

C.Sc. 6600 – Computer Security

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Tuesday/Thursday 8:00 AM, Rm 209 Computer Science

Office Hours: 12:00-1:30, Tuesday and Thursday or drop in or by appointment

Prerequisites: CS 4600/5600 (365) (Networks) and CPE 5420 (349) (Trustworthy Computing) or permission of instructor. The course is largely self-contained so if you're interested, please come and talk with me regarding the pre-requisites – you can probably take the class.

Textbook: *Computer Security 2nd Ed, Art and Science*, Matt Bishop, Addison-Wesley 2018.

INTRODUCTION

The course presents various vulnerabilities and threats to information in cyberspace and the principles and techniques for preventing and detecting threats, and recovering from attacks. The course deals with various aspects and layers of security with concentration in formal models of application-level security. A course project using model checking will be used to illustrate theoretical concepts on model problems. In particular, we will create a set of “challenge applications” that involve both Cyber and Physical components (A Cyber Physical System) and model the information flow in these systems using formal models.

Ch1: Introduction to Security

Confidentiality, Availability, and Integrity Trust and Assurance
Security Policies - Homework 1: 1.12: 1, 3,4,6,11,18

Ch2- Ch5: Privacy & Access Control

Access Control and the HRU Model [Reference Papers/P461-harrison.pdf](#)
Homework 2: 2.9, 1,4,5,6, 3.9: 1, 2

Homework 3 – Problem 4, 5 Take-Grant Model

Homework 5 – Problem 5, Chapter 3 and Prove Corollary 3-1

Bell Lapadula [Reference Papers/bell-lapadula73](#)

Biba

Clark-Wilson

Ch 7-Ch8: Confidentiality and Information Flow

Chinese Wall Model Lattice Model

Goguen and Meseguer's Noninterference Nondeducibility

Noninference

[Reference Papers/mccullough](#)

BNDC/SBNDC, Focardi's work

[Reference Papers/MSDND Article](#)

Thanksgiving Break

Ch 16: Run-Time Security

Alpern-Schneider framework

[Reference Papers/AlpernSchneiderdefining liveness.pdf](#)

Enforceable Security Policies [Reference Papers/p30-schneider.pdf](#)

Chapter 17, Confinement Problem and Covert Channels Tools:

PROVERIF, SPIN, PROMELA, and CoPS,

Model Checking Security Properties (Project)

Project Presentations – Last two weeks of class (including finals time)

COURSE DETAILS

Format

Each week during class will be a combination of lecture and problem solving sessions in which class participation is required. Problems will be from the text and papers we read. Each student will be required to present several problems/paper examples during the semester. All students are responsible for all the material presented during the semester.

There will be a Project and a required Conference-Style paper in LaTeX. I will help you submit this paper to a conference if you are interested. A LaTeX template for this exists at [Template](#). Dr. Tauritz has excellent resources for using LaTeX on his web site. The grading rubric for the project can be found at: [Grading Template](#)

Grading Policy

Grades will be assigned as follows:

20% Midterm Exam
20% Final Exam – during final exam time
20% Problem sets and class participation.
40% Project/Paper
100%

You are encouraged to collaborate on the Problems and in the Problem Solving Session. The Exams, however, **MUST BE YOUR OWN WORK**. Any cheating will result in procedures under Academic Dishonesty (below) being invoked.

Personal Electronics

Personal electronic devices such as cell phones, etc, are not to be used during class. This includes voice calls, texting, etc. The one exception is emergency calls. If you receive an emergency call, please exit the room quickly.

Attendance

Since the class is a lecture/seminar type class, attendance is mandatory. If you miss more than six classes during the semester, you will be dropped from the course after being notified through academic alert (see below). Class participation is based on your interaction during the lecture and

during the problem solving sessions. Class begins at 08:00 AM sharp, so be on time.

Challenge Applications

The following are samples the applications you can pick from for your project, but ideally you will find your own. We will flesh these out in class as a group.

- Automated Air Traffic Control System
- UAV management
- Automated Shop Floor Process
- Oil Drilling Rig
- Gas Pipeline Management
- Smart Transportation Systems (Air, Land, and Sea)
- Smart Agriculture
- Disaster Responders
- Smart House - Eldercare
- Natural Resource Management
- HIPAA
- Robotic Personal Assistant
- Net 0 Energy buildings
- Telemedicine
- Smart Cities
- Plug and Play medical devices
- Watershed Management
- Drive by wire systems
- Automated Agriculture

We will create security policies and functional models for each of these then apply formal models of information flow to assess their vulnerabilities through cyber-physical interactions. The process will be iterative, i.e. later discoveries may require revising earlier work throughout the semester.

Campus Policies

Student Honor Code and Academic Integrity:

Academic integrity is vital to the educational process and it matters to you, the discipline, and to future employers. An Honor Code has been developed and endorsed by the Missouri S&T Student Council: the Honor Code can be found at this link: <http://stuco.mst.edu/about/honor.shtml>. Please read and reflect upon the Honor code and its emphasis on HONESTY and RESPECT. Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the University of Missouri System's

Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage (<http://registrar.mst.edu/academicregs/index.html>). Additional guidance, including the University's Academic Dishonesty Procedures, is available on-line at <http://ugs.mst.edu>. Other informational resources for students regarding ethics and integrity can be found online at <http://ugs.mst.edu/academicintegrity/studentresources-ai>.

- **S&Tconnect:** <https://blackboard.mst.edu/> (S&Tconnect tab)

S&Tconnect provides an enhanced system that allows students to request appointments with their instructors and advisors via the S&Tconnect calendar, which syncs with the faculty or staff member's Outlook Exchange calendar.

- **Classroom Egress Maps:**

Note where the classroom emergency exits are located. Please familiarize yourself with the classroom egress maps posted on-line at: <http://designconstruction.mst.edu/floorplan/>.

- **Disability Support Services:** <http://dss.mst.edu>

Any student inquiring about academic accommodations because of a disability should be referred to Disability Support Services so that appropriate and reasonable accommodative services can be determined and recommended. Disability Support Services is located in 204 Norwood Hall. Their phone number is 341-4211 and their email is dss@mst.edu. *"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 Services staff send a letter to me verifying your disability and specifying the accommodation you will need before I can arrange your accommodation."*

- **The Burns & McDonnell Student Success Center**

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the B&MSSC at 198 Toomey Hall; 573-341-7596; success@mst.edu;

facebook: www.facebook.com/SandTssc; web:
<http://studentsuccess.mst.edu/>

If you have any questions about the information listed above, please contact the Office of Undergraduate Studies at 573-341-7276.