



# Decision making for cybersecurity

## Course description

People and organizations make decisions about cybersecurity and privacy every day. Decisions can range from whether to install a game on a smartphone to how to allocate scarce information security resources in an organization. In this course, we will discuss human and organizational decision making from a variety of perspectives and will apply different risk assessment and decision making frameworks that are relevant to personal and organization cybersecurity. The main quantitative framework for organizational security that we will implement is the Factor Analysis of Information Risk (FAIR) model. In addition to monetary losses, we will consider the social and societal costs of cybersecurity decisions.

## Learning Objectives

Upon completion of the course, you should be able to:

1. Distinguish between premises and conclusions, or between data and inferences from data. Set up questions about cybersecurity risk and determine what data can address those questions.
2. Understand the differences among appropriate and inappropriate methods for drawing conclusions. Identify sources of systematic bias in human decision making.
3. Apply appropriate methods to evaluate inferences and to reason about complex information. Identify sources of information that can be used to assess cybersecurity risk and evaluate what inferences can be drawn from them.
4. Systematically evaluate evidence for accuracy, limitations, and relevance, and identify alternative interpretations of evidence. Analyze cybersecurity decisions using a quantitative risk management framework.
5. Use formal, analytical, or computational techniques to address real-world problems. Apply quantitative and qualitative risk management frameworks to problems in organizational security.
6. Generate examples of monetary and social costs to be minimized in security and privacy scenarios. Consider the ethical and societal effects of particular decisions.

## Required Resources

Course website: <https://umd.instructure.com/courses/1278072>

Books:

- Freund, J., & Jones, J. (2014). *Measuring and managing information risk: a FAIR approach*. Butterworth-Heinemann. [eBook available from UMD Libraries]
- Welsh, M. (2018). *Bias in Science and Communication*. IOP Publishing. [eBook available from UMD Libraries]

Dr. Susan G. Campbell  
[susanc@umd.edu](mailto:susanc@umd.edu)  
she/her

## Class meets

Tuesday/Thursday  
11AM-12:15PM  
SQH 1117

## Office hours

Tuesday/Thursday  
1:30 PM – 2:30 PM  
PTX 2114

## Prerequisites:

INST 314  
INST 364

## Course communication

I will announce any changes to the syllabus or other important information on ELMS. You may choose to have such announcements sent to you in your preferred manner through the ELMS interface.

To contact me, please send me an email at the address above and I will get back to you within 24 hours. If the communication is less urgent, feel free to message me on ELMS.

## Expectations and grading procedures

### Composition of percentage grades

Midterm 1, Midterm 2, and Final Exam: 30%

- Each exam is worth 10%.
- Exams will be take-home and may be a mix of short answer, quantitative, and essay questions.

Participation: 10%

- I expect your attendance and active participation in class discussions and in-class activities.

Online assignments and discussion: 10%

- Short online assignments and discussion questions will be posted. For discussion questions, you are expected to answer the question and to provide a response to at least one other student's answer. The lowest two grades in this category will be dropped.

Case study project: 50%

- Short report specifying the organizational and IT context for your chosen case: 10%
- Short report describing the results of a qualitative analysis of risks to your chosen organization: 10%
- Spreadsheet and write-up describing the results of a FAIR analysis of your chosen organization: 10%
- Slide presentation describing the results of your risk analyses to upper management of your chosen organization: 10%
- Final report describing the results of your risk analyses to upper management of your chosen organization: 10%

### Converting percentage grades to letter grades

I follow the standard practice in converting percentage grades to letter grades, as listed in the table below.

Letter	Points	Lower bound
A+	4.0	97
A	4.0	94
A-	3.7	90
B+	3.3	87
B	3.0	84
B-	2.7	80
C+	2.3	77
C	2.0	74
C-	1.7	70
D+	1.3	67
D	1.0	64
D-	0.7	60
F	0.0	0

## Course procedures and policies

This syllabus is subject to change. I will notify you in advance of important changes that could affect grading or assignments.

It is our shared responsibility to know and abide by the University of Maryland's policies that relate to all courses, which include topics like:

- Academic integrity
- Student and instructor conduct
- Accessibility and accommodations
- Attendance and excused absences
- Grades and appeals
- Copyright and intellectual property

Please visit [www.ugst.umd.edu/courserelatedpolicies.html](http://www.ugst.umd.edu/courserelatedpolicies.html) for the Office of Undergraduate Studies' full list of campus-wide policies and follow up with me if you have questions. Policies that are specific to this course are listed here.

### Attendance and absences

This class is structured as a seminar, and I expect you to attend and participate in each class meeting, both for your benefit and for the benefit of your classmates. Please inform me in advance of absences if possible. Prolonged absence from class may affect both your understanding of the material and your participation grade.

If you are going to miss an exam due to an unavoidable obligation, please inform me in advance so that we can schedule an earlier exam date. If you miss an exam due to a medical issue, please provide me with a note from a doctor or a self-signed note. I will provide a make-up exam if necessary.

### Late assignments

I expect you to turn assignments in on time. If you must turn an assignment in late for a reason that is not covered by the excused absence policy and you have not arranged with me to turn it in late, I will take off 10% per day that the assignment is late. Discussion questions will receive no credit, as the lowest two discussion questions are dropped already.

### Academic integrity

This course is designed to be collaborative; you are welcome to discuss any assignment with your classmates, but if an assignment is not explicitly listed as a group effort, you are expected to produce your own final product. For exams, you may collaborate on study materials, but you are expected to answer exam questions on your own. If you have questions about this distinction, please let me know.

You are welcome to use outside sources for discussions and even for exam questions (although the exams are designed to be answered without outside sources). You must cite your sources, however. Please do not quote directly from the lecture notes – I want to know that you have understood the material, not that your notes have a good indexing system.

I take academic dishonesty very seriously, and work that is not your own does not demonstrate the understanding necessary to count for an assignment. If you are unsure if something is appropriate, please ask.

The student-administered Honor Code and Honor Pledge prohibit students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents and forging signatures. Allegations of academic dishonesty will be reported directly to the Student Honor Council: <http://www.shc.umd.edu>

### Accessibility

The University of Maryland provides resources for students who need accommodations to perform coursework. More information is available at <https://www.counseling.umd.edu/ads/>

### Writing center

To help you with writing assignments, peer consultants are available in the Writing Center, 1205 Tawes Hall. The consultants can help you with all aspects of your writing process, from generating ideas to organizing your thoughts to revising your prose. Check the website for current semester hours. Daytime hours include both appointments and walk-in (call 301-405-3785 for a 30 or 60 minute appointment), while evening hours are walk-in only. To make an appointment, go to <https://umd.mywconline.com>. The Writing Center also maintains limited walk-in hours in 2101 McKeldin Library.

### Copyright notice

Class lectures and other course materials are copyrighted and may not be reproduced for anything other than your personal use without the permission of the course instructor. Course materials are the property of the course instructor – do not sell them, do not post them on a website. Be aware that copyright infringements may be referred to the Office of Student Conduct.

As a student, you own the work that you create as part of your University academic and research activities. Sending a copy of your work to your instructor does not mean that they have the right to repost that work elsewhere or use it without your permission.

### Emergency protocol

If UMD is closed for an extended period of time, the class will be conducted online using ELMS.

### Course evaluations

Course evaluations are a part of the process by which the University of Maryland seeks to improve teaching and learning. Your participation in this official system is critical to the success of the process, and all information submitted to CourseEvalUM is confidential. (Instructors can only view group summaries of evaluations and cannot identify which submissions belong to which students.)

### Sexual misconduct

By university policy, I must report any sexual misconduct directed at or perpetrated by a student that I hear about to the university. Sexual misconduct does not just cover assault, and includes such things as stalking, threats of assault, and covert creepy photography. (Sadly, I cannot report all of Twitter.) Please keep that in mind.

The University of Maryland is committed to providing support and resources, including academic accommodations, for students who experience sexual or relationship violence (as defined by the University's Sexual Misconduct Policy). To report an incident and/or obtain an academic accommodation, contact the Office of Civil Rights and Sexual Misconduct at 301-405-1142. If you wish to speak confidentially, contact Campus Advocates Respond and Educate (CARE) to Stop Violence at 301-741-3555. Disclosures made to faculty are not confidential and must be reported to the Office of Civil Rights and Sexual Misconduct. For more information visit <https://ocrsm.umd.edu/sexual-misconduct/>.

### Diversity and inclusion

I expect you to treat your classmates with respect, and I expect you to consider that other people may have perspectives and experiences that differ from your own.

The University of Maryland values the diversity of its student body. Along with the University, I am committed to providing a classroom atmosphere that encourages the equitable participation of all students regardless of age, disability, ethnicity, gender, national origin, race, religion, or sexual orientation. Potential devaluation of students in the classroom that can occur by reference to demeaning stereotypes of any group and/or overlooking the contributions of a particular group to the topic under discussion is inappropriate.

### Basic Needs Security

If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live and believe this may affect your performance in this course, please visit [go.umd.edu/basic-needs](https://go.umd.edu/basic-needs) for information about resources the campus offers you and let me know if I can help in any way.

### Names/Pronouns and Self Identifications

The University of Maryland recognizes the importance of a diverse student body, and we are committed to fostering inclusive and equitable classroom environments. I invite you, if you wish, to tell us how you want to be referred to both in terms of your name and your pronouns (he/him, she/her, they/them, etc.). The pronouns someone indicates are not necessarily indicative of their gender identity. Visit [trans.umd.edu](https://trans.umd.edu) to learn more.

Additionally, how you identify in terms of your gender, race, class, sexuality, religion, and dis/ability, among all aspects of your identity, is your choice whether to disclose (e.g., should it come up in classroom conversation about our experiences and perspectives) and should be self-identified, not presumed or imposed. I will do my best to address and refer to all students accordingly, and I ask you to do the same for all of your fellow Terps.

### Electronic devices in the classroom

I expect that you will pay attention to class when class is in session, and especially when your peers are speaking. To that end, I expect you to manage your electronic devices so that they do not ring in class, and I expect you to use those devices in a way that enhances the class, rather than distracting from it. You may be required to bring a device to class to perform certain activities.

## Course schedule

<i>Week</i>	<i>Date</i>	<i>In class</i>	<i>Class preparation</i>	<i>Deliverables</i>
1	1/28	Lecture: course overview Discussion: cybersecurity & stats review		
	1/30	Discussion: individual decisions, insider threat	Read: Welsh Ch 2 & 4	Exercise 0: reasoning quiz Discussion 1: introduction Discussion 2: quiz results
2	2/4	Discussion: confidence, bias	Read: Welsh Ch 7 & 12	
	2/6	Discussion: cybersecurity and information security		Discussion 3: cybersecurity review
3	2/11	Discussion: probability estimation and confidence	Read: Freund & Jones Ch 1 and Ch 2	
	2/13	Lecture: vulnerabilities, threats, & risks Discussion: Classifying news reports on cyber incidents		Exercise 4: Calibration analysis
4	2/18	Exercise: Reading a vulnerability report	Read: Freund & Jones Ch 5	
	2/20	Discussion: using statistical models to make decisions		Discussion 5: example case study
5	2/25	Lecture: FAIR ontology Discussion: Applying the FAIR ontology to sample case study	Read: Freund & Jones Ch 3 & 4	
	2/27	Discussion: Good case studies Exercise: Picking a case to examine		Discussion 6: qualitative risk assessment factors
6	3/3	Exercise: Qualitative risk assessment	Read: Freund & Jones Ch 6	Midterm 1
	3/5	Discussion: Qualitative and quantitative risk assessments		Discussion 7: qualitative risk assessment metrics
7	3/10	Demonstration: FAIR process	Read: Freund & Jones Ch 7	
	3/12	Discussion: Liability and social cost		Project 1: Picking a case
8	3/17	NO CLASS		
	3/19	NO CLASS		
9	3/24	Exercise: enumerate information and cyber assets	Read: Freund & Jones Ch 8 & 9	
	3/26	Discussion: information security cases		Discussion 8: Problems in qualitative risk assessment process
10	3/31	Discussion: qualitative risk assessment	Read: Freund & Jones Ch 11 & 12	
	4/2	Discussion: quantitative risk assessment		Project 2: Qualitative risk assessment
11	4/7	Work time: FAIR analysis	Read: Freund & Jones Ch 13 & 14	Midterm 2
	4/9	Discussion: Scoring vulnerabilities		Discussion 9: Vulnerability scoring system
12	4/14	Work time: FAIR analysis	Read: NIST Cybersecurity framework	
	4/16	Discussion: Metrics and implementation		Exercise 10: FAIR analysis of your information risk

13	4/21	Discussion: Interpreting risk analysis results		
	4/23	Discussion: Monetary and non-monetary outcomes		Project 3: FAIR analysis of selected case
14	4/28	Work time: Presenting analysis results		
	4/30	Presenting slides		Project 4: Slides summarizing FAIR results
15	5/5	Work time: interpreting risk analysis results		
	5/7	Discussion: Societal impacts of individual and organizational decisions		Project 5: Report on proposed course of action
16	5/12	Discussion: Future sources of information security and cybersecurity risk		
<b>FINAL</b>	<b>5/19</b>	<b>(Note that this is later than the Final Exam schedule says)</b>		<b>Final Exam (due 12:30PM)</b>