



# PUNJAB COLLEGE OF TECHNICAL EDUCATION

## COURSE - PLAN (Jan 10 - July 10)

<b>SUBJECT:</b>	Operating System
<b>CODE:</b>	BC – 404 (N2)
<b>CLASS:</b>	BCA – 4th Sem
<b>TEACHERS:</b>	Mr. Harman Jit Singh Kanwer (HS)

### Course Description:

This course is an introduction to Operating System. In this class, we will focus on operating system design, including Process Management and Memory Management, the difference between single user and multi user operating system

More specifically, we will cover the following topics:

- Introduction to operating system
- Process Management
- Memory Management
- File Management
- Deadlock
- Security
- Encryption
- Scheduling Algorithm

### Prerequisites:

Students should have basic knowledge of following topics for the better understanding of concepts of operating system:

- Multiprogramming
- Multitasking
- Real time System
- Single user OS

### Course Goals:

The goal of this course is for you to learn operating system , their benefits and architecture of operating system , develop an understanding of file management, process management & memory management. The course includes topics on operating system , deadlock, security, file protection, linked and index allocation, swapping, algorithm, real time system and threats & why we need this?

The objective of this course is to:

- Students should be able to describe the operating system.
- Students should be able to write shell programming as well as write all the basic Linux commands.
- Students should possess the skills to test and debug shell programs in the laboratory.
- Students should understand techniques for writing a program in vi editor so that they can easily differentiate these two different concepts.
- Students should understand the process management, memory management, file management, deadlock and also importance.
- Understand operating system design concepts e.g single user, multiuser, multiprogramming, multitasking, parallel system and real time system.
- Enable you to design and develop a user with all the rights.

### Scope and Opportunities:

This course offers an opportunity to be at the forefront of the emergent practice of operating system architecture. The graduates of this course can be absorbed in the mainstream of resources allocation, management of file, memory, process, security with authentication, threats, scheduling criteria, inter process communication & deadlock concepts.

### Grading:

Assignments:	5
Tests:	10
Presentation:	5
MSEs:	15
Behavior:	5
<b>Total:</b>	<b>40</b>

### Rules for Assignments:

#### Purpose:

The assignments will primarily be practice problems for the exams. Thus, you should not collaborate on it with others by splitting the work and sharing answers. You will gain the most benefit from doing it by yourself. You can, of course, ask me for help. If someone in the class asks you for help on assignments, handle the situation as if you are a course instructor. Don't just give them an answer, but make sure they know how to find the answer on their own. ***If I feel that people have submitted answers that are merely copies of each other, I will grade the one solution and divide the credit for it equally among the copies i.e. ZERO.***

### Due Date:

As indicated in the course break-up below.

**Late Policy:**

You must do your work on time because we'll be correcting/discussing it in class. ***No assignment will be accepted after the due date.*** If you know that you have a specific time conflict, make arrangements with me in advance for a separate assignment for late submission.

**Format:**

All assignments should be done according to the following format:

- Assignment must have a cover page including *title of assignment, subject, date of submission, students name, class, roll no. and submitted to.*
- For a sample of cover page, visit my website <http://www.w3professors.com>.
- Use loose sheets with one side plain and other side lined.
- Write questions/headings with black pen and other text with blue pen.
- Draw diagrams (if necessary), neat and clean with pencil on plain side of paper.
- Pages should be numbered.
- Mention ***Contents*** at the beginning and ***References*** at the end of each assignment.

**Tests:**

Tests can be oral/written/open book. Open book test is so that you can look up formulas or data from the text or lecture notes. You need to be sufficiently familiar with the material in the book to know where to look up the information that you need. The purpose of the exams is for you to demonstrate that you have attained an operational level of understanding of the material.

The tests will be conducted on the dates mentioned in the course break-up. No extra test will be conducted for the absentees. If you have any time conflict for the test, contact me in advance so that we can make sufficient arrangements. Keep in mind that there will be no improvement test at the end of the semester. Therefore, it's your responsibility to give test on time.

**Presentation:**

One presentation will be held for operating system. You will be informed well in advance. The rules for presentation are as follows:

- Group will be of 3-4 students.
- Students can make groups of their choice.
- Students should be in strict formal for the presentation.
- Three attendances will be taken during presentation. One at sharp 9:00 am, second after lunch break, and third at the end of the presentation.
- ***Present*** will be counted only for those students who'll be present in all the three attendances.

- Marks will be given only to the present students.
- Marks will be deducted for each misbehavior/indiscipline during the presentation.
- Topics will be given at first-cum-first-get basis. No topic will be repeated.
- Marks for the presentation are distributed as follows:

Attendance:	6 marks
Report:	2 marks
Synopsis:	3 marks
Confidence:	5 marks
Query Handling:	9 marks
<b>Total:</b>	<b>25 marks</b>
Indiscipline:	- 5 (for each misbehave)

### **Class Participation:**

A large component of your learning takes place in class. The actual concepts of operating system are fairly simple, although their implementation is often complicated by real-world constraints. Thus, I tend to give lectures to explain these concepts, and pose questions for discussion that are meant to draw out these implications. I will guide discussion, and add information here and there as necessary to carry the discussion forward or to lead it into a digression that adds depth in a different direction.

I will frequently have in-class exercises that you will do as individual/groups. Thus, it is very important that you attend class regularly. I will keep attendance throughout the semester. Please let me know in advance of any scheduled absences.

It is very important that we focus our attention during the limited time we have together. Each of us comes to the classroom distracted by thoughts from outside. Thus, each day we will take about two minutes at the beginning with a brief mind-clearing exercise, followed by a focusing exercise. During the mind-clearing exercise we will sit in silence and concentrate on our breathing. Because it is important that we not be distracted while doing these exercises, I will close the door promptly at the starting time for class. If you arrive late and the door is already closed, please wait outside until I reopen it and invite you in.

### **Classroom Policies:**

Following are the classroom policies and they are meant to be strictly followed:

- Be punctual for the class; try to minimize your disturbance if you are late. I may not reject students who come after 5 minutes from the scheduled time but without attendance.
- Student coming late will be considered as *late arrival* and I will record late arrivals on the day's attendance.
- Three late arrivals equals to one absent.
- Mobile phones are not allowed in the classroom. If any student found using the mobile phone, he/she has to pay Rs. 200 as fine in the account office.

- During lecture delivery, if you have any kind of query, just raise your hand. Queries are important for the understanding of the concepts. So, do ask queries but make sure they are relevant to the subject.
- Be disciplined in the classroom and don't make any noise while we are studying.

## SYLLABUS

### Operating System (BC- 404(N2))

**Max. Marks 100**

**Internal Assessment 40**

**External Assessment 60**

#### Syllabus :

**Instructions for paper setter:** The question paper will consist of two sections A and B. Sections B will have six questions and will carry 10 marks each. Section A will have 10 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

**Instructions for Candidates:** Candidates are required to attempt four questions from section B and the entire section A. Use of nonprogrammable scientific calculator is allowed.

**Introduction to Operating System,** its need and Operating System services;

**Operating System Classification** - single user, multi-user, simple batch processing, Multiprogramming, Multitasking, Parallel system, Distributed system, Real time system.

**Process Management:** Process Concept, Process scheduling, Overview of Inter-Process communication.

**CPU Scheduling:** Basic concepts, Scheduling Criteria, Scheduling Algorithms.

**Memory Management:** Logical Versus Physical address space, Swapping Partition, paging and segmentation, concepts of Virtual Memory.

**File Management:** File concept, access methods, Directory Structure, file protection. Allocation methods: Contiguous, linked and index allocation.

**Deadlocks:** Deadlock Characteristics, Prevention, Avoidance, Detection and Recovery, critical section, synchronization hardware, semaphores, combined approach to deadlock handling.

**Security:** Authentication, Program Threats, System Threats, and Encryption.

#### REFERENCES BOOKS:

1. Silberschatz Galvin Operating system concepts

2. D.M. Dhamdhare System programming and operating system
3. Milan Milenkovic Operating system
4. Deital H.M. An introduction to operating system (Addison Wesley)
5. P.Brinch Hansen Operating system principles (PHI)
6. Stalling, W Operating system (PHI)

## COURSE BREAKUP

**SUBJECT NAME: Operating System**  
**TEACHER CODE: HS**  
**NO. OF. LECT. : 55**

**SUBJECT CODE: BC- 404(N2)**  
**NO. OF TESTS: 3**  
**NO. OF ASSIGNMENTS: 3**

### THEORY BREAK UP

Proposed Week	Lect. No.	Lecture Content	Revision	Assignment	Test	DOD
1	1	Introduction to course module				
	2	Inroduction to OS and its need				
	3	Operating system services				
	4	Operating System Classification: Single User, Multi-User, Simple Batch Processing				
2	5	Single and Multiprogramming OS				
	6	Single and Multi-Tasking OS, Parallel Systems, Real Time Systems, Clustered Systems.				
	7	Different types of OS: Win, Linux etc				
	8	<b>Tutorial 1</b>				
3	9	<b>Assignment 1</b>		<b>A1</b>		
	10	Concept of process, process Scheduling				
	11	Interprocess Communication, various States of a process				
	12	Characterstics of a problem				
4	13	System Calls regarding process				
	14	CPU Scheduling: Overview, Scheduling Creteria				

	15	Scheduling Algos: FCFS, SJF				
	16	RR, Priority algo				
5	17	Multilevel feedback, Multilevel Queue				
	18	One Practical example of all the algos				
	19	First fit, Best Fit, worst fit				
	20	<b>Tutorial 2</b>				
6	21	<b>TEST1</b>			<b>Test1</b>	
	22	Memory Management				
	23	Logical v/s Physical address space				
	24	Swapping and its partitions				
7	25	Paging				
	26	Segmentation				
	27	Virtual Memory				
	28	<b>Assignment 2</b>		<b>A2</b>		
8	29	File management: Concept and access methods				
	30	Directory structure and file system of various OS				
	31	File protection system				
	32	Allocation methods: Contiguous, Linked and Index Allocation				
9	33	Practical problem of allocation method				
	34	Practical problem of allocation method				
	35	<b>TEST2</b>			<b>TEST2</b>	
	36	Deadlocks: Characteristics				
10	37	Prevention and Avoidance				
	38	Prevention and Avoidance				
	39	Detection and recovery from deadlock				
	40	Detection and recovery from deadlock				
11	41	Critical section				
	42	Synchronization hardware				
	43	Semaphores				
	44	Deadlock Handling				
12	45	Deadlock Handling				
	46	<b>Tutorial 3</b>				
	47	<b>TEST3</b>			<b>TEST3</b>	
	48	Security: Authentication				
13	49	Program threats				
	50	System threats				
	51	Encryption and decryption				
	52	Shell programming tutorial				
14	53	Shell programming tutorial				

	54	Shell programming tutorial				
	55	<b>Old question papers discussion</b>				
	<b>56</b>	<b>Assignment 3</b>		<b>Assignment 3</b>		
15	<b>57</b>	<b>Revision 1</b>	<b>R1</b>			
	<b>58</b>	<b>Revision 2</b>	<b>R2</b>			

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## PRACTICAL BREAK UP

S.No.	Topic	Date
1	Introduction to linux & difference b/w linux & windows Cat (overwrite, append, typing) Head, move, copy Tail, clear, md, cd, rm, rd commands Ls simple <b>Activity of linux</b>	
2	Types of licenses, users, features of linux Chmod command Ls options, sort <b>Activity of linux</b>	
3	Changing prompt I/o redirection Links <b>Activity of linux</b>	
4	User management Creating, deleting, modifying users <b>Activity of linux</b>	
5	Group management Creating, deleting, modifying groups <b>Activity of linux</b>	
6	Types of shells Bash Z Tcsh Pdksh <b>Activity of linux</b>	
7	Test & viva	
8	Passwd, pwd, who, who am I, which, man, cut <b>Activity of linux</b>	
9	Chown, more, pipe, find, nice, aliases, history, info <b>Activity of linux</b>	
10	Print command, wild card characters, vi <b>Activity of linux</b>	
11	Foreground & daemon processes, gzip, mknod, ps, kill <b>Activity of linux</b>	
12	Sync, cut, quota management, umask, find, tar, where is <b>Activity of linux</b>	
13	Diff b/w grep & egrep, fgrep, rpm <b>Activity of linux</b>	
14	Shell scripting, if, if-else, ladder <b>Activity of linux</b>	
15	Loops: for, while do-while <b>Activity of linux</b>	
16	Switch statement & batch files & project assignment <b>Activity of linux</b>	

17.	Installation, file system of linux Kde, gnome <b>Activity of linux</b>	
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### ASSIGNMENT 1

1. EXPLAIN FOLLOWING QUESTIONS:

10\*2=20

- A. Diff b/w lazy swapper & pager.
- B. CPU Starvation & its solution.
- C. Thrashing & its working set model.
- D. Explain fork(), wait(), requestmemory() and releasememory() system call.
- E. Difference b/w Symmetric & Asymmetric clustering & multi-programming.
- F. Relationship b/w semaphore & deadlock.
- G. Explain index allocation method & dirty bit.
- H. Explain trap door and name the common virus dropper.
- I. File System mounting. How it is supported in linux?
- J. Difference b/w deadlock avoidance & prevention.

2. a) Explain concept of page fault with the help of diagram & explain the situation where there is no frame available.

b) Explain blade servers?

c) Explain various queues?

(5,2,3)

## ASSIGNMENT 2

a) Explain bankers algo?

b) calculate the need matrix from the following:

Available		Allocation		Max
A B C		A B C		A B C
3 3 1	p0	3 0 2		9 0 2
	P1	2 1 1		2 2 2
	P2	2 0 0		3 2 2

c) Is this a safe state? Give reason. (5,3,2)

2. a) Difference b/w First fit, Best fit, Worst fit, Next fit allocation.

b) Explain dispatcher & its role in context switching?

c) Difference b/w dynamic loading & dynamic linking? (4,3,3)

3. a) Discuss how the pairs of scheduling criteria conflicts in certain settings:

1. CPU Utilization & Response time.

2. I/O device utilization and CPU utilization.

3. Average turnaround time and max wait time

b) process	burst time	priority
p1	10	3
p2	1	1
p3	2	3
p4	1	1
p5	5	4

**note:**

Assume order of arriving is same as given sequence at time 0 and solve by FIFO, SJF, non-preemptive priority, RR(quantum=2)

Prepare gantt. Chart, calculate turnaround time & wait time per process, average wait time for all algos.

Which algo gives minimum average wait time? (7,3)

### ASSIGNMENT 3

1. What is a dirty bit?
2. What do you mean by thrashing?
3. What is the main advantage of using deadlock detection instead of prevention or avoidance?
4. What is the difference between authentication and authorization?
5. What is the difference between internal and external security?
6. What is resident page set, page fault and working set?
7. Write two advantages threads have over multiple processes.
8. Why are page sizes always a power of 2?
9. In what situation would using memory as a RAM disk be more useful than using it as a Disk Cache?
10. Difference between Internal and External fragmentation.
11. Suppose that a system is in a unsafe state. Show that it is possible for the processes to complete their execution without entering a deadlock state.

## **Presentation Topics: (For Theory)**

1. OPERATING SYSTEM AND ITS TYPES
2. SECURITY LEVEL OF OPERATING SYSTEM
3. PROTOCOLS
4. DEMAND PAGING
5. MEMORY MANAGEMENT
6. DISTRIBUTED SYSTEMS
7. FILE SYSTEMS
8. VIRTUAL MEMORY
9. SYSTEM SECURITY
10. LINUX V/S UNIX
11. LINUX V/S WINDOWS
12. WINDOWS VISTA
13. MOBILE SOFTWARES
14. DEADLOCKS, PREVENTION AND DETECTION
15. ENCRYPTION AND DECRYPTION
16. APPLE, MACINTOSH OPERATING SYSTEM
17. REAL TIME SYSTEMS AND THEIR APPLICATION AREAS
18. 3-G MOBILES
19. TOUCH TECHNOLOGY
20. SECONDARY STORAGE STRUCTURE
21. PROCESS, LIFE CYCLE
22. INTERPROCESS COMMUNICATION
23. VERY FIRST OS USED