College of Science · Computer Science

# Computer Communication Systems Section 02

## CS 258

Spring 2023 3 Unit(s) 01/25/2023 to 05/15/2023 Modified 01/22/2023

## Contact Information


### Dr. Genya Ishigaki

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### Office Hours

Monday, Wednesday, 3:00 PM to 4:00 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

No fixed textbooks. The course schedule below indicates reference materials for each topic.

Suggested Reading:

- 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/) with your SJSU account]
- Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Elsevier, 2012. [eBook available here (https://book.systemsapproach.org/) under Creative Commons (CC BY 4.0)]

# Course Requirements and Assignments

The total grade will be calculated based on three exams, two assignments, and the final presentation grades.

- Exams will be conducted during regular class hours.
- 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 the final presentation, it is expected to form a group of TWO students. The final presentation grade will be determined based on (1) presentation and (2) participation in discussions with other groups.

# Grading Information

| Assignment | Grade Weight |
|---|---|
| Exam 1 | 15 % |
| Exam 2 | 20 % |
| Exam 3 | 20 % |
| Assignment 1 | 15 % |
| Assignment 2 | 15 % |
| Final Presentation | 15 % |

**Extra-credits and Reworks**
No extra-credit assignments or rework opportunities will be given.

**Late Submission**
Late submissions within 24 hours will be deducted 10% of its final grade. Submissions over 24 hours late will have 20% grade deducted. Late submissions over 2 days will not 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 (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 Syllabus Information web page (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

# Course Schedule

| Date | Topic | Reference | Note |
|---|---|---|---|
| 1/25 | Course Intro | | |
| 1/30 | Network Overview | Peterson & Davie, Chap 1.3 | |
| 2/1 | IP | Peterson & Davie, Chap 3.3 | |
| 2/6 | Intra-Domain Routing | Peterson & Davie, Chap 3.4 | |
| 2/8 | Inter-Domain Routing | Peterson & Davie, Chap 4.1 | |
| 2/13 | Transport Layer Fundamentals | Peterson & Davie, Chap 5.2 | |
| 2/15 | Advanced Topics in Transport Layer | Peterson & Davie, Chap 6.3 | |
| 2/20 | Review | | |
| 2/22 | Exam 1 | | |

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|---|---|---|---|
| 2/27 | Optical Networking | WDM Networks (https://ieeexplore.ieee.org/abstract/document/6083231) | |
| 3/1 | Optical Networking | | Assignment 1 Posted |
| 3/6 | Software Defined Networking (SDN) | Stallings, Part II | |
| 3/8 | Software Defined Networking (SDN) | Stallings, Part II | |
| 3/13 | Practical Aspects of SDN | Stallings, Part II | |
| 3/15 | Practical Aspects of SDN | Stallings, Part II | |
| 3/20 | Network Function Virtualization (NFV) | Stallings, Part III | Assignment 2 Posted |
| 3/22 | Review | | |
| 3/27 | Spring recess; No class | | |
| 3/29 | Spring recess; No class | | |
| 4/3 | Exam 2 | | |
| 4/5 | Network Slicing | Network Slicing Overview (https://ieeexplore.ieee.org/document/8685766) | Final Presentation Guideline Posted |
| 4/10 | Resource Optimization | Network Optimization (https://ocw.mit.edu/courses/15-082j-network-optimization-fall-2010/pages/lecture-notes/) | |
| 4/12 | Resource Optimization | 5G PPP AI and ML(https://5g-ppp.eu/wp-content/uploads/2021/05/AI-MLforNetworks-v1-0.pdf) | |
| 4/17 | Resource Optimization | | |
| 4/19 | Edge and Fog Computing | Stallings, Part V | |
| 4/24 | Alternative Internet Architecture Proposals | Content Centric Networking (https://conferences.sigcomm.org/co-next/2009/papers/Jacobson.pdf) | |
| 4/26 | Review | | |
| 5/1 | Exam 3 | | |
| 5/3 | Advanced Topics in Communication Systems | Reference will be provided in class | |
| 5/8 | Final Presentation | | |
| 5/10 | Final Presentation | | |
| 5/15 | Final Presentation | | |