

PUNJAB COLLEGE OF TECHNICAL EDUCATION**COURSE – PLAN (Jan 10 – Jun 10)**

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| SUBJECT: | Operating System |
| CODE: | BC – 404 (N2) |
| CLASS: | BCA – 4 th Sem. |
| SECTION: | D |
| TEACHERS: | Mr. Gursharan Singh (GS) |

Course Description:

An operating system (OS) is the software that manages the sharing of the resources of a computer and provides programmers with an interface used to access those resources. An operating system processes system data and user input, and responds by allocating and managing tasks and internal system resources as a service to users and programs of the system.

This course gives knowledge about the Operating System and its types. Operating System is the core of any device. Students will be able to differentiate between different types of Operating Systems and their selection criteria. They will also learn how to customize the Operating System according to their own requirements, which is also called operating system optimization. They will learn various services and functions offered by Operating System such as file management, device management, resource (hardware or software) management, recent developments in operating system. They will also learn various types of security schemes offered by the Operating System so that they can make choice of Operating System on the basis of Security policies offered.

More specifically, we will cover the following topics:

- Introduction to Operating System
- Operating System Classification
- Process Management
- CPU Scheduling
- Memory Management
- File Management

- Deadlocks
- Security

Course Goals:

The goal of this course is for you to learn and recognize the concepts and principles of operating systems. The main objective of this course is to provide students with the basic knowledge and skills of operating, managing, and maintaining microcomputer systems. Hands-on experience with the Linux environment will be a major concern in this course.

The objective of this course is to:

- Use traditional and nontraditional operating systems.
- Recognize the differences between various types of operating systems.
- Study and explore the internals of new operating systems.
- Understand advanced concepts in traditional and nontraditional operating systems.
- Know where to look for more information when he is faced with an OS problem.
- Sense where bottlenecks lie in system design.
- Learn how to be critical of what he is told by system designers.

Prerequisites:

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

- Computer System Architecture
- Introduction to Microprocessors

Grading:

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|----------------------------------|-----------------|
| MSE: | 15 marks |
| 1 st One Hourly Test: | 5 marks |
| 2 nd One Hourly Test: | 5 marks |
| Presentation: | 5 marks |
| Class Tests: | 5 marks |
| Assignments: | 5 marks |
| Total: | 40 marks |

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.*

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.eazynotes.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 formals 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.
- If the student is absent, I will deduct (- 10) marks for it.
- 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:

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|-----------------|-----------------|
| Dress: | 10 marks |
| Report: | 10 marks |
| Synopsis: | 5 marks |
| Content: | 5 marks |
| Slides: | 5 marks |
| Confidence: | 5 marks |
| Query Handling: | 10 marks |
| Total: | 50 marks |

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| Absent: | – 10 marks |
| Indiscipline: | – 1 marks (for each misbehavior) |

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.

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 reject students who come after 15 minutes from the scheduled time.
- 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 SYSTEMS

BC – 404 (N2)

Max. Marks: 100

Internal Assessment: 40

External Assessment: 60

Instructions for paper setter:

The question paper will consist of two sections A and B. Section 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.

COURSE BREAK-UP

| | | | |
|----------------------|--------------------------|----------------------------|---------------|
| Subject: | Operating Systems | Code: | BC – 404 (N2) |
| Class: | BCA | Semester: | IV |
| No. of Lect.: | 51 | No. of Assignments: | 3 |
| Teacher: | Mr. Gursharan Singh (GS) | No. of Tests: | 3 |

| Proposed Week | Lect. No. | Lect. Content | Assignments | Tests | Actual Date of Delivery |
|---------------|-----------|--|-------------|--------|-------------------------|
| 1 | 1. | Introduction to Course Plan | | | |
| | 2. | Introduction 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: Windows, Linux etc. | Assign-1 | | |
| | 8. | Concept of process, process Scheduling | | | |
| 3 | 9. | Inter-process Communication, various States of a process | | | |
| | 10. | Characteristics of a problem | | | |
| | 11. | System Calls regarding process | | | |
| | 12. | | | Test-1 | |
| 4 | 13. | CPU Scheduling: Overview, Scheduling Criteria | | | |
| | 14. | Scheduling Algos: FCFS, SJF | | | |
| | 15. | RR, Priority algo. | | | |
| | 16. | Multilevel feedback, Multilevel Queue | | | |
| 5 | 17. | First fit, Best Fit, worst fit | Assign-2 | | |
| | 18. | Memory Management | | | |
| | 19. | Logical v/s Physical address space | | | |
| | 20. | Swapping and its partitions | | | |
| 6 | 21. | Paging | | | |

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|----|-----|---|----------|--------|--|
| | 22. | Segmentation | | | |
| | 23. | Virtual Memory | | | |
| | 24. | | | | |
| 7 | 25. | | | Test-2 | |
| | 26. | File management: Concept and access methods | | | |
| | 27. | Directory structure and file system of various OS | | | |
| | 28. | File protection system | | | |
| 8 | 29. | Allocation methods: Contiguous, Linked and Index Allocation | | | |
| | 30. | Practical problem of allocation method | | | |
| | 31. | | Assign-3 | | |
| | 32. | Deadlocks: Characteristics | | | |
| 9 | 33. | Prevention and Avoidance | | | |
| | 34. | | | | |
| | 35. | Detection and recovery from deadlock | | | |
| | 36. | | | | |
| 10 | 37. | Critical section | | | |
| | 38. | Synchronization hardware | | | |
| | 39. | | | Test-3 | |
| | 40. | Semaphores | | | |
| 11 | 41. | Deadlock Handling | | | |
| | 42. | | | | |
| | 43. | Security: Authentication | | | |
| | 44. | Program threats | | | |
| 12 | 45. | System threats | | | |
| | 46. | Encryption and decryption | | | |
| | 47. | Shell programming tutorial | | | |
| | 48. | | | | |
| 13 | 49. | | | | |
| | 50. | Discussion of Previous Question Papers | | | |
| | 51. | Discussion of Previous Question Papers | | | |

Textbooks and Resources:

- Operating System Concepts
 - Authors: Silberschatz Galvin
 - Publisher: Addison – Wesley
- System Programming and Operating System
 - Author: D. M. Dhamdhare
- Operating System
 - Author: Milan Milenkovic
- An Introduction to Operating System
 - Author: Deital H. M.
 - Publisher: Addison – Wesley
- Operating System Principles
 - Author: P. Brinch Hansen
 - Publisher: PHI
- Operating System
 - Author: Stalling, W.
 - Publisher: PHI
- Other handouts will be provided throughout the semester

ASSIGNMENT – 1

1. Short answer type question:

- a. What is the need of Operating System?
- b. What are the two main functions of an Operating System?
- c. List various Operating Systems available today.
- d. Explain Single-User and Multi-User Operating Systems.
- e. What is the principal advantage of Multiprogramming?

2. Long answer type questions:

- a. What is an Operating System? Explain its different services.
- b. State and discuss the differences between Distributed Systems and Real Time Systems.

ASSIGNMENT – II

1. Short answer type questions:

- a. What is Process State?
- b. What is Busy Waiting?
- c. What is a Scheduler?
- d. Discuss the Non-Preemptive Scheduling.
- e. What are the disadvantages of FCFS Scheduling?

2. Long answer type questions:

- a. What is Process Control Block? Explain with diagram all its contents.
- b. Explain the difference between Multilevel Queue Scheduling and Multilevel Feedback Queue Scheduling.

ASSIGNMENT – III

1. Short answer type questions:

- a. Differentiate Logical and Physical Address Space?
- b. Describe different steps in case of Page Fault?
- c. What type of Fragmentation is there in case of Paging and why?
- d. What is the difference between Authentication and Authorization?
- e. What do you mean by System Threats?

2. Long answer type questions:

- a. Explain the different operations performed on files.
- b. Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the logical address and physical address?

PRESENTATION TOPICS

1. Operating System Classifications
2. Scheduling Algorithms
3. Program Threats and System Threats
4. Deadlock Handling in Various Operating Systems
5. Virtual Memory Management in Windows XP
6. Resource Management Under Microsoft Windows
7. Memory Management in Windows 98
8. File Management in Various Operating Systems
9. Different Classes of Windows Operating Systems
10. Single User vs. Multi User Operating Systems
11. Linux Operating System
12. MS-DOS Operating System
13. Unix Operating System
14. Operating System and its Types
15. Security Level of Operating System
16. Protocols
17. Demand Paging
18. Memory Management
19. Distributed Systems
20. File Systems
21. Virtual Memory
22. System Security
23. Linux vs. Unix
24. Linux vs. Windows
25. Windows Seven