Networks and Data Communications  
CS 447-004 (CRN: 38136) - Fall 2023

Welcome to CS 447!

Instructor: Dr. Hiroshi Fujinoki
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Email: hfujino@siue.edu
URL: www.siue.edu/~hfujino
Office Phone: 650-3727

Office Hours: (1) Mondays: 10:00 a.m. - 12:00 p.m.
              (2) Tuesdays: 11:30 a.m. - 12:00 p.m.
              (3) Wednesdays: by appointment (should be made 24 hours in advance
                             or the office hour will be made available based on the
                             best-effort basis)
              (4) Thursdays: 11:30 a.m. - 12:00 p.m.
              (5) Fridays: no office hour

Note 1: The above office hours will not be available during the final exam week and Thanksgiving week.
Note 2: The above office hours can be offered as zoom meetings.

Class Meeting Room: SE-2232
Class Meeting Days: T and R
Class Meeting Time: 9:30-10:45 a.m. (for both T and R lectures)

Note: item with "★" symbol means an important item.

★ Course Prerequisites:

CS340 (Data Structure and Algorithms), CS286 (Computer Organization), and
CS314 (Operating Systems), or the instructor's permission. If you have not taken
these courses, please talk to the instructor.

★ Course Objectives:

This course is an introduction to computer networks. There are three objectives in
this course. The first objective is to acquire fundamental knowledge about underlying
mechanisms in computer networks. The second objective is to become proficient in
essential network programming techniques such as sockets using TCP/IP and HTML
protocols through programming projects. The third objective is to be familiar with
theoretical methods to analyze system performance of various aspects of computer networks. Since this course is an introductory course, much emphasis will be put in the first two objectives. By the end of the semester, students are expected to be proficient in networking programming with an insight to the underlying network mechanism.

Grading Policy for Undergraduate Students:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Weight:</th>
<th>Final Letter Grade:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>16%</td>
<td>100-92: A</td>
</tr>
<tr>
<td>Project(s)*³</td>
<td>15%</td>
<td>91-82: B</td>
</tr>
<tr>
<td>Midterm Exam:</td>
<td>29%</td>
<td>81-72: C</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>40%</td>
<td>71-62: D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Below 62: F</td>
</tr>
</tbody>
</table>

Grading Policy for Graduate Students:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Weight:</th>
<th>Final Letter Grade:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>15%</td>
<td>100-92: A</td>
</tr>
<tr>
<td>Project(s)*³</td>
<td>10%</td>
<td>91-82: B</td>
</tr>
<tr>
<td>Paper Review:</td>
<td>10%</td>
<td>81-75: C</td>
</tr>
<tr>
<td>Midterm Exam:</td>
<td>30%</td>
<td>74-70: D</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>35%</td>
<td>Below 70: F</td>
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</tbody>
</table>

Note 3: A total of two projects are planned (subject to change) in this course. The grading weight for the two projects are 70% (the first project) and 30% (the second project) of the project grade (this weight scheme is subject to change).

Exams:

- Exams will be closed textbook and closed notes.
- Exams will cover reading assignments, the course projects, and the exercise questions posted to the course home (the course website).
- The final exam will be a cumulative exam.
- Absence from an exam or failing to submit your work by the end of an exam will result in zero point for the exam (except for medical emergencies).
- No electronic devices ((smart) phones, PCs, and etc.) can be used during the exams. Use (including manipulating or watching one) of such electronic devices during an exam will be considered academic dishonesty.
• Makeup exam will be offered only for medical emergency (with a signed doctor's letter).

Any error regarding your graded exams should be reported to Dr. Fujinoki within two weeks (14 calendar days) after your attendance status is posted to the course website.

◆ Programming Projects (tentative plans – subject to change):
  • There will be two programming projects.
    Project 1: Develop a multi-threaded application-level firewall using C/C++ socket.
      We are going to use Winsock for Win32 environment.
    Project 2: TBA

◆ Quizzes:
  • There will be 12 quizzes during this course. The quizzes are closed textbook, notebooks and neighbors (you are allowed to use your pens, pencils, blank papers, eraser(s) and a calculator during a quiz). A list of possible questions for each quiz will be posted in the course home page at the end of the week before each quiz. The questions will appear as posted in the list in the actual quizzes (parameters may be modified for some questions).

Paper Review (only for graduate students): TBA (using another handout)

Attendance Policy:
• Attendance will be taken without prior notice at the beginning of lectures (being late more than 5 minutes will be considered absence).

• For each absence after the second absence, -2 point penalty will be applied to your exam grade (each such absence before the midterm, the penalty will be applied to your midterm exam and for those after the midterm, the penalty will be applied to the final exam).

• The above penalty will not apply to medical emergency (however, you need to provide written proof of medical service to waive the penalty).

• An attendance card will be provided to each person who attends a lecture. At the end of a lecture, each of you should return your attendance card with your SIUE ID written on the card. The attendance card should be the one provided by the course instructor or the teaching assistant for this course. Returning an attendance card that is NOT provided by either the course instructor or the teaching assistant will be considered as an act of cheating.
For the first time a person violates this rule, that person will receive a
warning (and it will be considered as an absence). The second time the same
person violates this rule, the person will receive a failing grade for this
course.

- Any error regarding your class attendance status should be reported to Dr.
  Fujinoki within two weeks (14 calendar days) after your attendance status is
  posted to the course web site.

⚡ Academic Dishonesty:

Following activities (but not limited to them) will be considered academic
dishonesty:

I. Exams:
   - Communicating (e-mails, phone calls, and texting, but not limited to
     them) with anyone (except the course instructor)) during exams.
   - Using materials not allowed during exams.
   - Anyone committing academic misconduct above (I-(a) or (b)) will receive
     a failing grade for this course and reported to the department chair as
     well as to the dean of the school of engineering.

II. Programming Projects:
   (a) Submitting work totally or partially done by somebody else (this
       includes any human/electronic sources (such as web sites and even
       another course at SIUE) unless explicitly allowed by the course
       instructor).
   (b) Submitting program source code files (for the programming projects)
       that are developed by collaborations with other people. This includes
       both program designs and implementations.
   (c) Anyone committing academic misconduct above (II-(a) or (b)) can
       receive a failing grade for this course and reported to the department
       chair as well as to the dean of the school of engineering

III. Academic Dishonesty Penalties to graduate students

   Academic dishonesties by graduate students will be more seriously
   penalized (than undergraduate students).
_required Textbook:


Other Required Skills/Knowledge:
- Experience with C/C++ (MS .NET or MS VC++)
- Knowledge of modern operating systems

Other Notices:
- Every student is expected to check "Course Notices" in CS447 home (follow the link from within "http://www.siue.edu/~hfujino") at least twice in a week.
- The instructor is NOT responsible for losing course credit by failing to use the information posted to the course home (including those when you do not check the CS447 home). Information regarding important activities, such as exams and projects, will be posted at least 24 hours prior to the deadline unless otherwise announced (this means if posting any important information is announced in the classroom, it can appear in the CS447 home even within 24 hours from the deadlines).
- Each of you is expected to regularly check your SIUE emails. Some important messages may be sent to your SIUE e-mail address.
- For any grading problem, each student is expected to contact the course instructor within 14 days after the grade is posted or returned (failing to contact within 14 days may result in being unable to fix the problem).
- E-mails sent to the course instructor during weekends, holidays, and the Thanksgiving break week may not be responded.
- Any special arrangement agreed between you and the course instructor (Dr. Fujinoki) should be documented. Any promises or agreements orally made between you and the course instructor may not take effect without a documentation (it is your responsibility to document any such promises and agreements).
- Ask your questions to the course instructor whenever you have anything you do not have a clear answer for. Please do not make your own assumptions (if you do, you are responsible for any assumptions you make when they are not correct).
• **Disability Support:**
  - Students who believe they may need accommodations in this class are encouraged to contact the office of Disability Support Services as soon as possible. It is the students' responsibility to alert the instructor to SIUE sanctioned accommodations. If anyone needs assistance from SIUE Disability Support Services, please contact them.

• **Tentative Class Schedule (subject to change):**

This schedule is tentative and subject to change.

<table>
<thead>
<tr>
<th>Week #</th>
<th>Day</th>
<th>Topics</th>
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<tbody>
<tr>
<td><strong>Week 1:</strong></td>
<td>August 22 (T):</td>
<td>Course Introduction, circuit-switching and packet-switching networks</td>
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<tr>
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<td>August 24 (R):</td>
<td>Local-area-network (LAN), Wide-Area-Network (WAN), the Internet and intra-net Network Protocols and OSI 7-layer model</td>
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<tr>
<td><strong>Week 2:</strong></td>
<td>August 29 (T):</td>
<td>Quiz #1, Project #1 description (1), socket programming tutorial</td>
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<td>Client-server architecture</td>
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<td></td>
<td>IP address and TCP port number</td>
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<td></td>
<td>August 31 (R):</td>
<td>Project Phase 1 description (2)</td>
</tr>
<tr>
<td><strong>Week 3:</strong></td>
<td>September 5 (T):</td>
<td>Quiz #2, Circuit-switching and packet switching networks</td>
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<td></td>
<td>September 7 (R):</td>
<td>TCP error and flow control (Stop-and-Wait ARQ)</td>
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<td><strong>Week 4:</strong></td>
<td>September 12 (T):</td>
<td>Quiz #3, TCP error and flow control (Selective-Reject &amp; GBN ARQs)</td>
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<td></td>
<td>September 14 (R):</td>
<td>Internet architecture (IP address structure)</td>
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<td>Domain address, host address, CIDR-IP address</td>
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<td><strong>Week 5:</strong></td>
<td>September 19 (T):</td>
<td>Quiz #4, Layer-2 and 3 switches</td>
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<td>September 21 (R):</td>
<td>Local Area Networks</td>
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<td></td>
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<td>Bus, ring and star LAN, Repeaters, bridges and routers</td>
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<td></td>
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<td>MAC address, IP address, and host name translation (DNS and ARP)</td>
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<td><strong>Week 6:</strong></td>
<td>September 26 (T):</td>
<td>Quiz #5, Dijkstra and Bellman-ford algorithms, distance-vector routing protocol</td>
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<td></td>
<td>September 28 (R):</td>
<td>Transmission Control Protocol (TCP) and TCP-slow start linear-growth flow-control</td>
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<tr>
<td><strong>Week 7:</strong></td>
<td>October 3 (T):</td>
<td>Quiz #6, Ethernet Essential: CSMA/CD and binary back-off, one-persistent, and p-persistent</td>
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</tbody>
</table>
October 5 (R): Switch architecture (TDM switch, cross-bar switch and knockout switches), concept of blocking and non-blocking switches

Week 8: October 10 (T): Quiz #7, Internet routing (1)
October 12 (R): Internet routing (2)

Week 9: October 17 (T): Midterm Exam
October 19 (R): Project #2 description

Week 10: October 24 (T): Multimedia Support: QoS Control and DiffServ (1)
October 26 (R): Multimedia Support: QoS Control and DiffServ (2)

Week 11: October 31 (T): Quiz #8, Wireless and cellular networks (1)
November 2 (R): Wireless and cellular networks (2)

Week 12: November 7 (T): Quiz #9, Cloud computing: concept, implementation, and concerns
November 9 (R): Network Security (1)

Week 13: November 14 (T): Quiz #10, Network Security (2)
November 16 (R): Hardware-based error controls: bit-errors, parity and CRC error detection

TG Holiday Week: November 21 and 23 (T and R): Thanksgiving Week

Week 14: November 28 (T): Quiz #11, synchronous and asynchronous signal transmissions
November 30 (R): time-division and frequency-division multiplexing

Week 16: December 5 (T): Quiz #12, Topics TBA
December 7 (R): Topics TBA

Final Exam Week
December 11 (Monday) at 8:00-10:30 a.m.: Final Exam (comprehensive)

- The list of the reading assignment is the minimum requirement. It is expected that each student voluntarily studies not only the required sections but other related sections or materials.
- Required reading should be done before the lecture.
- If you have any problem for the above schedule, please contact to Dr. Fujinoki as soon as possible.
- Any question regarding this syllabus should be addressed to: hfujino@siue.edu

CS447-004: Course syllabus last modified on 9:30 a.m., August 21, 2023