

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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Lecture-14 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

# Objectives of Process Scheduling Algorithm

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- **Max CPU utilization** [Keep CPU as busy as possible]
- **Fair allocation of CPU.**
- **Max throughput** [Number of processes that complete their execution per time unit]
- **Min turnaround time** [Time taken by a process to finish execution]
- **Min waiting time** [Time a process waits in ready queue]
- **Min response time** [Time when a process produces first response]

# Different Time with Respect to a Process

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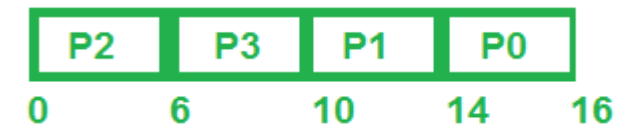
- **Arrival Time:**
  - Time at which the process arrives in the ready queue.
- **Completion Time:**
  - Time at which process completes its execution.
- **Burst Time:**
  - Time required by a process for CPU execution.
- **Turn Around Time:**
  - Time Difference between completion time and arrival time.
- **Turn Around Time = Completion Time - Arrival Time**
- **Waiting Time(W.T.):**
  - Time Difference between turn around time and burst time.
  - $\text{Waiting Time} = \text{Turn Around Time} - \text{Burst Time}$

# Non-Preemptive Scheduling

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- In the case of non-preemptive, scheduling does not interrupt a process running CPU in the middle of the execution.
- Instead, it waits till the process completes its CPU burst time, and then it can allocate the CPU to another process.
- Algorithms based on non-preemptive scheduling are:
  - ✓ Shortest Job First and
  - ✓ Priority (non preemptive version)

| Process | Arrival Time | CPU Burst Time (in millisec.) |
|---------|--------------|-------------------------------|
| P0      | 3            | 2                             |
| P1      | 2            | 4                             |
| P2      | 0            | 6                             |
| P3      | 1            | 4                             |



Non-Preemptive Scheduling

# Preemptive Scheduling

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- Preemptive scheduling is used when a process switches *from running state to ready state* or *from the waiting state to ready state*.
- The resources (mainly CPU cycles) are allocated to the process *for a limited amount of time* and then taken away, and the process is again *placed back in the ready queue* if that process still has CPU burst time remaining.
- That process stays in the ready queue till it gets its next chance to execute
- Algorithms based on preemptive scheduling are:
  - ✓ Round Robin (RR),
  - ✓ Shortest Remaining Time First (SRTF),
  - ✓ Priority (preemptive version), .

| Process | Arrival Time | CPU Burst Time (in millisec.) |
|---------|--------------|-------------------------------|
| P0      | 3            | 2                             |
| P1      | 2            | 4                             |
| P2      | 0            | 6                             |
| P3      | 1            | 4                             |



Preemptive Scheduling

# Scheduling Algorithms

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## Different Scheduling Algorithms

- *First Come First Serve (FCFS)*
- *Shortest Job First(SJF)*
- *Longest Job First(LJF)*
- *Shortest Remaining Time First(SRTF)*
- *Longest Remaining Time First(LRTF)*
- *Round Robin Scheduling*
- *Priority Based scheduling (Non-Preemptive)*
- *Highest Response Ratio Next (HRRN)*
- *Multilevel Queue Scheduling*
- *Multi level Feedback Queue Scheduling*