



# Department of Computer Applications

## National Institute of Technology, Jamshedpur

(An Institution of national importance under MHRD, Govt. of India)

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*Spring Semester Session 2019 – 2020*

### Course Handout

<b>Batch</b>	:	<b>MCA (2<sup>nd</sup> Semester)</b>
<b>Course No.</b>	:	<b>CA3204</b>
<b>Course Title</b>	:	<b>Operating Systems (OS)</b>
<b>Instructor In-Charge</b>	:	<b>Dr. D. A. Khan, Dr. C. Azad</b>
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### **Course Description**

**Introduction:** Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

**Process Management:** Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation

**Process Synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

**Storage management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

**Security & Case Study:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Inter-process communication, Network structure, security

### **Scope**

- To provide in-depth knowledge about most important aspects of operating system and its major role in computer system.
- To study about fundamental concepts of processes management, synchronization, deadlock, memory and storage management, security and case study (*Windows, Linux*)
- To develop excellent understanding operating system concepts and programming

### **Objectives**

- At the end of this course, the student will able to understand about role and working principles of an operating system,
- At the end of this course, the student will able to gain knowledge and understating of the all functionality of operating system.

### **Text Books**

- T1: Operating Systems: Design and Implementation, Woodhull, Albert S., Tanenbaum, Andrew S., PHI  
T2. The Design of The Unix Operating System, Bach, Maurice J. PHI  
T3. Operating System, 3/e , Deitel, Deitel and Choffnes, Pearson India  
T4. Operating Systems, Achyut Godbole, TMH

### **Reference Books**

- R1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Wiley India  
R2. Stallng, "Operating Systems", Pearson Education Pvt. Ltd.  
R3. Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.

## Course Plan

Lec. No.	Learning Objectives	Topics to be covered	Refer to chapter see (text book)
1-4	Introduction, development history, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems,	Basic and development process of Operating System	Chap. 1 (T3) Chap. 1-2 (R1) Chap. 1 (T4)
5-9	Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.	Operating System Architecture	Chap. 2 (T3) Chap. 2 (T4)
9-13	Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, CPU scheduling criteria	Process Management	Chap. 2 (T1) Chap. (T4)
13-17	Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation	Multiprocessor Architecture	Chap. 3,4 (T3) Chap. 2 (T1)
18-22	The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors,	Critical Section Management	Chap. 5,6 (T3) Chap. 2 (T1) Chap. 7 (T4)
23-38	Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling	Deadlock Prevention and Recovery	Chap. 7 (T3) Chap. 2 (T1) Chap. 8 (T4)
28-33	Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory,	Primary Memory Management	Chap. 9-11 (T3) Chap. 8-9 (R1) Chap. 9 (T4)
34-38	Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation,	Paging and File structure	Chap. 13 (T3) Chap. 10-11 (R1) Chap. 9 (T4)
39-43	Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Disk structure, Disk management, Swap-Space management, Disk reliability.	Disk Management	Chap. 12 (R1) Chap. 12 (T3)
44-48	Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.	Security Goals and Issues	Chap. 19 (T3) Chap. 10 (T4) Chap. 17-18 (R1)
49-52	Case Study : Windows and Linux Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Inter-process communication, Network structure, security	Case Study	T2, R2 and R3

### Evaluation Scheme (EC):

EC No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
1.	Mid Term Examination	02 Hours	30%	Academic Calendar	Closed Book
2.	End Term Examination	03 Hours	50%	Academic Calendar	Closed Book
3.	Internal Assessment	--	20%	TBA	(Class Test, Attendance, Assignments/Reports/Projects/Seminars)

Class Test/Reports/Projects/Seminars - 10 Marks, Assignment- 05 Marks, Attendance & Punctuality in class- 05 Marks

- ➔ **Chamber consultation hour:** Monday to Friday, 5PM to 6PM, Faculty Chamber
- ➔ **Notices:** All notices regarding the course will be displayed only on the Department of Computer Applications notice board

Instructor In-Charge (CA3204)