CIS 3362-521 – 3 Credit Hours
Cryptography and Information Security
Spring, 2015

Instructor: Mr. Adam Francis, CISSP, CEH, PMP
E-Mail: awfranci@mail.usf.edu
Office Hours: Daily via email

Classroom: Virtually via Blackboard Collaborate
Time: Monday, 6:00 – 8:50 pm

PREREQUISITES: Consult your Advisor for the latest prerequisites.

COURSE DESCRIPTION: This course teaches the basics of cryptography as a method for providing confidentiality, integrity, and authentication of information systems.

TEXTBOOK:
Text: The recommended textbook for this course:

Computer Security: Principles and Practice, 3rd Ed.
By William Stallings and Lawrie Brown.
Published 7/8/14
840 Pages

COURSE TOPICS:
This course will cover the following content areas:
1. Symmetric and asymmetric cryptography
2. Network security
3. Access control
4. Security models
5. Applications security
6. Application of cryptography
7. Risk assessment

COURSE OBJECTIVES: This course is intended to provide students with a foundational understanding of cryptography that will enable them to apply the most effective protections in securing valuable information assets. Note that in addition to a full treatment of cryptography concepts in the first half of the course, the latter half will provide the student with a survey of other information security concepts to include application of cryptography, as well as software application security, network security, and security risk management.

COURSE STUDENT LEARNING OUTCOMES:
Upon completion of this course, students will be able to:
1. Understand current trends in information security
2. Understand the basic Security Services
3. Understand the nature of cybersecurity attacks
4. Understand basic Information Theory and Complexity Theory
5. Understand and apply basic Cryptanalysis techniques
6. Understand codes, steganography, and one-time pads
7. Understand and apply symmetric cryptography techniques and have familiarity with common symmetric ciphers
8. Understand block cipher and stream cipher and cryptographic modes
9. Understand and apply asymmetric cryptography techniques and have familiarity with common asymmetric ciphers
10. Understand hashes, MACs, and HMACs
11. Understand public key infrastructures, certificates, and the application of PKI techniques to secure a variety of systems
12. Understand access control techniques and models
13. Understand application-based attacks and countermeasures
14. Understand the basics of networks, networking protocols, and attacks/countermeasures against networks
15. Understand firewalls, intrusion detection, and intrusion prevention systems
16. Understand and apply risk assessment and mitigation techniques

OPTIONAL SUPPLEMENTARY MATERIALS
USF Whitehatters Computer Security Club (WCSC): If you are serious about information security and want more hands-on learning outside the classroom environment, consider joining WCSC. The purpose of the club is to promote learning about computer security and participate in organized Capture the Flag (CtF) events. The club meets weekly on Fridays at 5 p.m. in the Marshall Center, on the Tampa campus. Site: www.whitehatters.org.

GRADING, EVALUATION AND ATTENDANCE POLICIES:
Student performance will be evaluated based on tests, exercises, assignments and projects, as detailed below. All assignments are expected to be turned in on time, by 6:00 p.m. of the date assigned. They must be submitted via Canvas (not email). Late assignments will not be accepted unless prior permission has been granted by your Instructor. Each assignment will be reviewed in class after the Due Date.

Below are a summary for the determination of the final grade and an explanation for each component:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage of grade</th>
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<tbody>
<tr>
<td>Tests 1</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes, Assignments, Class Participation (class, online)</td>
<td>20%</td>
</tr>
<tr>
<td>Team Project</td>
<td>20%</td>
</tr>
<tr>
<td>Test 2</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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A grade will be determined based on the total of possible points earned, as follows: A = 90-100; B = 80-89; C = 70-79; D = 60-69; F = 59 or below
Tests – 60%
There will be two tests. Each will be worth 30% of your grade (60% in all). Tests will not be cumulative – each will cover the topics covered prior to the test, although an understanding of earlier material may be necessary as background. There will be no makeup tests. Exceptions on medical grounds will require a doctor’s letter, which will be verified by the appropriate department personnel.

Quizzes, Assignments, and Participation – 20%
All work should be submitted on time, by 6:00 p.m. of the due date. Late submissions will be penalized (or not accepted for some assignments, as announced). Dates for quizzes cannot be provided in advance, as they may occur as we complete relevant course topics. There will be about 5-6 of these assignments during the semester.

Team Project – 20%
Students will collaborate on teams of 2-4 to perform research and development of cybersecurity solutions. All projects will include a detailed written technical report, research that includes literature search, and complete listings and output (as applicable) of any custom code, tools, or scripts developed for the project. Project details will be given during the first couple weeks of class.

Attendance Policy
There is a live lecture on Mondays from 6:00 – 8:50 p.m. using the Blackboard Collaborate feature of Canvas to have virtual class sessions. All lectures are recorded for viewing at your convenience. I will also post PowerPoint slides for the lectures each week. Students are encouraged to connect to the live lectures on Mondays. Part of the student’s grade is based on class participation, which is difficult if the student is only watching the recorded conference sessions offline. There are some other opportunities for participating, such as the class discussion board, but these do not take the place of the live lecture and discussion.

Due to the highly interactive nature of the course and its subject matter, students are strongly encouraged to attend the live sessions. Material covered in class will not necessarily be contained in the textbook. Falling behind in assignments will affect students’ grades. Students are responsible for material covered in class, any announcements, schedule changes, etc. Absenteeism is not an excuse for late work or missed exams unless approval from your Instructor is obtained in advance. Sessions are recorded and will be made available to students after the class.

Classroom Policies
A. Academic Dishonesty: The University considers any form of plagiarism or cheating on exams, projects, or papers to be unacceptable behavior. Please be sure to review the university’s policy in the catalog, the USF System Academic Integrity of Students, and the USF System Student Code of Conduct.

B. Academic Disruption: The University does not tolerate behavior that disrupts the learning process. The policy for addressing academic disruption is included with Academic Dishonesty in the USFSM Undergraduate Catalog, USF System Academic Integrity of Students, and the USF System Student Code of Conduct.

C. Contingency Plans: In the event of an emergency, it may be necessary for USFSM to suspend normal operations. During this time, USFSM may opt to continue delivery of instruction through methods that include but are not limited to: CANVAS, Blackboard Collaborate, Skype, and email messaging and/or an alternate schedule. It’s the responsibility of the student to monitor CANVAS site for each class for course specific communication, and the main USFSM and College websites, emails, and MoBull messages for important general information. The USF hotline at 1 (800) 992-4231 is updated with pre-recorded information during an emergency.

D. Disabilities Accommodation: Students are responsible for registering with the Office of Students with Disabilities Services (SDS) in order to receive academic accommodations. Reasonable notice must be given to the SDS office (typically 5 working days) for accommodations to be arranged. It is the responsibility of the student to provide each instructor with a copy of the official Memo of Accommodation. Contact Information: Contact Information: Disability Coordinator, 941-359-4714, disabilityservices@sar.usf.edu; http://www.usfsm.edu/students/disability.

E. Religious Observances: USFSM recognizes the right of students and faculty to observe major religious holidays. Students who anticipate the necessity of being absent from class for a major religious observance must provide notice of the date(s) to the instructor, in writing, by the second week of classes. Instructors canceling class for a religious observance should have this stated in the syllabus with an appropriate alternative assignment.

F. Web Portal Information: Every newly enrolled USF student receives an official USF e-mail account. Students receive official USF correspondence and CANVAS course information via that address.

G. Student Wellness: The Counseling and Wellness Center is a confidential resource where you can talk about incidents of
sexual harassment and gender-based crimes including sexual assault, stalking, and domestic/relationship violence. You can receive assistance in confidence. This confidential resource can help you without having to report your situation to the Office of Student Rights and Responsibilities (OSSR) or the Office of Diversity, Inclusion, and Equal Opportunity (DIEO); unless you request that they make a report. Please be aware that educators must report incidents of sexual harassment and gender-based crimes including sexual assault, stalking, and domestic/relationship violence. If you disclose any of these situations in class, in papers, or to me personally, I am required to report it to OSSR or DIEO for investigation. The Deputy Coordinator for USFSM is Mary Beth Wallace, AVP for Student Enrollment, Engagement and Success, 941-359-4330 or marybeth@sar.usf.edu. Other number and resources:

- Counseling Center and Wellness Center 941-487-4254
- Victim Advocate (24/7) 941-504-8599

List of off-campus resources:

- Hope of Manatee: 941-755-6805
- Safe Place & Rape Crisis Center (SPARCC) – Sarasota: 941-365-1976
- First Call for Help- Manatee: 941-708-6488 -Sarasota & North Port 941-366-5025
- Manatee Glens: 941-782-4800

GENERAL INSTRUCTION FOR STUDENTS

Students are not permitted to take notes or tape lectures for the purpose of sale. This includes Blackboard Collaborate recordings.

Microsoft Office may be used to supplement this course. The online course tools package, which may be accessed from campus computer labs and via the Internet at https://my.usf.edu, will be used to enhance the course. Internet access and a reasonable up-to-date web browser are required. Except for response speed, there should be no difference in functionality between accessing from a lab and from home. Any exceptions to this will be announced as they become apparent.

COURSE SCHEDULE: Please note this is a tentative schedule – some shifting could occur as we progress into the semester.

Week 1, Jan 5 – Course Introduction, Digital Threats
Course overview
Discussion of assignments, grading format, class project
What are Information Systems?
What is Information Systems Security?
Why is it important?
What are some current trends in Info Sys Security?
What are the basic Security Services?
Reading: Computer Security, Chapters 0.

Week 2, Jan 12 – The nature of attacks, types of attacks, people who attack
Vulnerabilities and Threats
Hacking methodology
Security measures
Reading: Computer Security, Chapter 1.

Week 3, Jan 19 – Cryptanalysis and Classic Cryptography
Information Theory - Claude Shannon Complexity Theory
Cryptanalysis and attacks Cryptography Basics
Codes, Steganography, and Ciphers One-time pads
Reading: Computer Security, Chapter 2.
Week 4, Jan 26 – **Symmetric Cryptography**
Computer cryptographic algorithms—Symmetric vs. Asymmetric
Data Encryption Standard (DES)
Advanced Encryption Standard (AES)
Cryptographic Modes
Reading: Computer Security, Chapter 20.

Week 5, Feb 2 – **PKE, Hashes and MACs, Digital Signatures**
One-way hash functions: MD5, SHA-1
Reading: Computer Security, Chapters 21, sect. 1-2

Week 6, Feb 9 – **Asymmetric Cryptography**
Public-key encryption RSA
Key Management Diffie-Hellman
ECC
Other public key algorithms
Reading: Computer Security, Chapter 21, sect. 3-6

Week 7, Feb 16 – **Digital Signatures**
Digital Certificates & X.509 PKI
SSL
S/MIME
Reading: Computer Security, Chapters 22-23

Week 8, Feb 23 – **Access Control**
Access control concepts
Authentication systems
Identification techniques
Access control techniques
TCSEC Orange Book
Common Criteria
Access control models
Password security
Smart Cards
Biometrics
Review for Test #1
Reading: Computer Security, Chapters 3-4.

**Test #1 – online via MyUSF**
To review for Test #1: study lecture notes, chapters in Stallings book, homework, and any additional handouts.

Week 9, Mar 2 – **Spring Break!**

Week 10, Mar 9 – **Software Security**
Application-based attacks and countermeasures
Buffer overflows
Malicious code
Injection attacks
Covert channels
Reading: Computer Security, Chapters 6, 10-11.
Week 11, Mar 16 – Network Security
Internet History
IETF, IESG, RFCs
Network Reference Models, Protocols, Layers, Services Wireless security
Kerberos
Single sign-on
Reading: Computer Security, Appendix F

March 21 – Last Day to Withdraw from courses with a “W”

Week 12, Mar 23 – Network Security
IP, TCP, UDP, ICMP
Network attacks: IP spoofing, SYN Flood, Sequence guessing Denial of Services attacks
IETF Security Architecture (IPSEC)
Transport & Tunnel Modes
AH, ESP, SA, SPI, etc.
Key Management: ISAKMP/Oakley, SKIP
Virtual Private Networks (VPNs)
Reading: Computer Security, Appendix F, Chapt. 7

Week 13, Mar 30 – Firewalls and Intrusion Detection
Firewall types
Firewall architectures
Stateful packet inspection
Intrusion Detection Systems
Attack signatures
Intrusion Detection Systems
Intrusion Prevention Systems
Anomalous behavior detection
Reading: Computer Security, Chapters 8-9.

Week 14, Apr 6 – Forensics and Investigations
Computer security laws
Incident response
Conducting digital forensics investigations

Semester Team Projects Due: Apr 6.

Week 15, Apr 13 – Risk Assessment, Audit
Vulnerability Assessments Privacy & security
Performing Security Assessments Computer crime and forensics
Other topics as time permits
Review for Test #2
Reading: Computer Security, Chapters 14, 18.

Week 16, Apr 20
Test #2 – online via MyUSF
To review for Test #2: study lecture notes, chapters in Stallings book, homework, and any additional handouts.