

Computer Communication Systems Section 01

CS 258

Spring 2024 3 Unit(s) 01/24/2024 to 05/13/2024 Modified 03/05/2024

Contact Information

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Office Hours

Monday, Wednesday, 1:30 PM to 2:30 PM, MH 215

You don't need to make an appointment for these office hours. You can simply stop by my office.

Course Description and Requisites

Design, analysis and survey of the latest advancements in network and Internet technologies, such as supporting TCP/IP over various network media, software-defined networks, networks supporting cloud computing, network security, peer-to-peer and overlay networks, and quality of services.

Prerequisite(s): CS 158A and Graduate standing. Allowed Declared Major: Computer Science, Bioinformatics, Data Science. Or instructor consent.

Letter Graded

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students will be able to:

- Describe the characteristics of different types of modern network architectures and the underlying technologies, including optical networks, Software Defined Networking (SDN), and Network Function Virtualization (NFV)
- Identify the benefits and challenges of network softwarization
- Solve network resource optimization problems using advanced algorithms, including Integer Linear Programming (ILP), meta-heuristics, and Machine Learning (ML)
- Select an appropriate set of networking technologies and protocols to satisfy service requirements defined by users
- Develop network emulation software to evaluate protocol performance

Course Materials

Textbooks

No textbook. The course schedule below includes reference materials for each topic.

Suggested Reading:

- Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Elsevier, 2012. [eBook available [here \(https://book.systemsapproach.org/\)](https://book.systemsapproach.org/) under Creative Commons (CC BY 4.0)]
- Stallings, William; Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud, 1st edition, ISBN-13: 9780134175393, 2015. [eBook available [here \(https://www.oreilly.com/library/view/foundations-of-modern/9780134175478/\)](https://www.oreilly.com/library/view/foundations-of-modern/9780134175478/) with your SJSU account]

Programming Languages

Java and **Python** will be used to develop network simulators and emulators. Basic (undergraduate-level) knowledge and experience of software development in these languages are assumed. Students are recommended to review the basic syntax before any major assignments. Supplemental materials will be provided in class. If you have any concerns, please talk to the instructor.

Course Requirements and Assignments

The total grade will be calculated based on FIVE mini quizzes (Wednesday quizzes), FOUR assignments, a mid-term presentation, and the final paper.

- Students must complete the assignments as individual work. It is allowed to discuss general ideas to clarify the assignment questions, but any part of answers or codes should NOT be shared among students in any form.

- For both the mid-term presentation and final paper, it is expected to form a group of TWO students.
- Peer code/presentation/paper reviews will be considered in the grading process. More details will be explained in class.

✓ Grading Information

Item	Grade Weight
Wednesday Quiz 1 - 5	15% (3% Each)
Assignment 1 - 4	60% (15% Each)
Presentation	10%
Final Paper	15%

Extra-credits and Reworks

No extra-credit assignments or rework opportunities will be given.

Late Submission

No late submission will be accepted.

Missed Assignments or Exams

When students need to miss an assignment deadline or exam due to health conditions or any other emergency, it should be reported within ONE week after the due date.

Final Grade Table

Total Grade	Letter Grade
97% and above	A plus
92% to 96%	A
90% to 91%	A minus
87% to 89%	B plus
82% to 86%	B
80% to 81%	B minus
77% to 79%	C plus
72% to 76%	C
70% to 71%	C minus

67% to 69%	D plus
62% to 66%	D
60% to 61%	D minus
59% and below	F

University Policies

Per [University Policy S16-9 \(PDF\)](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the [Syllabus Information](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Date	Topic	Reference	Note
1/24	Course Intro		
1/29	Course Intro		
1/31	Network Overview	Peterson & Davie, Chap 1.3 (https://book.systemsapproach.org/foundation/architecture.html).	
2/5	Intro to TCP/IP Model	Wikipedia, Internet protocol suite (https://en.wikipedia.org/wiki/Internet_protocol_suite).	a1 due
2/7	Hands-on: Socket Programming		wq1
2/12	Hands-on: The Leader Election Problem		
2/14	IP	Peterson & Davie, Chap 3.3	
2/19	TCP and UDP	Peterson & Davie, Chap 5.1, Chap 5.2	
2/21	TCP and UDP	Peterson & Davie, Chap 5.1, Chap 5.2	wq2

2/26	Hands-on: Code Review		a2 due
2/28	Hands-on: GNS3 and Packet Capture		
3/4	Intra-Domain Routing	Peterson & Davie, Chap 3.4	
3/6	Inter-Domain Routing	Peterson & Davie, Chap 4.1	wq3
3/11	TCP Congestion Control and Queueing	Peterson & Davie, Chap 6.3	
3/13	Intro to Wireless Communication	Peterson & Davie, Chap 2.7	a3 due
3/18	Optical Networking	WDM Networks (https://ieeexplore.ieee.org/abstract/document/6083231).	
3/20	Advanced Optical Networking		wq4
3/25	Software Defined Networking (SDN)	Stallings, Part II	
3/27	Hands-on: Modeling and NetworkX		
4/1	Spring recess; No class		
4/3	Spring recess; No class		
4/8	Presentation 1		presentation file due
4/10	Presentation 2		

4/15	Presentation 3		
4/17	Project Topic Discussion		wq5
4/22	Intro to ML for Networking		
4/24	ML for Networking: RL	Intro to RL (https://spinningup.openai.com/en/latest/spinningup/rl_intro.html)	
4/29	ML for Networking: GNN	Intro to GNN (https://distill.pub/2021/gnn-intro/)	
5/1	Hands-on: ML for Networking		
5/6	Hands-on: Code Review		a4 due
5/8	Information Centric Networking	NDN Paper (https://conferences.sigcomm.org/conext/2009/papers/Jacobson.pdf)	
5/13	Paper Review		