DEPARTMENT OFCOMPUTER SCIENCE AND SOFTWARE ENGINEERING
AUBURN UNIVERSITY
**COMP 5370/6370 (6376 not offered)**
**Computer and Network Security**
Fall 2015
Professor: Anthony (Tony) Skjellum (skjellum@auburn.edu);
TA: Ms. Ananya Ravipati (azr0046@auburn.edu)

**Class location: Shelby Center Rm 1124; MWF 2pm-2:50pm; August 17-December 11, 2015**
           **Last day of class is December 4!**

**Final Exam: In Rm 1124, 4pm-6:30pm on December 7, 2015**

Office Hours: TBD for Ms. Ravipati – she will announce first week of class.
By appointment with Dr. Skjellum
(Each 3-4pm hour class when Dr. Skjellum lectures, he plans to leave as an informal office hour too whenever possible.)

Dr. Skjellum's office is Shelby Center Rm 3101D (in main office).  Ms. Ravipati's office in in Shelby Center Rm 3128.

Course Scope: 3 credits

Prerequisite: COMP 3270

*Survey of computer network security, techniques, technologies, theory, attacks and defenses, viruses and other malware and operating system vulnerabilities and safeguards.*

Course Objectives
1) Recognize potential risks and threats to computer operations and communications.
2) Understand the fundamental terminology and concepts.
3) Understand Federal rules and regulations affecting computer security, including legal ramifications, FOIA, and policies.
4) Understand security issues unique to wireless communications.
5) Have a working knowledge of relevant cryptographic techniques.
6) Have a critical understanding of computer security with an emphasis on "end-to-end vulnerabilities."
7) Ability to work with crypto keys and effect secure transmissions.
8) Understanding the ISO OSI Reference Model and how security fits with it, as well as relevant IETF standards.
9) Understand recent Internet vulnerabilities and their sources (*e.g.,* Logjam and Poodle).
10) Confident use of Git/Github and GPG/PGP in regards document transmission and secure e-mail communication.
11) Basic programming competencies related to these topics and this overall subject.

Format: Normally two lectures each week, one class exercise, special activity.  Guest lectures and special presentations may be included.   Test weeks there will be a review lecture before the test.

**References**

Primary:
COMP 5370/6370 Canvas Infrastructure

Required Book:
*Computer Security: Art and Science*, Matt Bishop
URL:  http://www.amazon.com/Computer-Security-Science-Matt-Bishop/dp/0201440997

ISBN-13: 078-5342440997
ISBN-10: 0201440997

Optional Book:
Network Security (2/e), Kaufman, Perlman, Speciner
URL:  http://www.amazon.com/Network-Security-Private-Communication-Edition/dp/0130460192

Extensive use of web content will be allowed, encouraged, and employed by the instructor and TA also (e.g., Wikipedia, IETF.org, Matt Bishop's web pages, etc).

Matt Bishop Home Pages:   http://nob.cs.ucdavis.edu/book/book-aands/index.html (about this book); top-level:  http://nob.cs.ucdavis.edu/bishop/

**Grades**

**Undergraduate**

| Gradable Activity | % Grade (approx.) | Description | Date (approx.) |
|---|---|---|---|
| Test #1 | 10 | In class | September 11 or 18 |
| Test #2 | 10 | In class | September 28 or October 3 |
| Test #3 | 10 | In class | October 16 or 23 (subject to change) |
| Test #4 | 10 | Take-home | November 18 |
| Classroom exercises | 2.5eaX8 = 20 | Individual HW, start in class, finish by date stipulated. | Various non-test weeks. May require extra work at home. |

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|---|---|---|---|
| Term Project | 20 | a term project prospectus is at the end of this document. | Due on last day of lecture: 12/4/15 @ 11:55pm. |
| Final Exam | 20 | Final Exam Period – Comprehensive! OPEN BOOK, LIMITED NOTES | December 7, 4pm-6:30pm. No early exams offered. |

**Graduate**

| Gradable Activity | % Grade (approx.) | Description | Date (approx.) |
|---|---|---|---|
| Test #1 | 7.5 | In class | September 11 or 18 |
| Test #2 | 7.5 | In class | September 28 or October 3 |
| Test #3 | 7.5 | In class | October 16 or 23 (subject to change) |
| Test #4 | 7.5 | Take-home | November 18 |
| Classroom exercises | 2.5eaX8 = 20 | Individual HW, start in class, finish by date stipulated. | Various non-test weeks. May require extra work at home. |
| HW Additional (Each HW will contain grad-only work) | 10 (subdivision TBD) | Individual HW | Various non-test weeks. |
| Term Project | 20 | a term project prospectus is at the end of this document. | Due on last day of lecture: 12/4/15 @ 11:55pm. |
| Final Exam | 20 | Final Exam Period – Comprehensive! OPEN BOOK, LIMITED NOTES | December 7, 4pm-6:30pm. No early exams offered. |

**Scoring Adjustments** - The Professor reserves the right to a) use "turn it in" type technology on all submitted work to ensure originality; b) to curve the grades in favor of the students if, at his sole discretion, tests in particular turn out to have an average substantially below 75%, c) to include "extra problems" that may be treated as experimental after the fact. Test dates may vary (other than the final exam) to ensure that the right material has been covered before tests are administered.

**Attendance –** It is required. When you can't attend, and have a legitimate excuse, please provide it to the Professor (see **Excused Absences** below).

**Make-up tests** — Make-up tests will be offered only with excused absence (see below). Arrangement to make up missed major examination (e.g., final exams, mid-term exams) due to properly authorized excused absences must be initiated by the student within one week from the end of the period of the excused absences.  Except in unusual circumstances, such as continued absence of the student or the advent of University holidays, a make-up exam will take place within two weeks from the time that the student initiates arrangements for it. Except in extraordinary circumstances, no make-up exams will be arranged during the last three days before the final exam period begins.  The format of the make-up exam will be *(as specified by instructor).*  No early final exams will be given, except if this is in support of an excused absence.

**Excused Absences**:  Students are granted excused absences from class for the following reasons: Illness of the student or serious illness of a member of the student's immediate family, the death of a member of the student's immediate family, trips for student organizations sponsored by an academic unit, trips for University classes, trips for participation in inter-collegiate athletic events, subpoena for a court appearance, and religious holidays. Students who wish to have an excused absence from this class for any other reason must contact the instructor in advance of the absence to request permission.  The instructor will weigh the merits of the request and render a decision. When feasible, the student must notify the instructor prior to the occurrence of any excused absences, but in no case shall such notification occur more than one week after the absence. Appropriate documentation for all excused absences is required.  Please see the *Student Policy eHandbook* for more information on excused absences:

http://www.auburn.edu/student_info/student_policies/ .

**Student's Responsibility -** You are responsible for readings in the book as assigned even if topics are not covered in lecture.   You are responsible for the contents of material presented in class, or assigned above and beyond the book too. Previews for each test will ensure there is a clear outline of what tests will cover.  The final will be **comprehensive**.

**Accommodations** – Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by e-mail. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).

**Academic Honesty Policy:** All portions of the Auburn University student academic honesty code (Title XII) found in the *Student Policy eHandbook* will apply to this class.  All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.

**Note:** You will be given specific guidance on homework as to where you can cooperate, and where you must do work entirely on your own.  Unless otherwise specified, all work must be done on your own.  All tests are individual assignments, subject to allowed materials only used at the examination.

As a student, you are responsible for understanding the concept of <u>plagiarism</u> in written and spoken form (although there are no presentations in this class), and how to paraphrase and how to make the appropriate citation of others' work in term papers and any other written assignments.  Copying software without proper permission is a form of plagiarism as well.  If you need help understanding the plagiarism concept and how to avoid it, please ask the instructor for help.  Note that plagiarism is a form of academic misconduct.   The instructor reserves the right to use automated software for plagiarism detection.

**The TA's rights and responsibilities:** Include grading, proctoring, some lecturing, and helping you where appropriate.  <u>Always treat your TA with respect and professionalism</u>.

**Homework submission/grading:** All submission and grading will be through Canvas, except as noted.  Late homework is still required to get a passing grade.  Late will be counted off 10% per day (weekends count one day), up to a maximum deduction of 50%.  All late HW must be turned in by December 4, 2015 @ 11:55pm central time.  Failure to turn in HW will result in a penalty of an "F" in the class.

**Distance Students (not offered this semester):** Exams will be proctored following Auburn policy.

**COMP 5370/6370/6376 - Computer and Network Security**

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| **What** | Term Project |

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| **Outcomes** | To explore an aspect of cyber security that is of interest to you. |

**Assignment**

How could we make a course on computer and network security so riveting that you would not only look forward to class but would be disappointed that the semester is so short? Let's face it: the textbook for this course is dry and you may find that the lectures don't always spark your interest. But, the topic itself can be an exciting one if we approach it in an engaging way. This is where you come in.

Your assignment is to develop a lesson that educates someone about a course topic of interest to you. Your lesson should address three general questions:

1. What is the topic?
2. Why is it relevant?
3. What about it should your audience know?

The specific topic is up to you, as is the means by which you choose to express the topic. I encourage you to select a medium that compels your audience to appreciate, understand, and value the information you wish to convey, as well as one that inspires them to explore the topic further.

**Guidelines**

– To distinguish between the graduate and undergraduate sections of the course, I am asking graduate students to work individually. Undergraduate students may work in teams of one, two, or three.

– Target your lesson to an audience of your peers; that is, students taking COMP5370 should use COMP5370 students as their audience, similarly for COMP6370 and COMP6376.

– The lesson should be original. It should not be something created for, or used in, another course. Information sources must be cited properly. It is OK to quote material, but please make sure to cite where the quote originated. I must be able to clearly distinguish between quoted material and

paraphrased material.  Projects consisting of large passages of quoted material are not acceptable.  See "Definition and Context" of the ACM Plagiarism Policy[1] for common forms of plagiarism.

– Your project should not regurgitate information found elsewhere, but should add value to it.  Strive for depth, not breadth.

– Your project should be objective.  Opinions, recommendations, suggestions, etc. are highly discouraged. If present, such subjective writing must be substantiated with a sound logical argument that has a basis in fact or empirical evidence.

– Your project should place your topic in context how it affects industry, the community, or society.  In other words, bring your topic to life by explaining its relevance.

**Topic Ideas**
– Document a case study of a particular cyber event.  Note the vulnerability, how the vulnerability was exploited, what information was compromised, what actions the victim took to mitigate the exploited vulnerability, and (if appropriate) how the vulnerability was repaired.  See http://www.heritage.org/research/reports/2014/10/cyber-attacks-on-us-companies-in-2014 for a list of cyber events.
– Explain how to copy a phone SIM card.
– Explain the impact of mobile devices on security.
– Describe security in industrial control systems.
– Explore the impact of cloud computing on security.
– Explore the impact of Internet of Things on security.
– Demonstrate common web vulnerabilities.
– Illustrate threat modeling.
– Demonstrate code signing.
– Describe how PGP web of trust works.
– Demonstrate use of a tool, such as Wireshark.
– Explain code obfuscation.
– Illustrate residual memory recovery.

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[1] www.acm.org/publications/policies/plagiarism_policy

**Media Ideas**

- Poster
  - A poster is used to provide detailed information in a quick-to-read, visual format.  Posters have a large format and are displayed on an easel or hanging on a wall.   Dimensions vary, but are typically 30x36 or 36x40.  Posters may be landscape or portrait.   You can print posters at the library at no cost.  Submit in .pdf, pptx, or .docx format.
  - Some helpful resources (N.B.:  These are links to hints on how to develop posters that describe research.  I'm not asking you to conduct research, so please disregard the "research" aspect.  Instead, focus on the how to communicate ideas effectively.)
    - http://www.makesigns.com/tutorials/
    - http://www.posterpresentations.com/html/free_poster_templates.html
    - https://brown.edu/academics/college/fellowships/utra/research-symposium/creating-successful-poster
    - http://www.utexas.edu/ugs/our/poster
- Infographic
  - An infographic is a visual representation of information that is intended to be to the point, easy to understand, content rich, and portable.   In contrast to a poster that provides the audience with the foundational background information, an infographic conveys practical information of immediate use.  As such, infographics are often aimed at practitioners because they encapsulate useful information in a small footprint.  Infographic dimensions vary widely, but for purposes of our class, please use a 8.5x14 format (legal size paper).  Submit in .pdf, .docx, or .pptx format.
  - Resources:
    - http://blog.slideshare.net/2013/12/16/5-steps-to-creating-a-powerful-infographic/
    - sample infographic: http://swemac.cse.eng.auburn.edu/~umphrda/comp6370/2014Fall/resources/EncryptionDemystified.pdf
- Screencast
  - A screencast is a video -- typically a screen capture -- in which a narrator walks the audience through a topic of interest.  It is particularly helpful when the

topic doesn't lend itself to a static description because the narrator can show a chain of logic in a continuous fashion without having the audience interpolate from one static concept to another. Screencasts are particularly powerful for demonstrating something in action. Please make sure any screencast you create is in one of the following formats: .wmv, .mp4, or .m4v. Research shows that the most effective instructive screencasts are in the four-six minute range and do not exceed nine minutes.

- o example: see the HeartBleed video in the "Foundations" section Canvas.

- Video enactment
  - o A video enactment consists of one more actors carrying out a story line, much like a TV show or movie. This is the one venue this semester in which humor might be appropriate. Regardless of tone, the video must convey a substantive lesson. Please make sure any video you create is in one of the following formats: .wmv, .mp4, or .m4v. Videos should not exceed nine minutes.
  - o example: http://swemac.cse.eng.auburn.edu/~umphrda/comp6370/2014Fall/resources/ShawVideoSD.mp4

- Paper
  - o A paper is a traditional means of conveying information. If you choose to write a paper, it should follow the "Large Format Single Column" ACM style guide[2]. Please ignore the requirement to place an ACM/Dad, copyright statement in the lower portion of the first page. Your paper, excluding the bibliography, should be 4-to-5 pages in length once formatted in the above style. Your paper must reference at least three sources published within the past five years. Submit in .pdf or .docx format.

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| **Accountability** | – COMP5370: 11:55pm on last day of lecture. . |
| | – COMP6370: 11:55pm on last day of lecture. |
| | – COMP6376: 11:55pm one week after the last day of lecture. |

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[2] www.acm.org/publications/word_style/word-style-toc

Assessment

Your project will be assessed based on the following guidelines:

**SCORE LEVELS 90-100:  "WOW"**
Sustains insightful, in-depth analysis of complex ideas; develops and supports main points with logically compelling reasons and/or highly persuasive examples; provides context in terms of industry use; is well focused and well organized; exploits the chosen medium to engage the audience in the topic; skillfully uses sentence variety and precise vocabulary to convey meaning effectively; demonstrates superior facility to communicate concepts; is an example of superior work.

**SCORE LEVELS 80-89:  "Good"**
Provides generally thoughtful analysis of complex ideas; develops and supports main points with logically sound reasons and/or well-chosen examples; alludes to usefulness and use in industry; is generally focused and well organized; takes advantage of the chosen medium;
uses appropriate sentence variety and vocabulary to convey meaning clearly; demonstrates good control over expression of concepts; but may have minor errors that do not interfere with meaning.

**SCORE LEVELS 70-79:  "Meh"**
Delivers common information and facts; develops and supports main points with reasonable, although possibly incomplete, reasons and/or examples; contains surface information with little depth; is adequately organized; choice of media appears not to contribute to engagement; conveys meaning with reasonable clarity; demonstrates satisfactory control of expression of ideas but may have some errors that affect clarity.

**SCORE LEVELS 60-69:  "Huh?"**
Displays some competence, although the expression of ideas is flawed in at least one of the following ways: limited analysis or development; weak organization; weak control of expression, with errors that often result in vagueness or lack of clarity.

**SCORE LEVELS 0-59:  "Parents, I'm Staying An Extra Semester"**
Displays serious weaknesses in analytical thinking. The project is seriously flawed in at least one of the following ways: serious lack of analysis or development; lack of organization; serious and frequent problems in expression, with errors that obscure meaning, improper use of information sources.