Instructor: Dr. Hiroshi Fujinoki  
Office: EB 2034  
Office Phone: (618) 650-3727  
Email: hfujino@siue.edu  
URL: www.cs.siue.edu/~hfujino/CS547/CS547.html  
Office Hours: Monday: 10:00 a.m.-12:00 p.m. and 2:00-3:00 p.m.  
Tuesday: 3:00-4:00 p.m.  
Wednesday: 10:00 a.m.-12:00 p.m. and 2:00-3:00 p.m.  
Thursday: by appointment (please make an appointment 24 hours prior to the time you want to meet the instructor).  
Friday: no office hour  

Note: The above office hour schedules do not apply to (1) the spring break, (2) the final exam week and (3) the week before the final exam week.  

Class Meeting Room: EB-1170  
Class Meeting Days: Tuesday and Thursday  
Class Meeting Time: 12:30 - 1:45 p.m. (same time for T and R)  

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

★ Course Prerequisites:  
CS447 (Networks & Data Communications) and an undergraduate-level OS course, or a consent by the course instructor (i.e., Dr. Fujinoki).  

★ Grading:  
Weekly Quizzes: 15%  
Projects: 25%  
Midterm Exam: 30%  
Final Exam: 30%  
Weight:  

Final Letter Grade:  
100-92: A  
91-82: B  
81-72: C  
71-62: D  
Below 62: F
Exams:
- Exams will be closed textbook and closed notes.
- Absence without a prior consent from Dr. Fujinoki will result in zero point except for medical emergency (a letter from your doctor is required).
- If you need any special assistance, you must contact Dr. Fujinoki at least one week before.
- One letter-size cheat sheet and a calculator are allowed in the exams.

Projects (tentative plan): there will be two projects in CS547 in Spring 2023. The first project is a project for which each student analyzes an actual ransomware using a malware analysis tool. In the project, students will learn the network programming techniques typical ransomwares utilize (APIs, network protocols, and remote proxies). The second project is a research project for which each student studies a selected topic on recent network programming. The result of the research should be presented at the end of Spring 2023 semester.

Quizzes:
- Quizzes will be closed textbook and closed notes.
- Absence without a prior consent from Dr. Fujinoki will result in zero point except for medical emergency (a letter from your doctor is required).
- There will be 12 quizzes during this course.
- Your lowest quiz will be dropped from grading.
- If we cancel some lectures, some quizzes may be dropped (the weight of the quizzes to the course grade is still 15%).

Attendance Policy:
- Attendance will be taken at the beginning of lectures (being late more than 5 minutes will be considered absence).
- No penalty will be given up to three absences in a semester. For each absence beyond the third absence, -2 point penalty (in 100 scale) will be given to your next exam.
- The above penalty will not apply to your medical emergency (however, you need to provide a written proof of medical service to waive the penalty).
- 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.
学术不端行为：

以下行为将被视为学术不端行为，并最终被给予F的等级。

- 提交由他人完成的工作（包括家庭作业和项目）。
- 通过任何来源（包括网络）观看和复制你的邻居的解决方案。
- 在考试中修改你的解决方案。
- 在考试中使用未被允许的材料。
- 根据工程学院的政策，任何学术不端行为将被报告给系主任和工程学院的院长。

必修教材：没有教材。所有的课程主题将由由Fujinoki博士准备的材料来呈现。

其他必要的技能/知识：

熟练掌握主要的编程语言，如C/C++, Java，至少掌握一种主要的脚本编程语言（例如Java-script, Python）。

残疾支持：

- 学生们被鼓励尽快联系残疾支持服务办公室。学生们有责任通知教授SIUE授权的任何修改。

其他通知：

1. 本课程要求你们除了上课外，还要工作九（9）个小时。
2. 重要通知将在讲座开始时宣布。
3. 如果你错过了一次讲座，你的责任是找到讲座内容。（建议你找你的同学来了解错过的内容）。
(4) Each of you is expected to check "Weekly Notices" in the web site of this course (you can reach the course web site at www.cs.siue.edu/~hfujino/CS547/CS547.html) at least twice in a week. The decisions regarding which course materials are posted belong to the course instructor. If any promised course material is missing in the course home, it is your responsibility to request such material to the course instructor (the course instructor will post such materials within at most one week since the request).

(5) Any grading problem should be reported within two weeks (14 days) after your grades are posted to the course home or the graded materials are returned in the classroom.

(6) Any electric device, such as smart phone, laptop PC, and tablet computer (except a calculator), should not be used during lectures and exams.

(7) E-mails sent to the course instructor during weekends and the break (spring break) may not be responded.
Tentative Class Schedule *(subject to change)*:

This schedule is tentative and subject to change.

<table>
<thead>
<tr>
<th>Week #: Day</th>
<th>Topics</th>
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| **Week 1: January 10 (T): Introduction to CS547** | • Course objectives  
• Course policies  
  - Lecture attendance policies  
  - Weekly quizzes  
  - Projects (malware analysis and selected-topic presentation)  
  - Exams (midterm and final exams)  
• The course website ([www.cs.siue.edu/~hfujino/CS547/CS547.html](http://www.cs.siue.edu/~hfujino/CS547/CS547.html))  
• Discussions: Network programming related career opportunity perspectives  
  - Career opportunities and life-long career developments  
  - Job security |
| January 12 (R): Network programming concepts | • OSI seven-layer model  
• Types of network programs covered in this course  
  - Low-level programming (OSI 7-layer model network and transport layer)  
  - OSI 7-layer mode application layer programming  
  - Application programming  
  - Application architectures |
| **Week 2: January 17 (T): Quiz #1, Low-level network programming (1)** | • Connection-oriented (TCP) vs. connection-less communication (UDP) modes  
• Unicast and multi-cast data transmissions  
• Addressing scheme: network address and ports  
• Physical address (MAC address) and logical address (IP address) |
| January 19 (R): Low-level network programming (2) | • Tunneling (e.g., IPv6 tunneling, telnet-tunneling, and PPP-over-IP)  
• NAT (Network Address Translation) and Proxy (C&C servers as "malicious proxies")  
• Promiscuous mode packet capturing and firewalls  
• Concepts of network domains and VPN (virtual private networks)  
• Application-layer (in OSI 7-layer model) protocols: FTP, SNMP, HTTP |
Week 3: January 24 (T): Quiz #2, Network application architectures (1)
- Client-server and peer-to-peer application models
- Thin-client (e.g., CGI and JSP (Java Server Pages)) and rich-client (e.g., Java applets and JavaScript) network application architectures

January 26 (R): Network application architectures (2)
- Edge-computing and fog-computing
- Network-platform integration architectures (ORB: Object Request Broker)
- Web-OS

Week 4: January 31 (T): Quiz #3, Network application architectures (3) - integrations of network programs
- SOA (Service Oriented Architecture)
- ESB (Enterprise Service Bus), ETL (Extract · Transform · Load) and EAI (Enterprise Application Integration)
- ERP (Enterprise Resource Planning)

February 2 (R): Project #1 introduction

Week 5: February 7 (T): Quiz #4, Web applications (1)
- HTTP as a connection-less application level protocol
- Combination of a connection-oriented transport-layer protocol (TCP) and a connection-less application level protocol (HTTP)
- Cookies for interactive web applications
- GET/POST methods
- Combination of a connection-oriented transport-layer protocol (UDP) and a connection-less application level protocol (HTTP)

February 9 (R): Web applications (2)
- Push-mode and pull-mode web applications
- Synchronous and asynchronous client-sever communication
- Major programming languages for web applications:
  - JavaScript and Java Byte-codes
  - Python and Ruby

Week 6: February 14 (T): Quiz #5, Web applications (3)
- Evolution of browsers and browser compatibility issues
- SOAP (Simple Object Access Protocol)
- W3C
- HTML-5
- Dynamic-HTML
- Browser compatibility testing and testing tools (ACID and Selenium)

February 16 (R): Web applications (4)
- Topics: TBA
Week 7: February 21 (T): Quiz #6, Security for network programs (1)
  • Network security fundamentals
    - Active and passive attacks
    - Release of message contents, traffic analysis, masquerading, replays, modification of message contents, and denial of service (DoS) attacks

February 22 (R): Security for network programs (2)
  • Digital signature
  • Digital certificates
  • IPsec and HTTPS/SFTP

Week 8: February 28 (T): Quiz #7, Security for network programs (3)
  • SQL-injections and input sanitization
  • HTTP header injection
  • Cross-site scripting
  • Cross Site Request Forgery (CSRF)

March 2 (R): Midterm Exam

Week 9: March 7 (T): Spring Break
March 9 (R): Spring Break

Week 10: March 14 (T): Quiz #7, Project #2 introduction
March 16 (R): iPaaS (Integration Platform as a Service) and cloud integration
  • Concepts
  • Oracle Integration, IBM Cloud Pak, SAP Cloud Platform, and Dell Boomi

Week 11: March 21 (T): Quiz #8, Network application standards (1)
  • PHP and ActionScript
    - Aptana, Eclipse, Dreamweaver (IDE for PHP)
  • Flash
  • XML, MXML, and Flex (and Flex Builder)

March 23 (R): Network application standards (2)
  • XML, DOM (Document Oriented Model), and Ajax

Week 12: March 28 (T): Quiz #9, Web application performance optimization (1)
  • *.jar file format
  • WebAssembly

March 30 (R): Web application performance optimization (2)
  • CDN (Contents Distribution Networks) and streaming
Week 13: April 4 (T): Quiz #10, Android, C++, and Rust
April 6 (R): Other major rich-client programming tools:
- Biz/Browser
- Curl
- NexaWeb
- OpenLaszlo
- Silverloght
- Comparisons to: Flash/Flex and Ajax

Week 14: April 11 (T): Quiz #11, Network Programming New Trends
- Rich-client's taking over of SOA

April 13 (R): Project Presentation Day #1

Week 15: April 18 (T): Quiz #12, Project Presentation Day #2
April 20 (R): Project Presentation Day #3

Week 16: April 25 (T): Topics To Be Announced
April 27 (R): Topics To Be Announced

Final Exam Week: May 4 (Thursday): comprehensive final exam, 12:00 - 1:40 p.m.

- 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

Course syllabus last modified at 11:38 a.m., January 9, 2023