Course Instructor: Hongwei Zhang (hongwei@wayne.edu)

Course Description

Data communication fundamentals and principles governing computer communication networks. Components of networks, how they are connected; basics of design and implementation of network protocols

Prerequisites

Undergraduate courses in algorithms, operating systems, and computer networks (e.g., CSC 3110, CSC 4420, CSC 4290, or equivalent)

Credits: 3

Contact Hours: 45

Textbook

Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan Kaufmann.

Additional references

- Contiki: http://www.contiki-os.org/
Course learning outcomes

- Through this course, students will be able to master the underlying principles of computer networks. In particular, students will master the following fundamentals of computer networking:
  - Network architecture
  - Medium access control
  - Packet switching and routing
  - Flow control, congestion control, and quality-of-service
  - Internet protocols (e.g., IP, TCP, and BGP)
  - Network security
  - Network management
  - Elements of distributed computing (e.g., naming, caching, and replication)

- Students will be able to master the aforementioned networking fundamentals for both the Internet and emerging networking technologies such as wireless control networks, wireless sensor networks, mobile ad hoc networks, and disruption tolerant networks.
- Students will be able to implement distributed networking protocols.
- Students will also be able to cultivate their capability of exploring new networking research areas through a course project focusing on surveying cutting-edge research findings.

Student outcomes

Through the course, students will achieve the following:

- An understanding of the fundamental principles of computer networking.
- An ability to understand advanced topics in networked systems.
- A skill set necessary for making innovative contributions to both networking technologies and applications.
- An ability to analyze a networking problem, and identify and define the networking requirements appropriate to its solution.
- An ability to design, implement, and evaluate a networking system, process, component, or program to meet desired needs.
- An ability to function effectively on teams to accomplish a common goal.
- An ability to use current techniques, skills, and tools necessary for networking practice.
- An ability to apply design and development principles in the construction of networking systems of varying complexity.

Topics

This course is designed for graduate students who are interested in the design, analysis, and implementation of computer network protocols. Our objective is to prepare students for designing network protocols with provable correctness and performance and for implementing network protocols in efficient manners. We focus on the basic principles and techniques for provable, efficient protocol design and implementation, and we will address the design and implementation of both the Internet and emerging networking technologies such as wireless sensor and vehicular networks.
Topics include: 1) how to design and analyze basic network protocols such as those for link reliability control, medium access control, switching, routing, and quality-of-service guarantee; 2) how to address implementation challenges such as high-speed, low-overhead packet processing, timing management, and network traffic measurement; 3) how to design and implement reliable, real-time protocols for wireless networks such as wireless sensor networks.

Grading

The tentative grade weighting for the semester will be:

Class participation: 10%
TinyExams: 40%
TinyLabs: 25%
Project: 25%

Letter grades will be assigned based on performance relative to other students. A tentative grading scale is as follows:

A: 93-100
A-: 90-92
B+: 85-89
B: 80-84
B-: 75-79
C+: 70-74
C: 65-69
C-: 60-64
F: 0-60

Religious Holidays

Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.
Student Disabilities Services

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located in the Adamany Undergraduate Library. The SDS telephone number is 313-577-1851 or 313-202-4216 (Videophone use only). Once your accommodation is in place, someone can meet with you privately to discuss your special needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

Students who are registered with Student Disability Services and who are eligible for alternate testing accommodations such as extended test time and/or a distraction-reduced environment should present the required test permit to the professor at least one week in advance of the exam. Federal law requires that a student registered with SDS is entitled to the reasonable accommodations specified in the student’s accommodation letter, which might include allowing the student to take the final exam on a day different than the rest of the class.

Academic Dishonesty - Plagiarism and Cheating

Academic misbehavior means any activity that tends to compromise the academic integrity of the institution or subvert the education process. All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct (http://www.doso.wayne.edu/student-conduct-services.html). Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.

- **Cheating:** Intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information or assistance in any academic exercise. Examples include: (a) copying from another student’s test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.

- **Fabrication:** Intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the source indicated; (b) listing sources in a bibliography not used in a research paper.
• **Plagiarism:** To take and use another’s words or ideas as one’s own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.

• **Other** forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student’s access to educational resources, or any attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student; (d) selling, buying or stealing all or part of an un-administered test or answers to the test; (e) changing or altering a grade on a test or other academic grade records.

**Course Drops and Withdrawals**

In the first two weeks of the (full) term, students can drop this class and receive 100% tuition and course fee cancellation. After the end of the second week there is no tuition or fee cancellation. Students who wish to withdraw from the class can initiate a withdrawal request on Pipeline. You will receive a transcript notation of WP (passing), WF (failing), or WN (no graded work) at the time of withdrawal. No withdrawals can be initiated after the end of the tenth week. Students enrolled in the 10th week and beyond will receive a grade. Because withdrawing from courses may have negative academic and financial consequences, students considering course withdrawal should make sure they fully understand all the consequences before taking this step. More information on this can be found at: [http://reg.wayne.edu/pdf-policies/students.pdf](http://reg.wayne.edu/pdf-policies/students.pdf)

**Student services**

The Academic Success Center (1600 Undergraduate Library) assists students with content in select courses and in strengthening study skills. Visit [www.success.wayne.edu](http://www.success.wayne.edu) for schedules and information on study skills workshops, tutoring and supplemental instruction (primarily in 1000 and 2000 level courses).

The Writing Center is located on the 2nd floor of the Undergraduate Library and provides individual tutoring consultations free of charge. Visit [http://clasweb.clas.wayne.edu/](http://clasweb.clas.wayne.edu/) writing to obtain information on tutors, appointments, and the type of help they can provide.
Class recordings

Students need prior written permission from the instructor before recording any portion of this class. If permission is granted, the audio and/or video recording is to be used only for the student’s personal instructional use. Such recordings are not intended for a wider public audience, such as postings to the internet or sharing with others. Students registered with Student Disabilities Services (SDS) who wish to record class materials must present their specific accommodation to the instructor, who will subsequently comply with the request unless there is some specific reason why s/he cannot, such as discussion of confidential or protected information.