanning, DoS)
- Learn about cryptography
- Learn about USER Authentication
- Learn about intrusion detection, firewalls

LECTURE PLAN:

Total No_ of Classes: 7

53	8	**Case Study-II-Linux System** - Design Principles	
54	8	Kernel modules,	T1,R1
55	8	Process Management	T1,R1
56.	8	Scheduling Memory Management	T1,R1
57.	8	File Systems, Input and Output,	T1,R1
58	8	Interposes Communication ,	T1,R1
59.	8	Network Structure , Security	T1,R1
60		(End of Unit VIII) : Total Classes 7	

ASSIGNMENT-8:

1.Write short notes on a)viruses b)Worms c) Logic bomb d)Trap door

2.a) What are the security requirements of a computer and network.
b) Explain different types of threats.c) Explain the computer system assets.

3. a) Who are the various classes of intruders. b) Discuss about intrusion techniques

4. Write short notes on a) intrusion detection b)password protection

5. How resources of a computer system is protected b)Explain user and data oriented access control
6. (a) Discuss the password file protection mechanisms.

DEPARTMENT OF INFORMATION TECHNOLOGY

INDIVIDUAL TIME TABLE

NAME OF THE FACULTY*:* K.Roshan

Period	1	2	3	4		5	6	7
Day/Time	9.00-9.50	9.50-10.40	10.40-11.30	11.30-12.20	LUNCH	12.50-1.40	1.40-2.30	2.30-3.20
Mon						OS	OS	
Tue		OS						
Wed			OS					
Thu						**NN**	**NN**	
Fri			NN	NN				
Sat	OS							

Operating Systems (OS)

Total no of theory classes : 06
Total no of practical classes : 06
Neural networks :04
Total no of classes : 16

J. B.Institue of Engineering & Techology
II B.Tech -2009-Batch/I SEM (I-MID DESCRIPTIVE)
BRANCH: INFORMATION TECHNOLOGY
SUB: Operating Systems

TIME: 60 MINUTES **Marks: 10**

SECTION-A

Answer any TWO of the following: **(2x5=10M)**

1 Define OS and explain about functions of OS briefly
Explain about storage structure and I/O structure
2 Explain evolution of OS
3 A)Explain about process creation and termination in UNIX
B) Explain about multithreading models
C)Explain about the types of schedulers
4 A)State and explain the various page replacement algorithms in detail?
B)Differentiate between demand cleaning and pre-cleaning
C)What is the difference between resident set and a working set

OJ. B.Institue of Engineering & Techology
II B.Tech -2009-Batch/I SEM (I-MID DESCRIPTIVE)

BRANCH: INFORMATION TECHNOLOGY
SUB: Operating Systems

TIME: 60 MINUTES **Marks: 10**

SECTION-A

Answer any TWO of the following: **(2x5=10M)**

1..A)What is deadlock? Prove that an unsafe state is not deadlock state. Explain the necessary conditions for the deadlocks.
B)What is deadlock avoidance? Explain process initiation denial and resource allocation denial in detail with example
C) What are the principles of deadlock? And explain in detail the two categories of resources
2. a)What are the conditions that must satisfy for deadlock occurrence and explain them
b) Explain various disk performance parameters.
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3..Write short notes on a)viruses b)Worms c) Logic bomb
d)Trap door
4.a) What are the security requirements of a computer and network.
b) Explain different types of threats.c) Explain the computer system assets.

Marks for Internal Theory Examination

ROLL.NO	NAME OF THE STUDENT	I MID (Des+Obj+Assign))	II MID Des+Obj+Assign))