# c. 6600 – Computer Security

Bruce McMillin - Computer Science - Room 314, Phone 341-6435, [ff@mst.edu](mailto:ff@mst.edu)

Tuesday/Thursday 9:15 AM, Rm 206 Computer Science

Office Hours: 8:30-9:30 Monday and Wednesday or drop in or by appointment or zoom

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

# Ch2- Ch5: Privacy & Access Control

Access Control and the HRU Model Reference Papers/P461-harrison.pdf

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 Ohalloran Thesis NF

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. A LaTeX template for this exists at the paper template at [Template](http://mst.edu/~ff/classes/6600/Template). [Overleaf](https://www.overleaf.com/) is a nice package for editing such files. I will comment on this and return to you for a final revision due at the end of the semester.  Mid semester and the last week will be in-class presentations based on your individual paper.

## Grading Policy

Grades will be assigned as follows:

20% Midterm Exam October 21, in class, closed book

20% Final Exam – take home handed out December 7 at the end of class, due December 10 at 15:13 pm.

20% Problem sets and class participation (distance students may get class participation through writing a lecture summary and posing a questions)..

40% Project/Paper – due incrementally throughout the semester with final paper due December15 at 15:13 pm.

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.

## 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
    - HIPPAA
    - 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.

# COVID Concerns:

 f you have a temperature greater than 100˚ F, do not come to campus.

 If you feel sick with any of the following symptoms but do not have a fever, do not come to campus. Symptoms of COVID-19 may include:

* Cough
* Shortness of breath or difficulty breathing
* Fatigue
* Unexplained muscle or body aches
* Headache
* New loss of taste or smell
* Sore throat
* Congestion or runny nose
* Nausea or vomiting
* Diarrhea
* Maintain physical distancing of six feet between individuals **on and off campus**.
* Keeping space between people is the best tool available to avoid exposure to the COVID-19 virus

Missouri S&T issued the [Health and Safety Standards Policy Memorandum No. I-12](https://chancellor.mst.edu/media/administrative/chancellor/documents/policy/070120PolicyI-12.pdf#200708031756) on July 1, 2020, setting a university policy on required face coverings. This policy considers the current state of science in developing a facial covering response to COVID-19.

Face coverings are an additional step to help slow the spread of COVID-19 when combined with everyday preventive actions and social distancing in public settings. Face coverings are especially important to keep people who don’t know they have the virus from transmitting it to others.

Additional information about the policy is available in the Missouri S&T [Face Covering Policy Guideline](https://coronavirus.mst.edu/files/2020/08/Facial-Covering-Guidelines.pdf).

In class you must wear a face covering. **Note that any student who refuses to wear a face covering as required will be asked to leave the class, lab, location, or activity and may be referred to the Office of the Dean of Students for review through the student conduct process.** Individuals who are not wearing a face covering may be asked whether they have a disability that prevents them from doing so, but they should not be asked to disclose their disability or provide medical documentation. Individuals who indicate they are not wearing a face covering because of a disability will be referred to the Testing and Student Disability Services (students) or Office of Accessibility and ADA (employees and visitors).

### Examples of acceptable face coverings

Face coverings must cover the individual’s mouth and nose.  Examples of acceptable face coverings include:

* Cloth ear-loop face coverings
* Clear plastic ear-loop face coverings
* Non-medical disposable face masks

Please note: Face coverings with exhalation valves or vents should NOT be worn to help prevent the person wearing the face covering from spreading COVID-19 to others.  Exhalation valves or vents can allow for respiratory droplets to pass through and possibly reach others.”

# 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 S&T early alert (see below). Class participation is based on your interaction during the lecture and during the problem solving sessions. Class begins at 09:30 AM sharp, so be on time. It’s important that you attend the class to satisfy US Immigration requirements for face-to-face delivery.

**Campus Systems and Resources**

**Canvas.** canvas.mst.edu is the site to house the syllabus and policies, calendar, and gradebook. Look for course materials there. However, not all assignments are practical to submit through Canvas, these will be denoted in the submission instructions.

**S&Tconnect**. <https://canvas.mst.edu/> (“Starfish” icon on left toolbar)

S&Tconnect enables students to request appointments with their instructors and advisors via the S&Tconnect calendar, which syncs with the instructor’s Outlook Exchange calendar. S&Tconnect tracks each student’s performance. S&Tconnect Early Alert enables students to be provided with services.

**S&T Writing Center.** <http://writingcenter.mst.edu>. The Writing Center will be open for writing consultation during the Fall semester. More information will be provided early in the Fall semester about the mode of services and hours that services are available.

**The Student Success Center.** SSC 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. The Student Success Center in Toomey Hall was designed for students to visit and feel comfortable about utilizing the campus resources available. Visit the SSC at 198 Toomey Hall; 573-341-7596; [success@mst.edu](mailto:success@mst.edu); Facebook:  www.facebook.com/SandTssc; web: <http://studentsuccess.mst.edu/>

**Missouri S&T Campus and UM System Policies**

**Statement about Copyright, FERPA, and Use of Video**

It is vitally important that our classroom environment promote the respectful exchange of ideas. This entails being sensitive to the views and beliefs expressed during discussions whether in class or online. Please speak with me before recording any class activity. It is a violation of University of Missouri policy to distribute such recordings without my authorization and the permission of others who are recorded. More information is provided [online](https://www.umsystem.edu/ums/elearning/policies).

**Well-Being and UCARE**

Any of us may experience strained relationships, increased anxiety, feeling down, alcohol/drug misuse, decreased motivation, challenges with housing and food insecurity, etc. When your mental well-being is negatively impacted, you may struggle academically and personally. If you feel overwhelmed or need support, please make use of S&T’s confidential [mental health services](http://counseling.mst.edu/) at no charge. For a quick guide to campus resources that address specific issues please visit our Well-Being Referral Guide, available as a website at <https://minerwellness.mst.edu/well-being-referral-guide/>. If you are concerned about a friend or would like to consult with a Care Manager, please make a UCARE referral for support and assistance. <https://stuaff.mst.edu/ucare/>.

**Student Honor Code and Academic Integrity**

* The Honor Code all students are expected to follow can be found at this link: <http://stuco.mst.edu/honor-code/>.
* 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 at <http://academicsupport.mst.edu>.
* Other resources for students regarding ethics and integrity can be found at <http://academicsupport.mst.edu/academicintegrity/studentresources-ai>.

**Accessibility and Accommodations**

It is the university’s goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on a disability, please contact Student Disability Services at (573) 341-6655, [sdsmst@mst.edu](mailto:sdsmst@mst.edu), visit <http://dss.mst.edu/> for information.

**Nondiscrimination, Equity, and Title IX**

Missouri University of Science and Technology is committed to the safety and well-being of all members of its community, and to creating an environment free from discrimination and harassment.

The University does not discriminate on the basis of race, color, national origin, ancestry, religion, sex, pregnancy, sexual orientation, gender identity, gender expression, age, disability, protected veteran status, and any other status protected by applicable state or federal law. As used in this policy, the word “sex” is also inclusive of the term “gender.”

Additionally, 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. Violations of this law include sexual harassment, sexual assault, dating/domestic violence, and stalking.

In accordance with The Collected Rules and Regulations University of Missouri, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Equity Officer, any notice of discrimination disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises.

Missouri S&T’s Equity Officer and Title IX Coordinator is Chief Diversity Officer Anitra Rivera. Contact their office at (573) 341-6038; 203 Centennial Hall) to report violations of the university’s nondiscrimination polices, including Title IX. To learn more about resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.

**Classroom Egress Maps**

For all in-person instruction, faculty should explain where the classroom emergency exits are located. Classroom egress maps are posted at <http://designconstruction.mst.edu/floorplan/>.