

Knight Foundation School of Computing and Information Sciences  
 CTS 1500  
 Emerging Topics in Digital Life

**Outline**

<b>Topic</b>	<b>Number of Lecture Hours</b>	<b>Outcome</b>
<ul style="list-style-type: none"> <li>• Introduction to Digital Life Issues               <ul style="list-style-type: none"> <li>○ Basic concepts of digital life</li> <li>○ Overview of Issues</li> </ul> </li> </ul>	2	6
<ul style="list-style-type: none"> <li>• Fundamentals of Information Assurance               <ul style="list-style-type: none"> <li>○ Concepts and definitions</li> <li>○ CIA Principles                   <ul style="list-style-type: none"> <li>▪ Basic types of attacks</li> </ul> </li> <li>○ Data protection strategies (identity multi-factor authentication, authorization, access control)</li> <li>○ Secure communication concepts (https)</li> <li>○ Keeping applications up to date</li> <li>○ Forensics concepts</li> </ul> </li> </ul>	4	2, 4
<ul style="list-style-type: none"> <li>• Media Issues               <ul style="list-style-type: none"> <li>○ Social media issues                   <ul style="list-style-type: none"> <li>▪ Authenticity of social media accounts (real or bots)</li> <li>▪ Censorship by social media platforms</li> <li>▪ Uses and dangers of locational data (GPS and geotags)</li> <li>▪ Effects on user attention spans and learning, self-images</li> </ul> </li> <li>○ Impacts of misinformation, disinformation, mal information                   <ul style="list-style-type: none"> <li>▪ Political ramifications</li> <li>▪ Fake online shopping reviews</li> <li>▪ Foreign interference in governance</li> <li>▪ Effects on public trust</li> <li>▪ Media bias vs. journalism</li> <li>▪ Deepfakes</li> </ul> </li> <li>○ Virtual Reality/ Augmented Reality                   <ul style="list-style-type: none"> <li>▪ The Metaverse – crossing geopolitical boundaries</li> </ul> </li> </ul> </li> </ul>	8	1, 2, 3, 6, 7
<ul style="list-style-type: none"> <li>• Technology and Social Issues</li> </ul>	3	1, 2, 3, 7, 8

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<ul style="list-style-type: none"> <li>○ Social Engineering             <ul style="list-style-type: none"> <li>▪ Concepts: Phishing, whaling, spear fishing, watering hole approaches</li> <li>▪ Scareware and ransomware</li> <li>▪ Pretexting</li> <li>▪ How Social Engineering differs by culture</li> </ul> </li> <li>○ Cybernetics and Cyberwarfare             <ul style="list-style-type: none"> <li>▪ Human enhancement for warfare</li> <li>▪ Collateral damage of cyberwarfare between geopolitical groups</li> <li>▪ Hacking/Hactivism</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>● Privacy and Anonymity             <ul style="list-style-type: none"> <li>○ Role of technology</li> <li>○ Anonymity pros and cons</li> <li>○ Government surveillance of its citizens in diverse areas of the globe</li> <li>○ IoT and mobile device privacy issues</li> <li>○ Legal and compliance aspects</li> <li>○ Global issues/differences</li> </ul> </li> </ul>	4	1, 2, 3, 4, 6, 7, 8
<ul style="list-style-type: none"> <li>● Emerging Technology Issues             <ul style="list-style-type: none"> <li>○ Blockchain             <ul style="list-style-type: none"> <li>▪ Basic concepts</li> <li>▪ Is it a solution for privacy, voting, etc.?</li> <li>▪ Cryptocurrency concepts                 <ul style="list-style-type: none"> <li>● Its use with ransomware</li> </ul> </li> <li>▪ NFTs</li> </ul> </li> <li>○ Artificial Intelligence             <ul style="list-style-type: none"> <li>▪ Its use in decision making</li> <li>▪ Social impact of bias in AI algorithms</li> </ul> </li> <li>○ Quantum computing             <ul style="list-style-type: none"> <li>▪ Basic concepts</li> <li>▪ Its role in security</li> <li>▪ Global impacts</li> </ul> </li> </ul> </li> </ul>	2	1, 3, 6
<ul style="list-style-type: none"> <li>● Organizational Issues</li> </ul>	3	4, 5

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<ul style="list-style-type: none"> <li>○ Data storage – legal and compliance issues</li> <li>○ IR/DR principles, planning, responses</li> <li>○ Breaches – costs, reporting, legal and compliance issues</li> <li>○ Hacking (ethical/unethical) &amp; Pen Testing (red team/blue team concepts)</li> </ul>		
<ul style="list-style-type: none"> <li>● Careers and certifications in Information Assurance             <ul style="list-style-type: none"> <li>○ Information assurance and compliance career paths</li> <li>○ Information assurance and compliance certifications</li> <li>○ Responsibilities of a CISO</li> <li>○ Cyber threat resources used by information assurance professionals</li> </ul> </li> </ul>	4	5

**Learning Outcomes:** (Familiarity->Usage->Assessment)

Human and Societal Digital Impacts:

1. Analyze an incident related to the use of misinformation or disinformation involving public trust issues, buying trends, or local and global governance. [Assessment]
2. Assess the possible implications and impacts of media bias. [Assessment]
3. Analyze an incident in which cyberwarfare had global implications [Assessment]
4. Understand the potential legal and personal implications of the use of deepfake technology [Familiarity]
5. Understand how locational data is collected and used in our personal and professional lives [Familiarity]
6. Differentiate among the diverse types of social engineering. [Familiarity]
7. Analyze an incident in which social engineering led to a major data breach. [Assessment]

Blockchain

1. Identify the major benefits and uses of blockchain technology [Familiarity]
2. Compare and contrast pros and cons of digital currency with fiat currency [Usage]
3. Explore blockchain technology as related to voting [Familiarity]

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Artificial Intelligence

1. Identify the major benefits of artificial intelligence for decision-making tasks. [Familiarity]
2. Summarize the major issues surrounding AI related to the possibility of biased results. [Familiarity]

Virtual Worlds

1. Identify the major benefits and disadvantages of virtual reality, augmented reality, and the metaverse. [Familiarity]
2. Describe the implication of virtual worlds on society and governance. [Usage]

Quantum Computing

1. Identify the major possible benefits and unintended consequences of quantum computing [Familiarity]

Basic Digital Information Assurance Concepts:

1. List the key components of the CIA principles of security. [Familiarity]
2. Identify tactics used by bad actors in the digital arena [Familiarity]
3. Describe the different personal and organizational practices that are necessary to protect against digital attacks. [Usage]

Privacy and Anonymity:

1. Compare and contrast the benefits and disadvantages of personal privacy protections and anonymity, on both a local and global scale. [Usage]
2. Analyze an incident where anonymity resulted in a significant negative outcome. [Assessment]
3. Compare and contrast the benefits and dangers of U.S. and foreign governments' surveillance of its citizens. [Usage]
4. Differentiate among regional differences in privacy legislation. [Familiarity]

Organizational Security Issues

1. Identify the need for organizational planning related to digital assets [Familiarity]
2. Identify the major phases and artifacts of disaster recovery planning. [Familiarity]
3. Describe the major legal and compliance requirements that organizations must meet. [Familiarity]

Certification and Career Opportunities in Information Assurance

1. Identify career paths in the fields of information assurance and compliance. [Familiarity]
2. Identify professional certifications in the fields of information assurance and compliance. [Familiarity]

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**Course Outcomes Emphasized in Laboratory Projects / Assignments**

<b>Outcome</b>	<b>Number of Weeks</b>
1. Review case studies in social engineering, misinformation/media bias Outcomes: 1, 2, 3	2
2. Discussion forums (6) Outcomes: 1, 2, 6, 7, 8	6
3. Create a case study based on a global cyberwarfare incident (Group activity) Outcomes: 1, 2, 3, 4, 5, 6, 7, 8 Global learning will be assessed via this case study.	4

**Oral and Written Communication:**

<b>Written Reports</b>		<b>Oral Presentations</b>	
Number Required	Approx. Number of pages for each	Number Required	Approx. Time for each
6 Discussion Forums based on readings and other course material for: (1) Privacy and Anonymity, (2) Media Bias, (3) Misinformation and Media Bias, (4) Social Engineering, (5) Blockchain, (6) AR, VR and the metaverse	1-2	0	0
2 Review of case studies readings	1		
1 Reflection on invited guest speaker or other course-sanctioned co-curriculum activity	1		
1 Group project: Create a case study to analyze a recent cyberwarfare incident with global implications. Include an infographic/poster for display.	3-4		

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**Social and Ethical Implications of Computing Topics:**

<b>Topic</b>	<b>Class time</b>	<b>Student Performance Measures</b>
Impacts of misinformation, disinformation, and mal information	4	Discussion forums, quizzes
Privacy and Anonymity – benefits and dangers	3	Discussion forums, quizzes
Hacking (ethical and unethical) & Penetration Testing (red team/blue team)	2	Quizzes
Cyberwarfare	6	Quizzes, group case study
AR, VR and the metaverse	3	Discussion forums, quizzes

**Approximate number of credit hours devoted to fundamental CY topics<sup>1</sup>**

<b>Topic</b>	<b>Core Hours</b>	<b>Advanced Hours</b>
Data Security:	8	0
Software Security:	2	0
Component Security:	0	0
Connection Security:	2	0
System Security:	2	0
Human Security:	16	0

**Theoretical Contents**

<b>Topic</b>	<b>Class time</b>
Fundamentals of Information Assurance	4

**Problem Analysis Experiences**

Review and create case studies
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<sup>1</sup> See <https://www.acm.org/binaries/content/assets/education/curricula-recommendations/csec2017.pdf> for a description of Knowledge units

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**The Coverage of Knowledge Units within Computer Science Body of Knowledge<sup>2</sup>**

<b>Area: Knowledge Unit</b>	<b>Topic</b>	<b>Lecture Hours</b>
Data Security: Basic concepts	Fundamental concepts of digital life	1
Data Security: Data Privacy	Privacy & Anonymity issues Social engineering	1
Data Security: Information Storage Security	Organizational Issues Legal and compliance requirements	1
Data Security: Data Integrity and Authentication	Basic digital protection strategies	1
Data Security: Secure Communication Protocols	Secure communication concepts	1
Data Security: Digital Forensics	Fundamentals – hacking; red team/blue team; penetration testing	1
Software Security: Deployment & Maintenance	Keeping applications up to date	1
Software Security: Ethics	Hacking and Penetration Testing Media Bias Impacts of Misinformation, disinformation, mal information	2
Connection Security: World Wide Web	Secure Communication Concepts	1
Connection Security: Vulnerabilities and example exploits	Basic types of attacks Tactics used by bad actors Cyberwarfare	2
System Security: System Management	Keeping applications up to date Basic types of attacks Tactics used by bad actors Hacking & penetration testing	1
System Security: System Testing	Hacking & penetration testing	1
Human Security: Social Engineering	Social Engineering Social Media Issues Misinformation, disinformation, mal information Media Bias	4

<sup>2</sup> See <https://www.acm.org/binaries/content/assets/education/curricula-recommendations/csec2017.pdf> for a description of Knowledge units

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Human Security: Social & Behavioral Privacy	Privacy & Anonymity Issues Social Engineering	2
Human Security: Identity Management	Identification, multi-factor authentication, authorization	1
Organizational Security: Risk Management	Organizational Issues – Risk management	1
Organizational Security: Security Governance & Policy	Organizational Issues – Legal and compliance requirements Global issues/differences	2
Organizational Security: Laws, Ethics & Compliance	Organizational Issues – Legal and compliance issues	1
Organizational Security: Business Continuity, Disaster Recovery, and Incident Management	Organizational Issues – IR/DR principles	1
Societal Security: Cybercrime	Social Engineering Cyberwarfare Misinformation/disinformation	2
Societal Security: Cyber Law	Legal and Compliance Issues Privacy Data storage	1
Societal Security: Cyber Ethics	Hacking (ethical and unethical) Penetration testing (red team/blue team) Privacy policies Media Bias	1
Societal Security: Privacy	Privacy & Anonymity Misinformation/disinformation	1