SER 334 A Session

SI Session

Monday February 12th 2024

7:00 pm - 8:00 pm MST

Agenda

- Scheduling Algorithms
- Terms
- Algorithms
- Sample Problems

SI Session Expectations

Thanks for coming to the **SER 334** SI session. We have a packed agenda and we are going to try to get through as many of our planned example problems as possible. This session will be recorded and shared with others.

- If after this you want to see additional examples, please visit the drop-in tutoring center.
- We will post the link in the chat now and at the end of the session.
  - tutoring.asu.edu
- Please keep in mind we are recording this session and it will be made available for you to review 24-48 hours after this session concludes.
- Finally, please be respectful to each other during the session.

Interact with us:

Zoom Features

Zoom Chat

- Use the chat feature to interact with the presenter and respond to presenter's questions.
- Annotations are encouraged

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Scheduling

Think state change!

What are the four scheduling event triggers?

- Running → Waiting
- Running → Ready
- Waiting → Ready
- Running → Terminate

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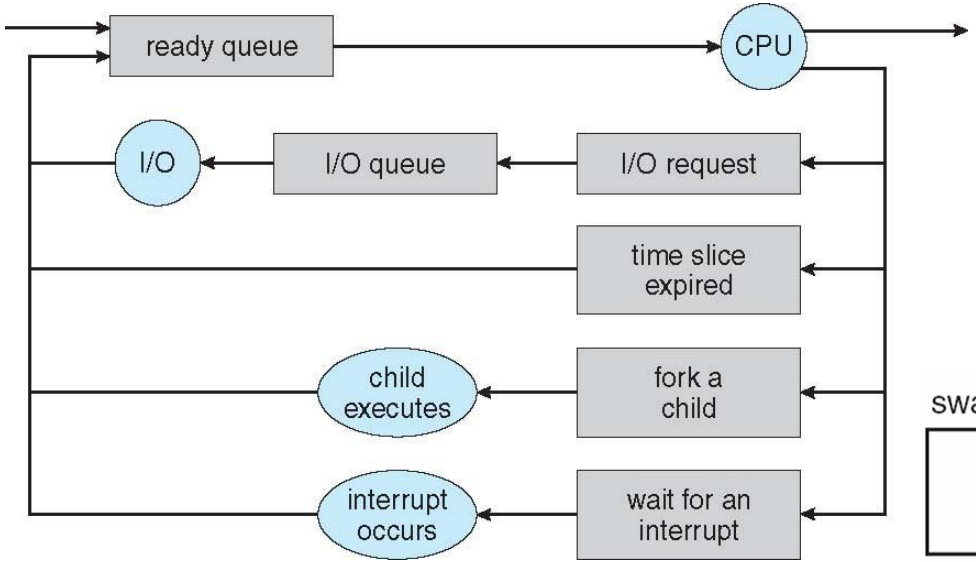
Scheduling

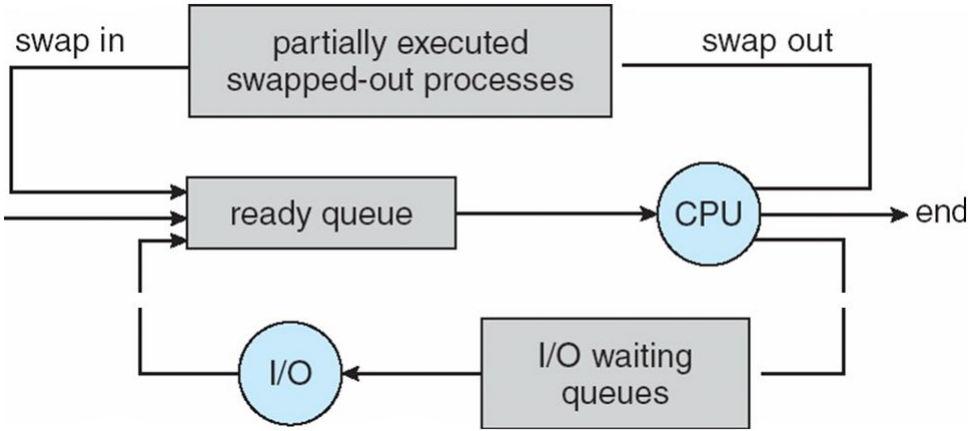
Running → Waiting

Running → Ready

Waiting → Ready

Running → Terminate





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Scheduling

Reviewing Terms

A scheduler can be *preemptive* or *non-preemptive*, which is which?

Can only “grab” the process after completion

Can “grab” the process at any time

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Scheduling

Which two scheduling event triggers are **preemptive**?

Running → Waiting

Running → Ready

Waiting → Ready

Running → Terminate

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Scheduling

Check out the recording for the solution!

Which two scheduling event triggers are **preemptive**?

- Running → Waiting
- Running → Ready
- Waiting → Ready
- Running → Terminate

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Scheduling

Reviewing Terms

Match the algorithm types to their definitions:

- Live Algorithm
- Streaming Algorithm
- Greedy Algorithm

- Chooses the immediate best option
- Meant to run forever, continuously updating
- Runs over partitions of the larger data set

Check out the recording for the solution!

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Scheduling

Reviewing Terms

Check out the recording for the solution!

- CPU Utilization
- Throughput
- Turnaround Time
- Waiting Time
- Response Time

- Tasks completed in **X** amount of time
- Time until a response/result is received
- Time spent in the Ready Queue
- Usage in terms of maximum load
- Completion time for one task

Module 9 Sample

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Scheduling Algorithms

First-Come First-Served

P0, 12	P1, 6	P2, 3	P3, 4

Avg Completion Time:
(TURNAROUND)

Avg Waiting Time:

Module 9 Sample

SER 334

Scheduling Algorithms

Shortest Job First

Focus:

P0, 12	P1, 6	P2, 3	P3, 4

Avg Completion Time: END time / # processes (TURNAROUND)

Avg Waiting Time: START time / # processes

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Scheduling Algorithms

Shortest Job First LIVE

$T_{n+1} = a(t_n) + (1 - a)T_n$

t_n = actual burst, T_n = CPU guess, a = weight (usually 0.5)

P0, 12	P1, 6	P2, 3	P3, 4

$T_1 = (0.5)(12) + (0.5)15$ $T_2 = (0.5)(6) + (0.5)13.5$ $T_3 = (0.5)(3) + (0.5)9.75$ $T_4 = (0.5)(6) + (0.5)6.375$

$T_1 = 13.5$ $T_2 = 9.75$ $T_3 = 6.375$ $T_4 = 5.1875$

Avg Completion Time: END time / # processes (TURNAROUND)

Avg Waiting Time: START time / # processes

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Scheduling Algorithms

Round Robin

Quantum = 5

P0, 10	P1, 6	P2, 7	P3, 4

Avg Completion Time: (WAIT+BURST) / # processes (TURNAROUND)

Avg Waiting Time: (slices that are not me) / #processes

Module 9 Sample

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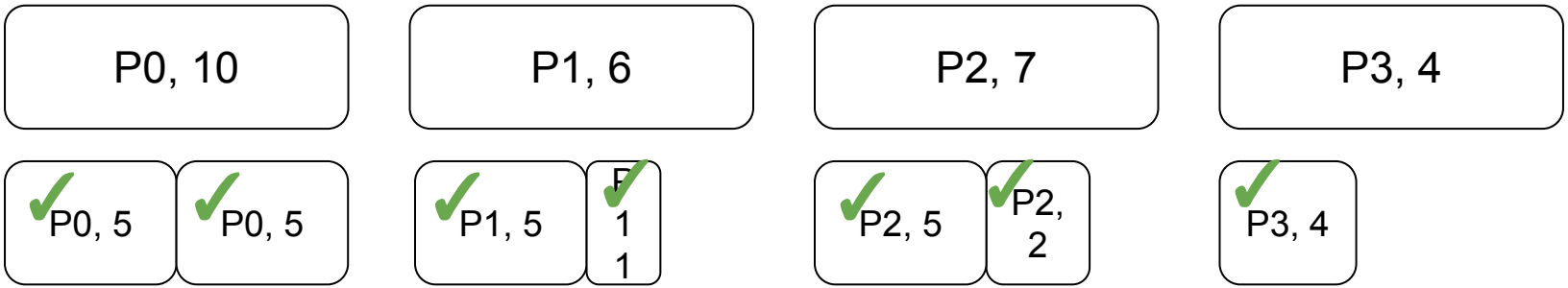
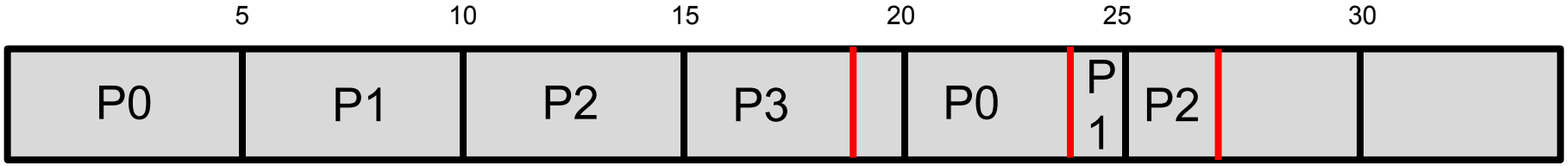
Scheduling Algorithms

Round Robin

Quantum = 5





Avg Completion Time: (WAIT+BURST) / # processes (TURNAROUND)

Avg Waiting Time: (slices that are not me) / #processes

Module 9 Sample

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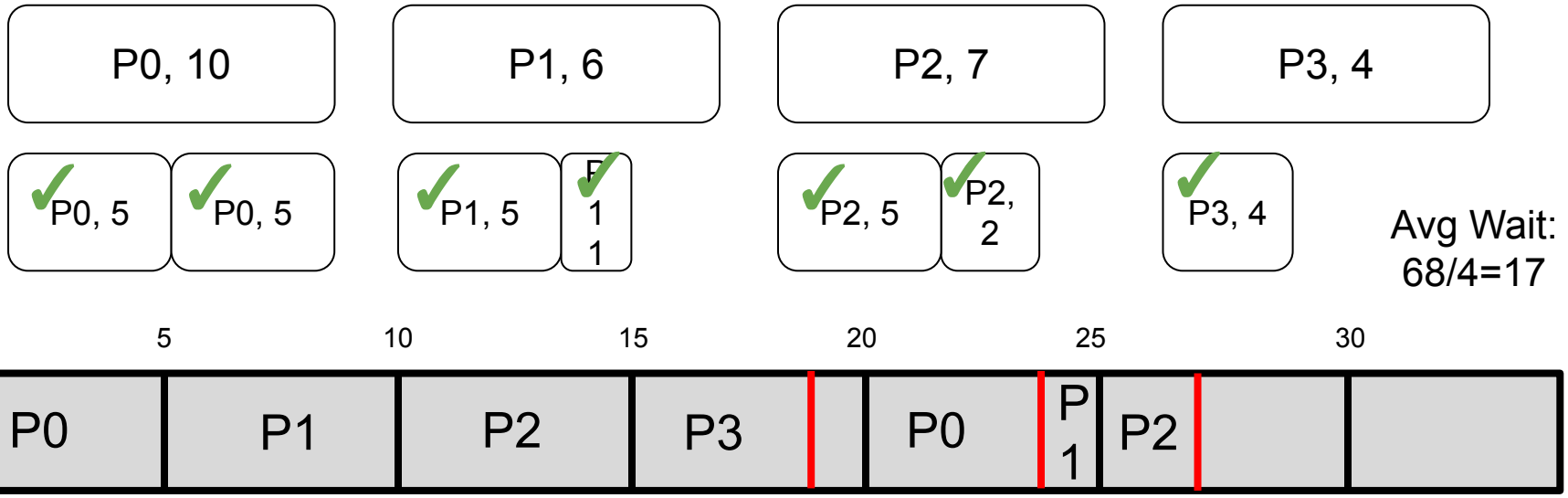
Scheduling Algorithms

Round Robin

Wait Times: 14 19 20 15



Avg Completion Time: (WAIT+BURST) / # processes (TURNAROUND)

Avg Waiting Time: (slices that are not me) / #processes

Module 9 Sample

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Scheduling Algorithms

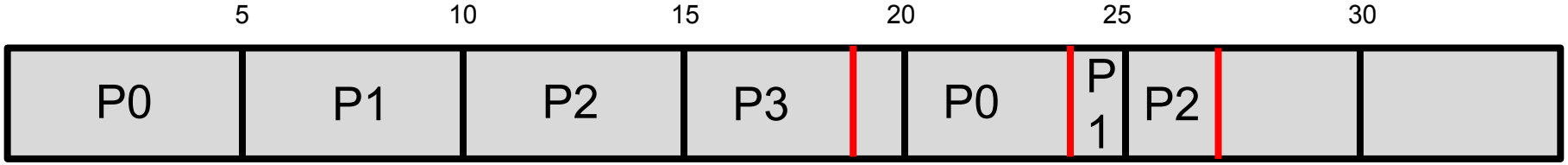
Round Robin

Turnaround: 14 + 10 = 24 | 19 + 6 = 25 | 20 + 7 = 27 | 15 + 4 = 19

P0, 10 | P1, 6 | P2, 7 | P3, 4

✓P0, 5 | ✓P0, 5 | ✓P1, 5 | ✓P1, 1 | ✓P2, 5 | ✓P2, 2 | ✓P3, 4

Avg Turnaround: 95/4=23.75



Avg Completion Time: (WAIT+BURST) / # processes (TURNAROUND)

Avg Waiting Time: (slices that are not me) / #processes

Module 9 Sample

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Scheduling Algorithms

process, period, burst

Rate Monotonic

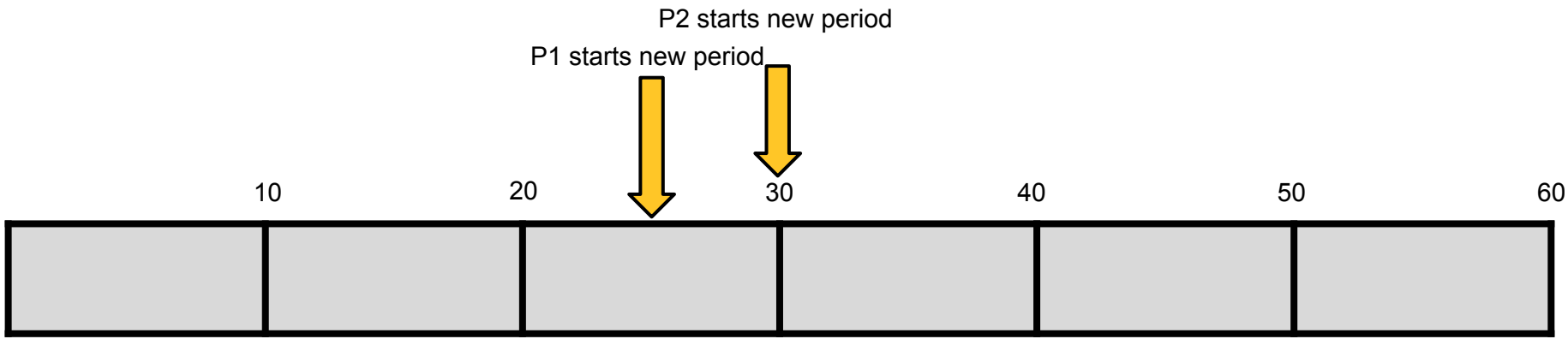
1/30 = 0.033

P0, 30, 15

Who goes first??

P1, 25, 15

1/25 = 0.04



Priority = 1/period

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Scheduling Algorithms

process, period, burst

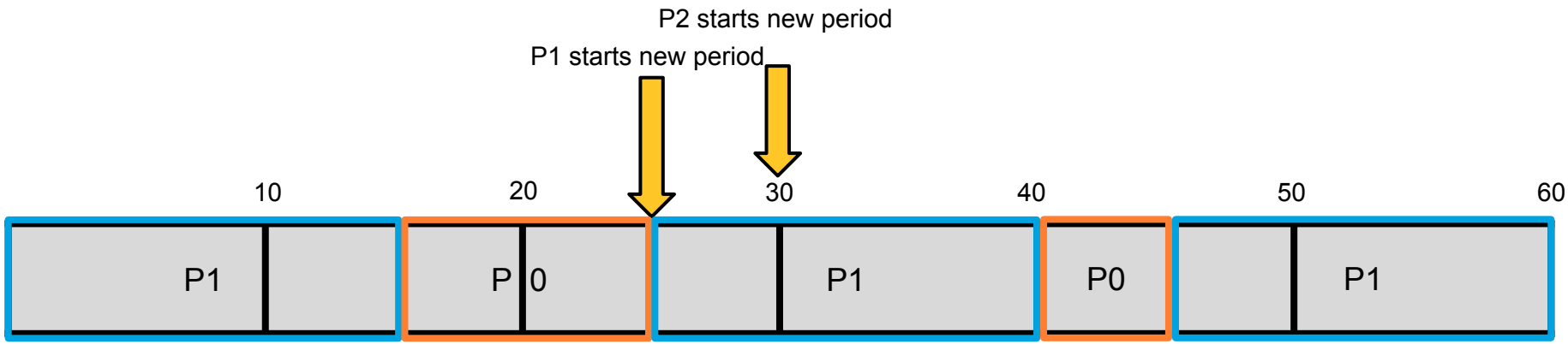
Rate Monotonic

1/30 = 0.033

P0, 30, 15

P1, 25, 15

1/25 = 0.04



Priority = 1/period

P1 usurps P0

Results in P0 missing deadline!

Module 9 Sample

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Scheduling Algorithms

Rate Monotonic

process, period, burst

Max CPU Load:

P0, 30, 15

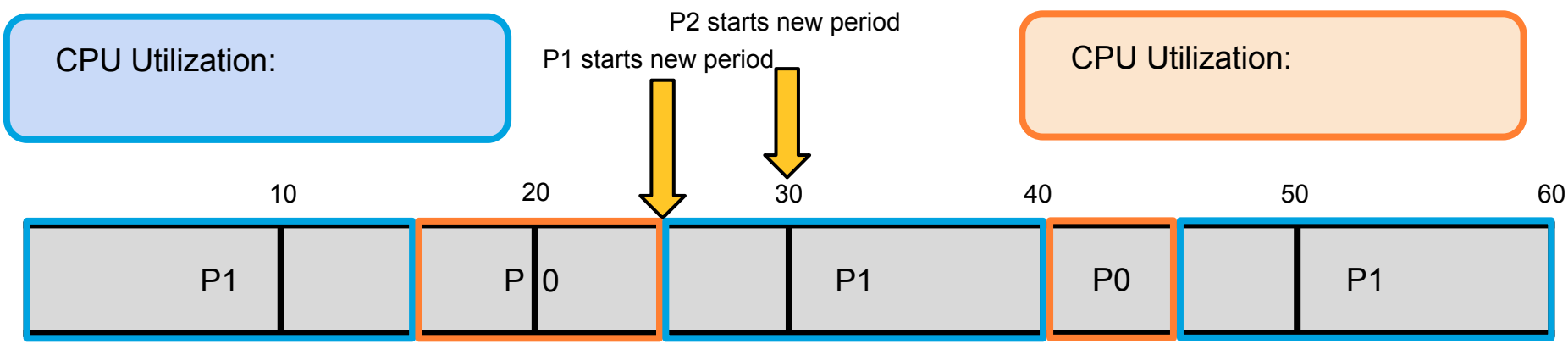
P1, 25, 15

1/30 = 0.033

1/25 = 0.04

CPU Utilization:

CPU Utilization:



Priority = 1/period

P1 usurps P0

Results in P0 missing deadline!

Module 9 Sample

SER 334

Scheduling Algorithms

2. [Alvaran] You run a console-based calculator program, which waits for user input. You submit an additional problem that the program calculates and outputs to the screen. Lastly you terminate the program. Explain which parts of the scenario correspond to scheduling events? For each event, what type of scheduling is used (preemptive vs non-preemptive)? [2 points]

Module 9 Sample

SER 334

Scheduling Algorithms

3. [Lisonbee] Consider a scenario where all queued jobs run for a random amount of time, but all are equally important in terms of the work they complete. Of the five criteria for scheduling jobs, which one would be the most important to optimize in this situation? Explain. [2 points]

Five Criteria:

- CPU Utilization
- Throughput
- Turnaround Time
- Waiting Time
- Response Time

Module 9 Sample

SER 334

Scheduling Algorithms

4. [Lisonbee] If you are trying to optimize for waiting time, roughly how will the processes be ordered in terms of the time they take to complete? Explain. [2 points]

Module 9 Sample

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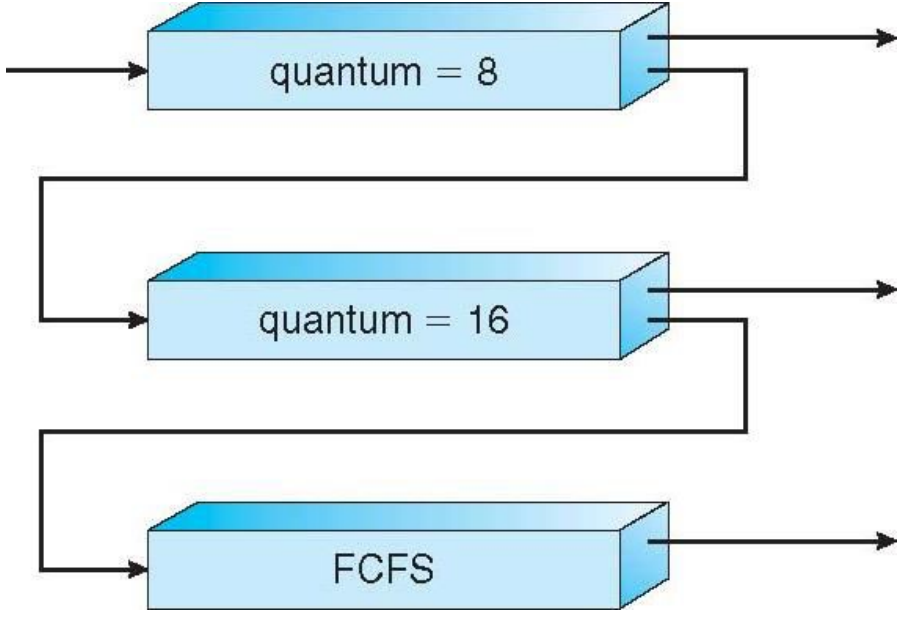
Scheduling Algorithms

8. [Silberschatz 6.4] What advantage is there in having different time-quantum sizes at different levels of a multilevel feedback queuing system? Explain. [2 points]



SER 334

Scratch Space

Upcoming Events

SI Sessions:

- Thursday, February 15th at 7:00 pm MST
- Sunday, February 18th at 7:00 pm MST
- Monday, February 19th at 7:00 pm MST

- Sunday, February 25th at 7:00 pm MST - Q&A Session before Exam 3

Review Sessions:

- Exam 3 Review: Thursday, February 22nd at 7:00 pm MST

Questions?

Survey:

http://bit.ly/ASN2324

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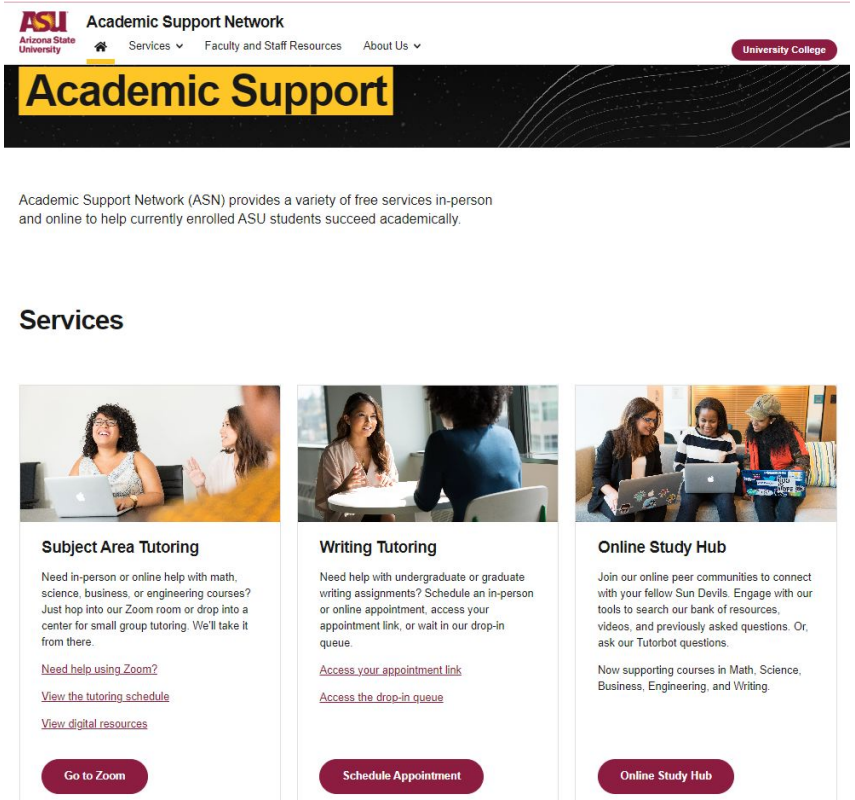
More Questions?

Check out our other resources!

tutoring.asu.edu

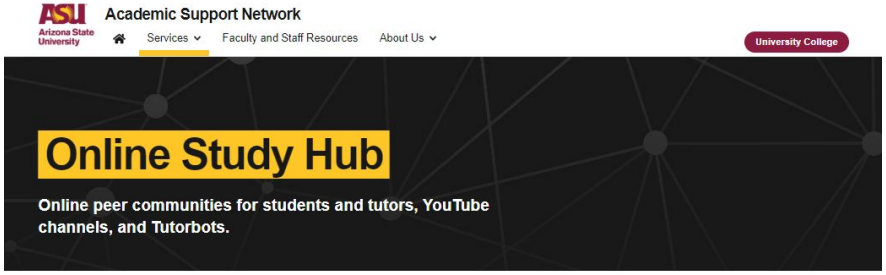


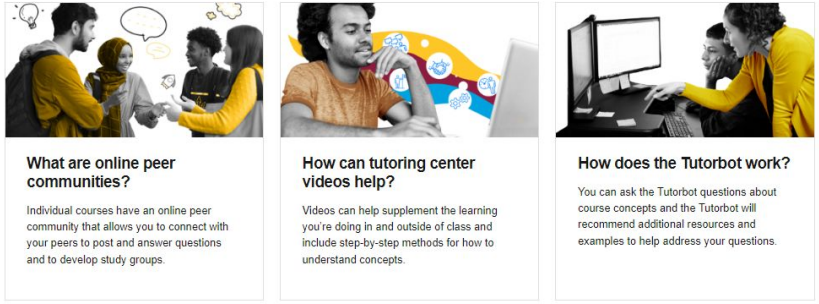
1. **Click on ‘Go to Zoom’ to log onto our Online Tutoring Center.**
2. **Click on ‘View the tutoring schedule’ to see when tutors are available for specific courses.**

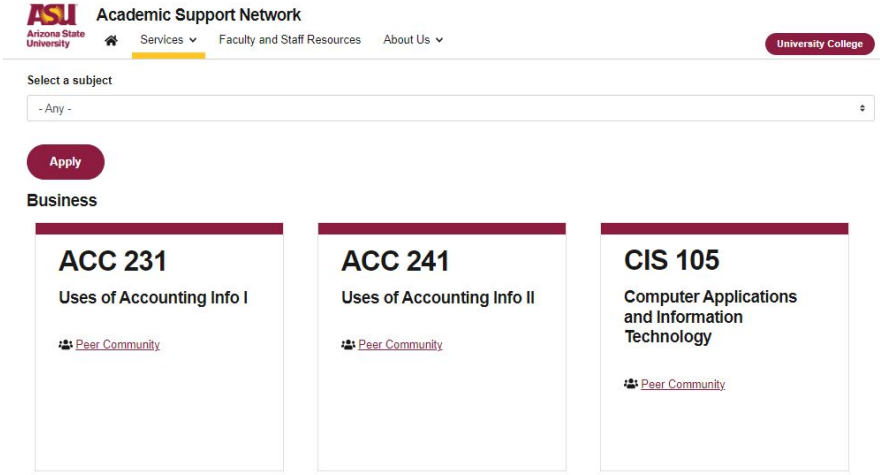
More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



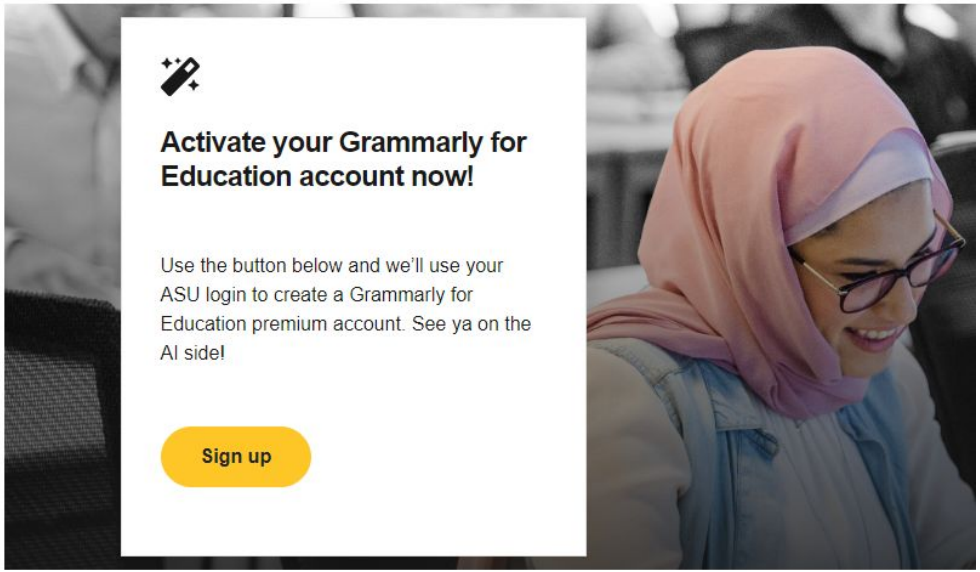




Don't forget to check out the Online Study Hub for additional resources!

Expanded Writing Support Available

Including Grammarly for Education, at no cost!



tutoring.asu.edu/expanded-writing-support

*Available slots for this pilot are limited

Additional Resources

- Course Repo
- Course Discord
- BMP File Format (Wiki)
- Linux Kernel API
- Bootlin - Linux Cross Referencer
- Dining Philosophers Interactive
- Producer/Consumer Visual