Carleton University
Department of Systems and Computer Engineering
SYSC 4502 Communications Software Winter 2018
Course Outline

Instructor:
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http://www.sce.carleton.ca/faculty/huang.html

Prerequisites:
SYSC 4602 and (SYSC 2004 or SYSC 2100), and third year status. Students who have not satisfied the prerequisites for this course must either a) withdraw from the course, or b) obtain a prerequisite waiver online at www.sce.carleton.ca/dept/us/academicsupport/forms, or c) will be deregistered from the course after the last day to register for courses.

Course Objectives:
Communications software architectures, protocols and operating systems. Application layer protocols, APIs and socket programming. P2P algorithms, network virtualization, SDN. Reliable data transfer algorithms, FSM, MSC. Network security. Multimedia applications, RTSP, CDN, DASH, RTP, RTCP. Packet scheduling algorithms, DiffServ, IntServ, RSVP. Traffic classification, cross-layer optimization.

Learning Outcomes:

- understand the layered structure of communication software and implementation challenges of each layer
- understand how to minimize the overheads introduced by operating systems for implementing communication protocol stack
- understand how cross-layer optimization may be implemented
- understand the implementation differences between stateful and stateless protocols
- understand how peer-to-peer (P2P) systems work with DHT
- understand the concept and implementation requirements of QoS for multimedia applications
- understand cryptography with public and symmetric keys
- understand packet scheduling algorithms
- understand the concepts and requirements of cloud computing, SDN, and NFV
- understand how these protocols can be implemented: HTTP, DNS, RTSP, DASH, RTP, RTCP, DiffServ, IntServ, SSL, IPsec, WEP
- can implement communication software using socket API
- can design and implement protocols using typical data structures such as hashing tables, Trie and AVL tree
- can design and implement protocols using Finite State Machine (FSM) and Message Sequence Chart (MSC)


References:


Network Algorithmics, G. Varghese, Morgan Kaufmann, 2005

TCP/IP Illustrated, Vol. 1, W. R. Stevens, Addison-Wesley, 1994


Object-Oriented Network Protocols, S. Boecking, Addison Wesley, 2000

http://www.ietf.org

Marking Scheme:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Attendance</td>
<td>10%</td>
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<tr>
<td>Lab.</td>
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<tr>
<td>Midterm 1</td>
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<tr>
<td>Midterm 2</td>
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<tr>
<td>Final Exam</td>
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Deadline Policy:

A minimum of one week, but normally ten days, will be allowed for completion of all assignments. Late assignments will not be accepted.

Class Schedule:

13:05pm-14:25pm, Monday and Wednesday, CB3400.

Checking Marks:

Lists of term marks will be posted on dates to be announced. It is each student’s responsibility to check that marks are correct or report any errors by the specified deadline.

Laboratory and Tutorial:
8:35am-11:25am, Wednesday every odd week at ME4233.

**Final Exam:** *Is for the evaluation purposes only and will not be returned to the student.*

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

**Plagiarism:**
Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated. Please refer to the section on instructional offenses in the Undergraduate Calendar for additional information.

**Review Week:**
Accreditation of our Engineering programs requires that classes and laboratories, tutorials, or problem analysis sessions continue to run through the review period of the winter term. For 2018, the last day of normally scheduled classes falls on Wednesday, April 11.

**Course Schedule:**

1) Course arrangements, scope etc. Communication software architecture and the concept of protocol.

2) Application layer protocols. API and socket programming. Issue AS 1

3) HTTP and DNS protocols. Lab 1.

4) FSM. MSC. Reliable data transfer algorithms and stateful software design. Issue AS 2.

5) Data structures and algorithms. PA Session 1. Midterm 1.

6) P2P protocols and search engine.


8) Multimedia applications. SIP Protocol.

10) Cryptography.


12) Traffic classification and SDN. PA Session 2.

13) OpenFlow and NFV. Layer integration.