COMPUTER SYSTEMS FUNDAMENTALS
(4COSC004W)

Lecture: Week 8. Part 2 of 3

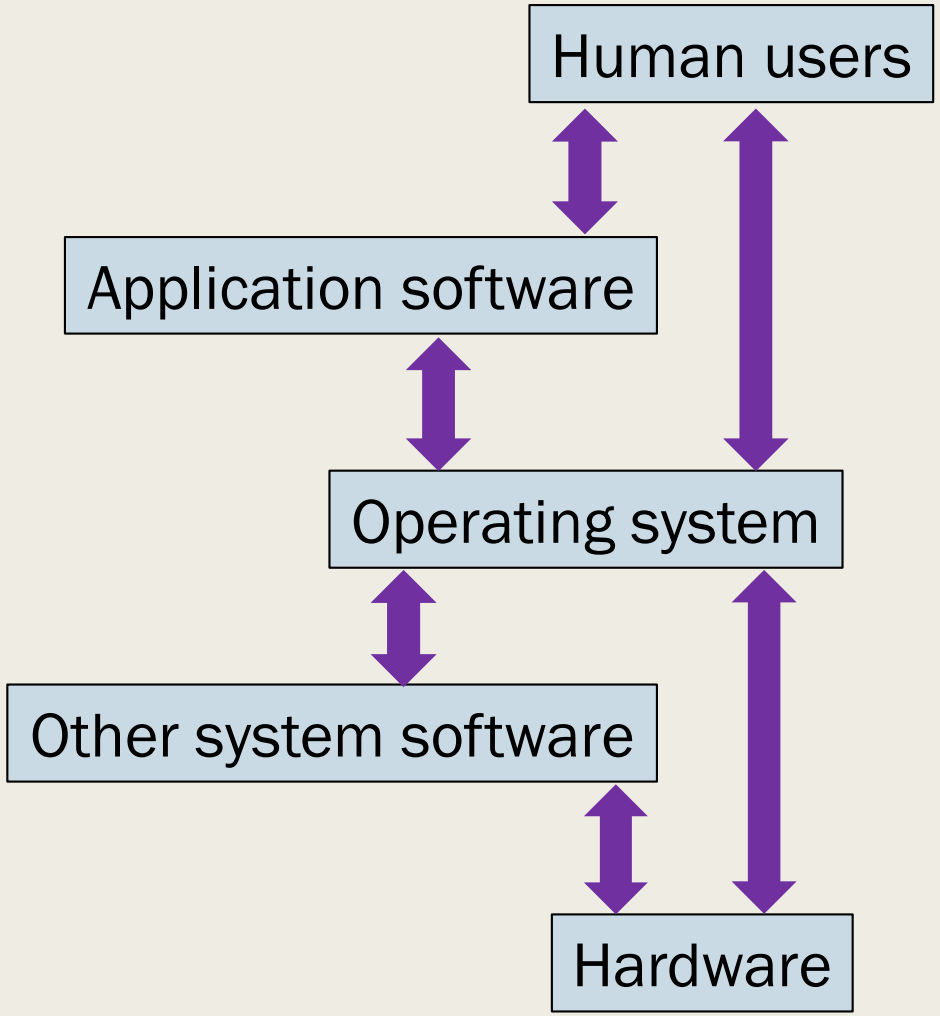
Contact details

- Module Leader:

Operating systems overview:

- Operation of Hardware is controlled by software.
  - *Operating system*
    - Every computer must have
    - Human role: King, Emperor, Director
- Functions
  1. *File Management*
  2. *Process Management*
  3. *Memory Management*
  4. *Input/output functionality*
  5. *General purpose functions – system information*

Operating System interactions



In this video we will cover:

- Process Management:
  - *What is a Process?*
  - *Process states*
  - *Process lifecycle*
  - *Process Scheduling*
  - *CPU Scheduling*

PROCESS MANAGEMENT

The Process Lifecycle

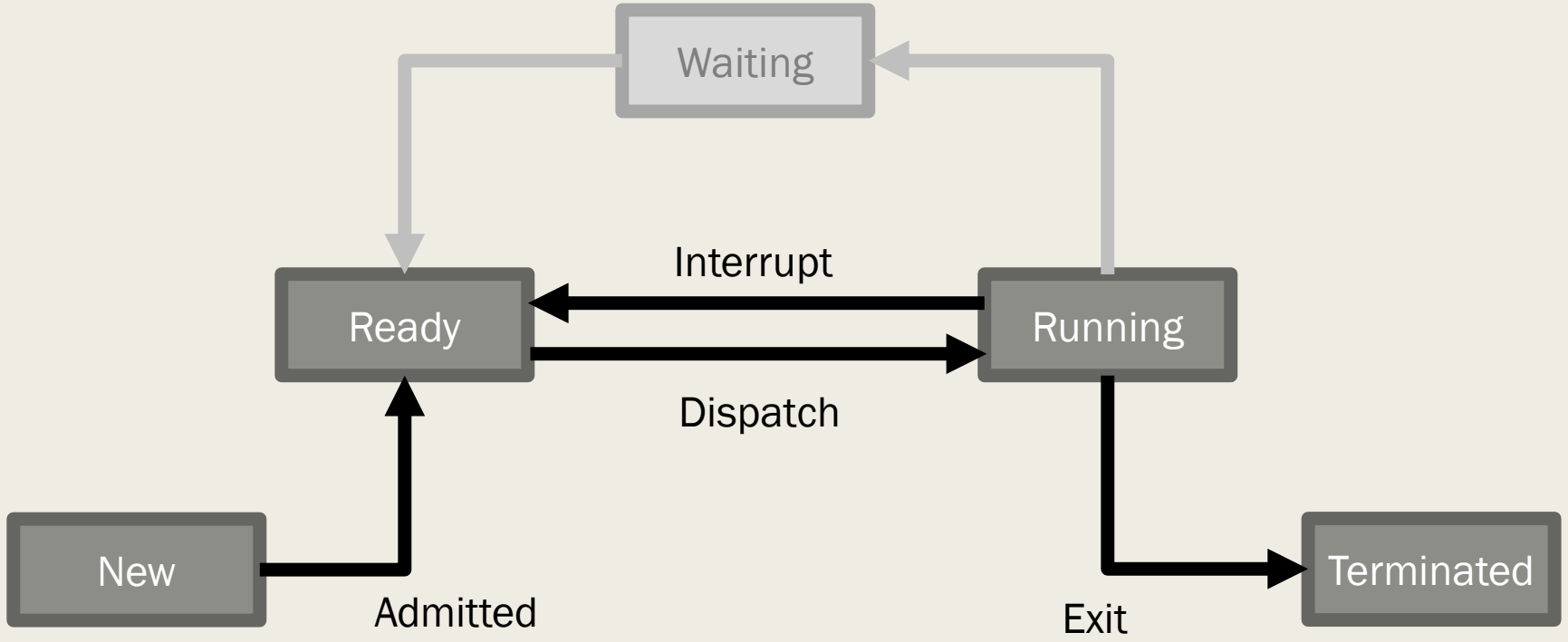
By the end of this unit, you will:

- Gain an appreciation of ;
  - *Process states*
  - *Process scheduling*
  - *CPU scheduling*

The Process:

- An instance of a computer program execution
- Machine code for process must reside in memory.
  - *May also require memory allocation for data*
- Requires CPU cycles – computer power
  - *OS manages this resource*

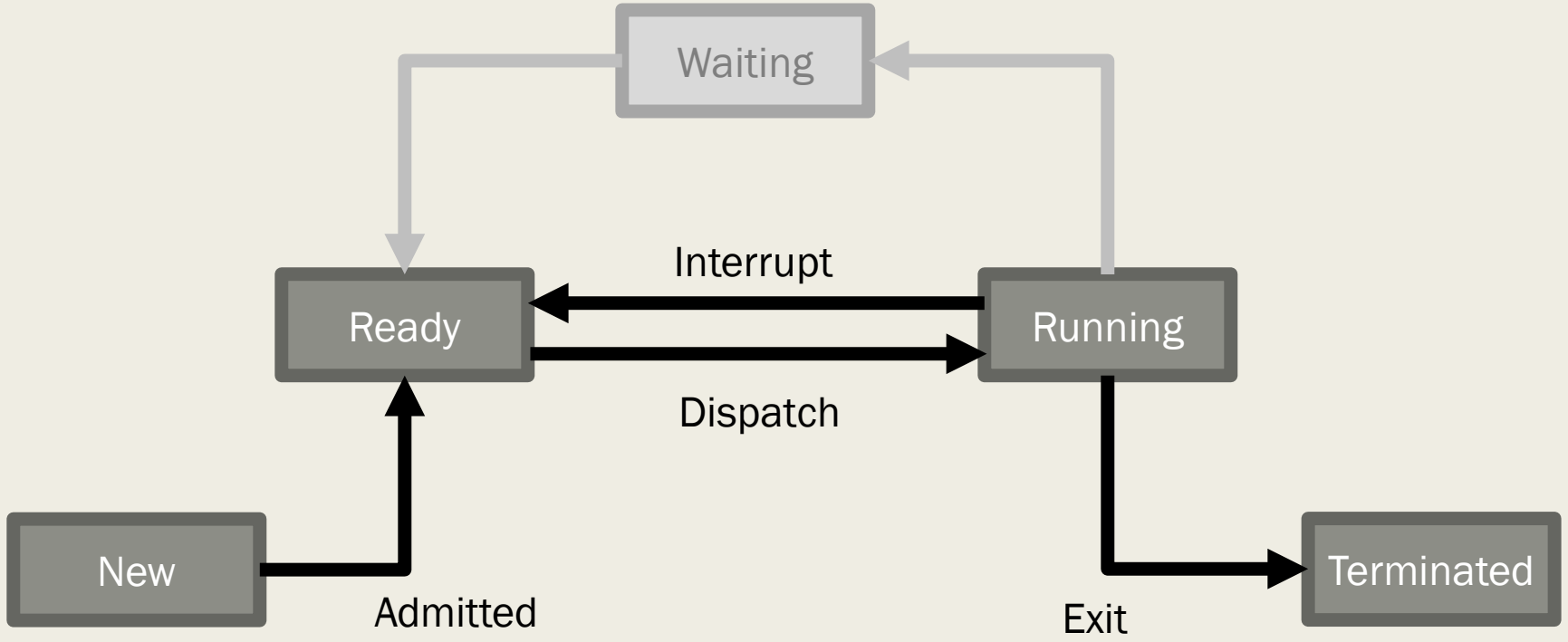
Process states



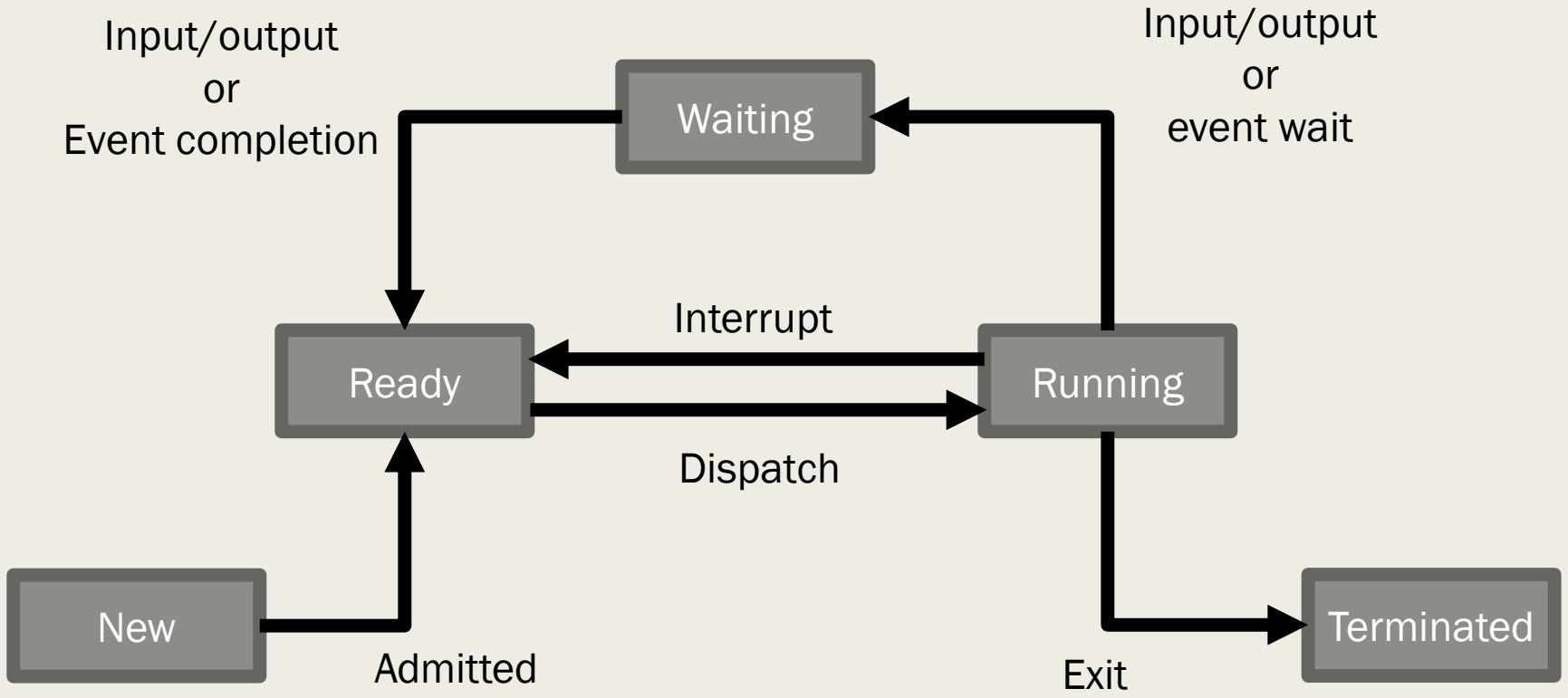
Process states

- **New**
  - *Being created*
  - *No resources yet allocated*
- **Ready**
  - *All resources are allocated*
  - *No more barriers to execution*
  - *No longer waiting for any events or data*
  - *Waiting for chance to use the CPU*
- **Running**
  - *Currently being executed*
  - *Instructions being processed in the fetch-execute cycle*
- **Terminated**
  - *Completed execution*
  - *No need to maintain data regarding process*

Process states

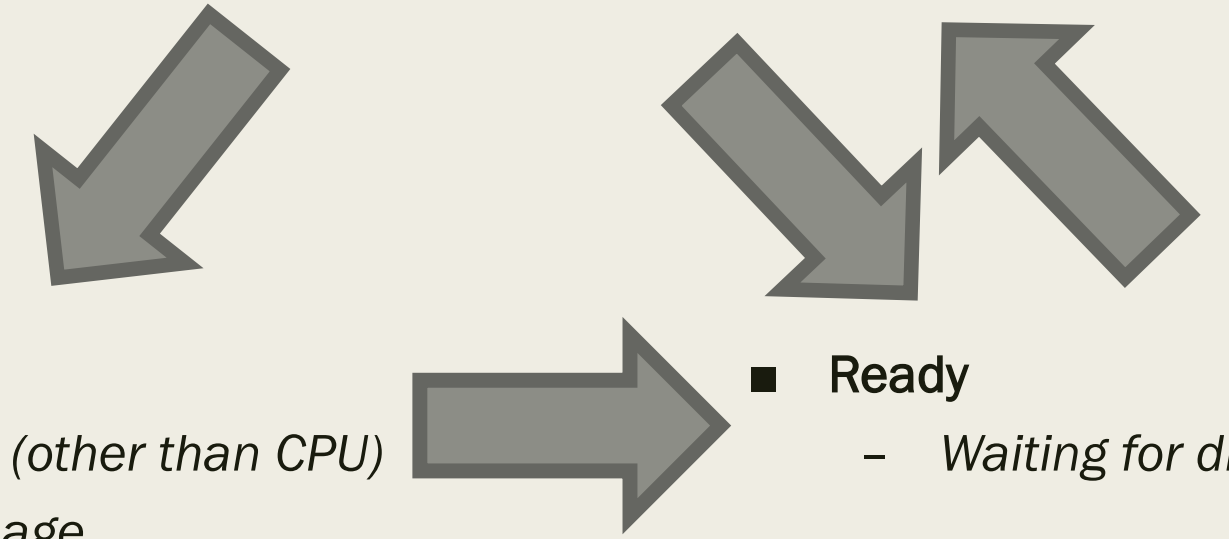


Process states



Process states : Waiting

- **Running**
  - *Currently being executed*
  - *Instructions being processed in the fetch-execute cycle*



- **Waiting**
  - *For resources (other than CPU)*
  - *For memory page*
  - *For process to send signal*
  - *For Input / Output*
- **Ready**
  - *Waiting for dispatch to CPU*

CPU scheduling

- Only processes in ready state can be moved to running state.
- **Turnaround time**
  - *Time between*
    - when process enters ready state,
    - and when it exits running state for the last time
- Scheduling approaches
  - *First Come, First Served*
  - *Shortest Job Next*
  - *Round Robin*

First Come, First Served (FCFS)

- Moved to CPU
  - *in the order in which the jobs arrive in the ready state*
- Non-preemptive

Process	Service time
P1	120
p2	80
p3	100
p4	30
p5	160

Shortest Job Next (SJN)

- Looks at all ready processes
  - *Selects shortest, runs it*
- Moves job to CPU
- Completes job

- Non-preemtive

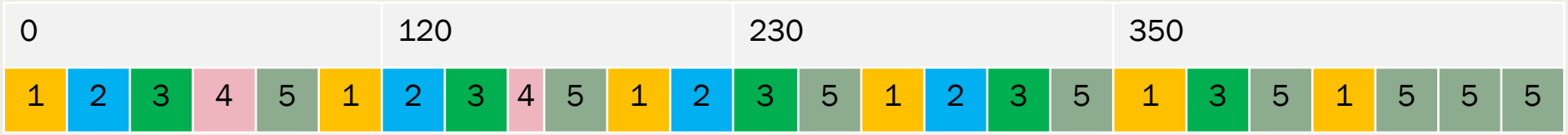
FCFS	
Process	Service time
P1	120
p2	80
p3	100
p4	30
p5	160

SJN	
Process	Service time
P4	30
p2	80
p3	100
p1	120
p5	160

Round Robin

- Time Slice (Quantum)
  - *Suppose Time slice is 20*
- Preemptive
- Widely-used

Process	Service time
P1	120
p2	80
p3	100
p4	30
p5	160



Imagine – single process:

Office: 5.100

Imagine – Multiple processes:

60

10

20

Office: 5.100

Imagine – First Come, First Served:

60

10

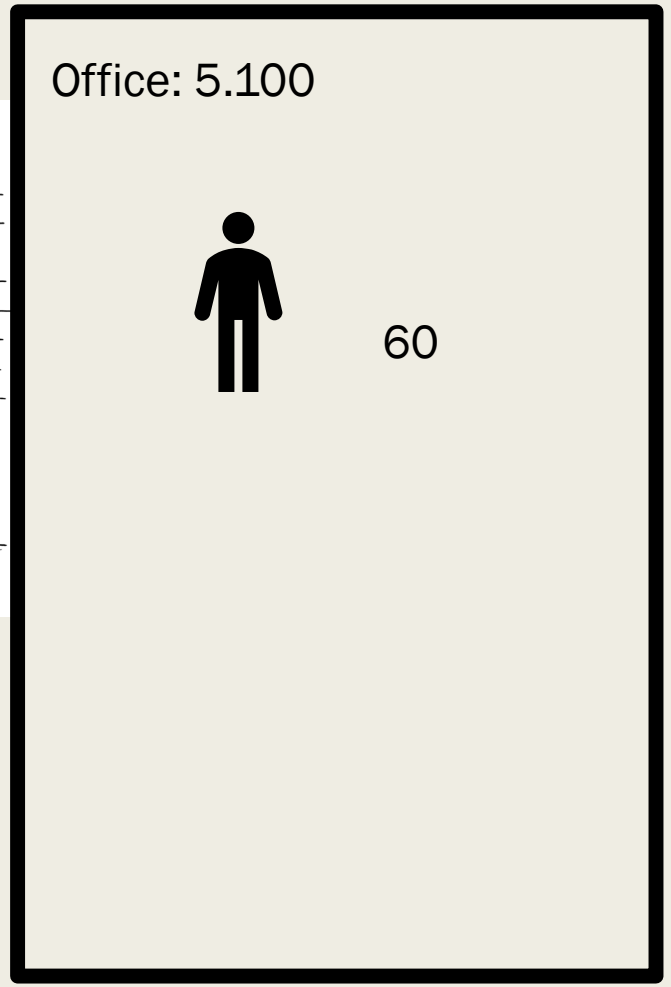
20

Office: 5.100

Imagine – First Come, First Served:

10

20



Imagine – Shortest Job Next

60

10

20

Office: 5.100

Imagine – Round Robin:

Quantum : 5

60

10

20

Office: 5.100

What we have covered about OS functions:

- Process management
  - *Process states*
  - *Process scheduling*
  - *CPU scheduling*
    - FCFS
    - SJN
    - RR

Further reading:

- Computer Science Illuminated
  - *Chapter 10*
    - 10.3 & 10.4 (p.347 – 361)
- Computer Systems
  - *Chapter 8*