Resilient Networks
Missouri S&T University CPE 6510
Introduction and Overview

Egemen K. Çetinkaya
Department of Electrical & Computer Engineering
Missouri University of Science and Technology

cetinkayae@mst.edu

http://web.mst.edu/~cetinkayae/teaching/CPE6510Spring2016
Introduction and Overview

Outline

• Course information
• Course schedule
• Course policies
• Project prospects
Introduction and Overview

Course Information

- Course information
- Course schedule
- Course policies
- Project prospects
Course Information

Description

This course presents reliability and fault tolerance for network-centric systems, including models, metrics, and analysis techniques. This course also concentrates on security, including technical tools and methods for audit and assessment as well as management and policy issues.

• Co-listed with Systems Engineering 6322
• Class number:
  - on campus: CPE: 72517 & SysE: 72519
  - distance education: CPE: 72518 & SysE: 72520
• Credit hours: 3.0
Course Information

Prerequisites

- CPE 6410/SysE 6321: Modeling Complex Systems
  - note: old name - Network Centric Systems
- OR
- CPE 5420: Introduction to Network Security
- You must have networking background
- Good to have:
  - computer programming
  - probability
  - Boolean algebra
  - matrix algebra
Network Centric Systems

Courses

- CPE 5420: Introduction to Network Security
- CPE 5430: Wireless Networks
- CPE 5110: Principles of Computer Architecture
- CPE 6410/SysE 6321: Modeling Complex Systems
  - note: old name - Network Centric Systems
- CPE 6510/SysE 6322: Resilient Networks
- CPE 6430: High Speed Networks

URL: http://dce.mst.edu/credit/certificates/networkcentric
Information Assurance

Courses

- CS 4700: Intellectual Property of Computer Scientists
- CS 5601: Security Ops. & Program Management
- CPE 5420: Introduction to Network Security
- CPE 6510/SysE 6322: Resilient Networks
- CS 6605: Advanced Network Security
- Below are required as part of CNSS certification
- CS 3800: Introduction to Operating Systems
- CS 4600: Computer Communications and Networks
- URL: http://dce.mst.edu/credit/certificates/informationassuranceandsecurityofficer
Computer Networks

Courses

• CPE 5410: Intro to Comp. Comm. Net. or CS 5600
• CPE 5420: Introduction to Network Security
• CPE 5430: Wireless Networks
• CPE 6420: Wireless Ad hoc and Sensor Networks
• CPE 6440: Network Performance Analysis
• CPE 6510: Resilient Networks
• CS 5800: Distributed Operating Systems
• CS 6304: Cloud Computing & Big Data Management
• CS 6001: Applied Graph Theory for Computer Science
• CS 6001: Complex Networked Systems
Course Information

Time and Location

• Time: Th. at 4:00 pm – 6:30 pm

• Location:
  – on MST campus:
    • G14 Library
  – distance:
    • http://dce.mst.edu/Content_Repository/soc/classes/xdis/sp2016/CompEng65101DIS/index.html
    • http://dce.mst.edu/Content_Repository/soc/classes/xdis/sp2016/SysEng63221DIS/index.html
  – url:
    • http://web.mst.edu/~cetinkayae/teaching/CPE6510Spring2016
Instructor Information

Background

- Dr. Egemen K. Çetinkaya
- Assistant Professor of Electrical & Computer Eng.
- Ph.D., The University of Kansas, 2013
- Dissertation title: Modelling and Design of Resilient Networks under Challenges
- Research interests:
  - networks and systems
  - graph algorithms
  - resilience and dependability
Instructor Information
Contact and Office Hours

- Office: 132 EECH
- Email: cetinkayae@mst.edu
- Telephone: +1 573 341 6887
- Skype: starpasha2004
- Administrative assistant: Ms. Carol Lay

- Office hours: TR at 1:30 pm – 2:30 pm or by appointment
Course Information
Distance Education Software Support

• Video Communication Center (VCC):
  – http://vcc.mst.edu
  – contact VCC for WebEx or other remote connection issues
  – Thanh VanVo (Media Production Specialist)
    • controller for the recordings
    • you might hear me saying his name

• Educational Technology (EdTech):
  – http://edtech.mst.edu
  – contact EdTech for Blackboard issues
Students
Introductions

• Your full name and nickname?
• Employer, if not full-time student?
• Degree program, CPE, SysE, EE, CS, other?
• Graduate? MS, PhD? Undergraduate?
• Interests?
• Email me
  - e-mail address(es)
  - phone numbers for urgent matters
Introduction and Overview

Course Schedule

- Course information
- Course schedule
- Course policies
- Project prospects
Course Schedule
Spring 2016 Calendar

• Class begins: 21 January 2016
• Spring recess: 17 March 2016
• Spring break: 31 March 2016
• Last class day: 05 May 2016
• Finals week: 12 May 2016
  – no final exam in this class
• Grades by instructor: 17 May 2016
• Grades available: 24 May 2016
# Course Schedule

## Tentative Class Schedule - First Half

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Project Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 January</td>
<td>Course Overview</td>
<td>Project overview and planning</td>
</tr>
<tr>
<td>28 January</td>
<td>Resilience Overview</td>
<td>N/A</td>
</tr>
<tr>
<td>4 February</td>
<td>Challenges</td>
<td>N/A</td>
</tr>
<tr>
<td>11 February</td>
<td>Resilience Evaluation</td>
<td>N/A</td>
</tr>
<tr>
<td>18 February</td>
<td>Graph Theory Overview</td>
<td>Finalize project topics and groups</td>
</tr>
<tr>
<td>25 February</td>
<td>Graph Robustness</td>
<td>N/A</td>
</tr>
<tr>
<td>3 March</td>
<td>Network Security Overview</td>
<td>N/A</td>
</tr>
<tr>
<td>10 March</td>
<td><em>Midterm Exam</em></td>
<td>N/A</td>
</tr>
<tr>
<td>17 March</td>
<td><em>Spring Recess</em></td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Course Schedule
### Tentative Class Schedule - Second Half

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Project Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 March</td>
<td>Network Security Attacks</td>
<td>Title, abstract, outline</td>
</tr>
<tr>
<td>31 March</td>
<td>Spring Break</td>
<td>N/A</td>
</tr>
<tr>
<td>7 April</td>
<td>Critical Infrastructures</td>
<td>N/A</td>
</tr>
<tr>
<td>14 April</td>
<td>Security of Control Systems</td>
<td>N/A</td>
</tr>
<tr>
<td>21 April</td>
<td>Wireless Network Security</td>
<td>Solid draft with references</td>
</tr>
<tr>
<td>28 April</td>
<td>Game Theory &amp; Net. Security</td>
<td>N/A</td>
</tr>
<tr>
<td>5 May</td>
<td>N/A</td>
<td>Project presentations</td>
</tr>
<tr>
<td>12 May</td>
<td>No Final Exam</td>
<td>Project reports due</td>
</tr>
</tbody>
</table>
Introduction and Overview

Course Policies

- Course information
- Course schedule
- Course policies
- Project prospects
Course Policies

Correspondence

• E-mail: cetinkayae@mst.edu
  - I generally check e-mail daily
  - do *not* send e-mails to any other address
• Skype: starpasha2004
  - verify availability before calling
• Course website:
  http://web.mst.edu/~cetinkayae/teaching/CPE6510Spring2016
• Course Facebook page: www.facebook.com/groups/MSTCPE6510
• Blackboard: https://blackboard.mst.edu/
• Academic alert system (S&Tconnect)
• Administrative assistant: Ms. Carol Lay
Correspondence

E-mail Subject Line

• E-mail: subject lines *must* start with CPE6510 - followed by meaningful indicator of the content
  
  - bad example:
    - Subject: Hi!
    - Subject: regarding this week
    - Subject:
  
  - good example:
    - Subject: CPE6510 - question regarding homework 1
    - Subject: CPE6510 - project draft report for Joe Miner

• Faculty receives tons of e-mails
  
  - e-mail will be misfiltered and misread
  
  - be courteous and help by following the instructions
Correspondence

E-mail Formatting and Content

• E-mail address:
  - use an academic or corporate e-mail

• E-mail formatting:
  - use plain text (no html)
  - do not embed images or files

• E-mail content:
  - spellcheck
  - do not daisy chain different subjects in a single message
  - proofread and think before you send
  - do not send “Hi! How are you?” in an MS word attachment
  - have a proper signature
Course Policies

Attendance

• On campus students are expected

• Distance education students are encouraged
  – if possible webcam presence is preferred
  – webcam is required for exams

• Everyone has to attend on certain days:
  – midterm exam: 10 March 2016
  – in-class project presentations: 5 May 2016
  – 2-3 paper presentations: throughout semester

• Participation will impact overall grade

• If you have contagious illness, don’t come to class
  – flu shots are recommended
Course Policies

Classroom Courtesy

• Physical meetings in G14 Library
• Slotted time: 4:00 pm – 6:30 pm
  – *be prompt* due to scheduling of the classroom
• Usually 10 min. break ~ 5:10 pm
• Everyone *must* turnoff their cellular/pagers/beeper
  – interferes with video recording equipment
• Avoid chip bags and typing near the microphones
  – generates annoying sound for others
• Distance students:
  – mute microphone when not talking
Course Policies
Assignments

• Due at **11:59 pm** on the day they are due
• Late assignments are **not** accepted
  – unless prior arrangements are made
• Think green and use electronic document
  – e.g. MS word, LaTeX, text editor
  – send assignments **only** in pdf format or plaintext via e-mail
• Use reasonable font size
  – e.g. Times New Roman font with 12 point size
• Put your name on **each page**
  – do **not** put your student id
• Paginate your pdf documents
Course Policies

Readings

• Due before the corresponding lecture
• No textbook required but heavy on scholarly readings
• Papers are available via course website and library
  – books (call numbers):
    • QA: Computer Science (mostly on second floor)
    • TK: Electrical and Computer Eng. (mostly on third floor)
  – databases:
    • ACM Digital Library
    • IEEE Xplore – IEE/IEEE Electronic Library
    • JSTOR
    • Lecture Notes in Computer Science
  – Electronic journals (some e-journals):
    • Computer Networks via ScienceDirect
    • Telecommunication Systems via SpringerLINK
Course Policies

Presentations

• Every student will present 2-3 papers
• It is up to you to select which paper to present
  – in some cases I will ask a specific paper
• Each presentation is expected to be ~ 25 min.
• Presentations must be sent **at least 48 hours prior**
  – you will receive feedback prior to presentation
  – earlier is better for you
• Presentation template can be downloaded on website
  – students can use their own style
• Presentations will contribute to 20% of your grade
Course Policies

Computer Labs

• Obey MST IT policy

• Linux machines:
  – located in EECH 107 and CS 213
  – list of hostnames:
    • http://itrss.mst.edu/ubuntuclcs

• Windows machines:
  – located in EECH 105 and 106

• Contact me if you need resources for intrusive testing

• Contact IT helpdesk for computer-related issues
Course Policies
Title IX/Sexual Misconduct

• Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises.

• Missouri S&T’s Title IX Coordinator is Vice Chancellor Shenethia Manuel. Contact her directly (manuels@mst.edu; (573) 341-4920; 113 Centennial Hall) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit http://titleix.mst.edu.
Course Policies

Disability Support

• If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with me early in the semester. You will need to request that the Disability Support Services staff send a letter to me verifying your disability and specifying the accommodation you will need before I can arrange your accommodation.
Course Policies

Academic Integrity

• Academic integrity is essential for your success
• Cheating, plagiarism, or sabotage is prohibited
• Applies to:
  – homework and assignment copying
  – cheating on exams
  – plagiarism on project report
• Consequences are severe for all parties
  – copier and student who permits to copy
  – warning to expulsion from the university
• It does not worth it!
Academic Integrity Guidelines

• Homework
  – you can discuss with each other, but write by yourself
  – do not use or search for a solution manual

• Code
  – you can discuss with each other, but write yourself
  – comment libraries that are being used, don’t reinvent

• Exams
  – focus only on your exam questions, nothing else

• Project report
  – properly cite, do not own someone else’s work
  – do not write using two screens
Academic Integrity

Resources

• Writing center
  – http://writingcenter.mst.edu/

• Proper citation
  – http://www.ittc.ku.edu/~jpgs/courses/source-cite.html

• Avoiding plagiarism
  – http://www.ittc.ku.edu/~jpgs/courses/academic-integrity.html

• Writing technical articles

• Ask me if you have any questions anytime
Course Policies

Grading Scale

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Letter</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 – 100</td>
<td>A</td>
<td>Excellent</td>
</tr>
<tr>
<td>80 – 89</td>
<td>B</td>
<td>Superior</td>
</tr>
<tr>
<td>70 – 79</td>
<td>C</td>
<td>Medium</td>
</tr>
<tr>
<td>0 – 59</td>
<td>F</td>
<td>Failure</td>
</tr>
</tbody>
</table>

- Graduate students cannot consider less than C
# Course Policies

## Grading Weights

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm exam</td>
<td>25%</td>
</tr>
<tr>
<td>Presentations</td>
<td>20%</td>
</tr>
<tr>
<td>Homework and quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Project</td>
<td>40%</td>
</tr>
<tr>
<td>Participation</td>
<td>5%</td>
</tr>
</tbody>
</table>
Grading Exams

• One midterm exam
  - will cover topics from the beginning of the class to Exam
  - it will be administered on 10 March 2016

• No final exam

• Exam include every topic we cover in class
  - including student presentations

• Distance students **must have** for proctoring
  - webcam, microphone and headset, scanner, printer
Course Policies

Grading

- Occasional homework and quizzes
- Participation grade will depend on:
  - interactions
  - questions asked
  - finding bugs in lecture notes or course website
  - recommendation for a paper
  - leading discussions
- Cannot consider the following in your final grade:
  - employer reimbursement
  - immigration status
Introduction and Overview

Project Prospects

- Course information
- Course schedule
- Course policies
- Project prospects
Project Prospects
Grading

• Students are expected to cover a topic in detail
• 40% of your grade depends on project
• Project grading will depend on:
  - novelty of ideas and results: 40%
  - project report: 40%
  - project presentation: 20%
  • this is not same as in class presentations
# Project Prospects

## Deliverables and Due Dates

<table>
<thead>
<tr>
<th>Due date</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 February 2016</td>
<td>Project title and group members</td>
</tr>
<tr>
<td>24 March 2016</td>
<td>Project report draft - title, abstract, outline</td>
</tr>
<tr>
<td>21 April 2016</td>
<td>Project report draft - solid draft with references</td>
</tr>
<tr>
<td>5 May 2016</td>
<td>Project presentations during class</td>
</tr>
<tr>
<td>12 May 2016</td>
<td>Project reports due</td>
</tr>
</tbody>
</table>
Project Prospects

Ideas

• Relevant to course

• You are free to choose the topic
  - something you are working at your job?
  - some piece of your thesis/dissertation?
  - something you have been wondering?

• Some programming aspect
  - e.g.: ns-3 network simulator
  - e.g.: attack modelling using NetworkX

• Hot research topics:
  - smart X, big data, security & privacy, cloud, Future Internet
End of Foils