

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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Lecture-12 By Vivek Dubey

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COMPUTER SCIENCE AND ENGINEERING

CS403PC

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

CS403PC

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

Scheme of Operating System

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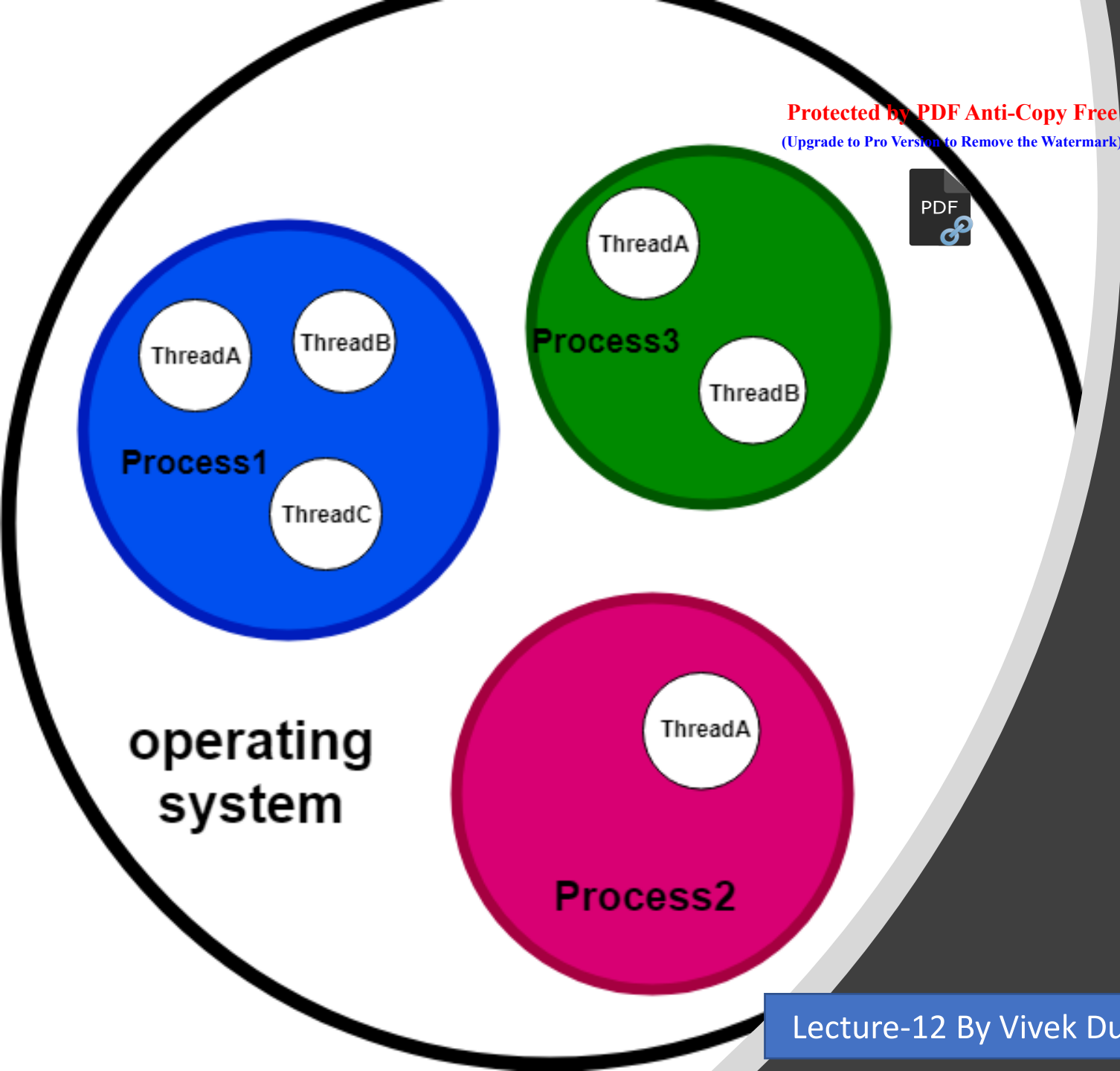
S. No.	Course Code	Course Title	L	T	P	Credits
3	CS403PC	Operating Systems	3	0	0	3
6	CS406PC	Operating Systems Lab	0	0	3	1.5

UNIT-2:

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- **Process and CPU Scheduling –**
 - Process concepts and scheduling, Operations on Processes, Cooperating Processes, **Threads**, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.
- **System call interface for process management-**
 - fork, exit, wait, waitpid, exec



THREADS Vs PROCESS

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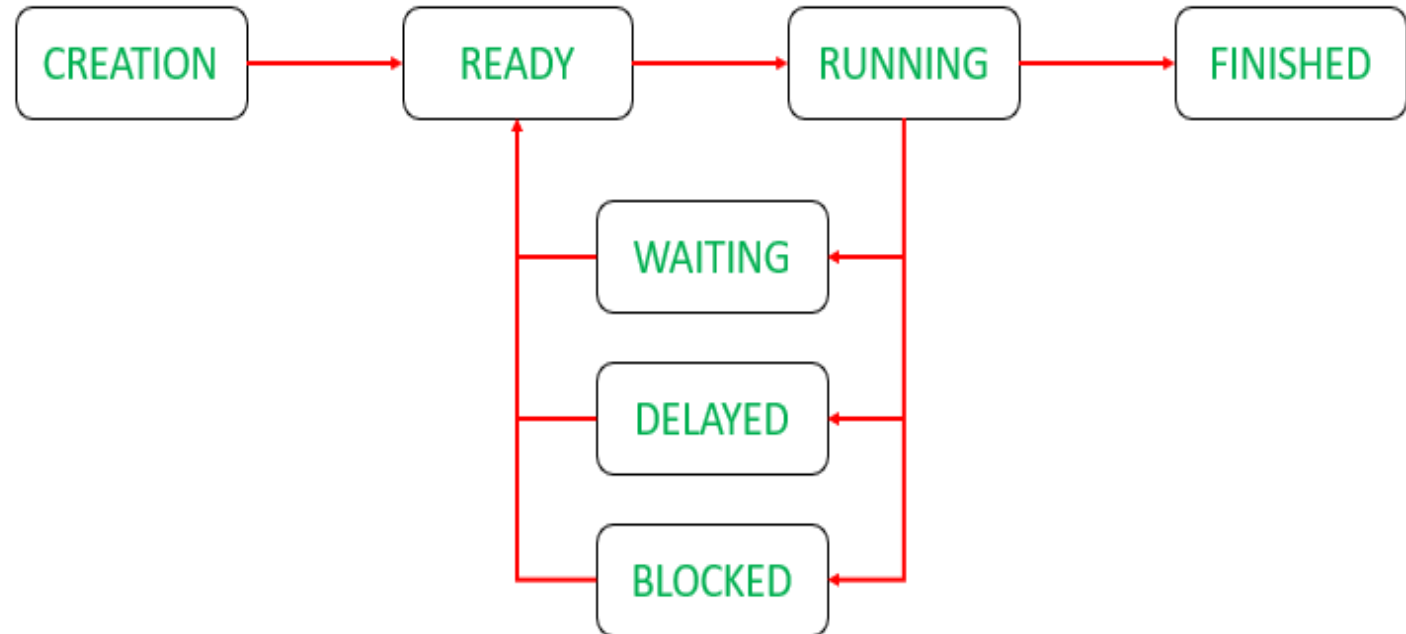
Parameter	Process	Thread
Definition	Process means a program is in execution.	Thread means a segment of a process.
Lightweight	The process is not Lightweight.	Threads are Lightweight.
Termination time	The process takes more time to terminate.	The thread takes less time to terminate.
Creation time	It takes more time for creation.	It takes less time for creation.
Communication	Communication between processes needs more time compared to thread.	Communication between threads requires less time compared to processes.
Context switching time	It takes more time for context switching.	It takes less time for context switching.
Resource	Process consume more resources.	Thread consume fewer resources.
Treatment by OS	Different process are tread separately by OS.	All the level peer threads are treated as a single task by OS.
Memory	The process is mostly isolated.	Threads share memory.
Sharing	It does not share data	Threads share data with each other.

Thread States in Operating Systems

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When a thread moves through the system, it is always in one of the five states:

- (1) Ready
- (2) Running
- (3) Waiting
- (4) Delayed
- (5) Blocked



Contd..

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1. When an application is to be processed, then it creates a thread.
2. It is then allocated the required resources (such as a network) and it comes in the READY queue.
3. When the thread scheduler (like a process scheduler) assign the thread with processor, it comes in RUNNING queue.
4. When the process needs some other event to be triggered, which is outside its control (like another process to be completed), it transitions from RUNNING to WAITING queue.
5. When the application has the capability to delay the processing of the thread, it when needed can delay the thread and put it to sleep for a specific amount of time. The thread then transitions from RUNNING to DELAYED queue.
6. When thread generates an I/O request and cannot move further till it's done, it transitions from RUNNING to BLOCKED queue.
7. After the process is completed, the thread transitions from RUNNING to FINISHED.

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- Each thread *has its own stack.*
 - A thread has
 - program counter (PC)
 - register set
 - stack space
- Threads are not independent of one other *like processes.*
- Threads shares *their code section, data section*, OS resources *with other threads.* Only one thread *active (running) at a time.*
- Threads within a process *execute sequentially.*
- If one thread is blocked, *another thread can run.*



Thread: Flow of control

- A thread is a flow of control within a process.
- Two kinds of threads are:
 - ✓ User-level threads
 - ✓ Kernel-level threads

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User-level threads:

- Visible to the programmer and are unknown to the kernel.
- These threads are faster to create and manage.
- Thread libraries provide the application programmer with an API for creating and managing threads.
- Three primary thread libraries are in common use:
 - ✓ POSIX Pthreads,
 - ✓ Windows threads, and
 - ✓ Java threads.



Kernel-level threads:

- The operating-system kernel supports and manages kernel-level threads.
- To create this thread, intervention from the kernel is required.

Multi-Threaded

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- A multi-threaded process contains several different flows of control *within the same address space.*
- The benefits of multithreading include
 - ✓ increased responsiveness to the user
 - ✓ resource sharing within the process
 - ✓ cost effectiveness
 - ✓ more efficient use of multiple processing cores

THREAD MODELS

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- The many-to-one model **maps**
 - many user threads to a single kernel thread.
- The one-to-one model **maps**
 - each user thread to a corresponding kernel thread.
- The many-to-many model **multiplexes**
 - many user threads to a smaller or equal number of kernel threads.