

Information Technology
Course Number: 22:544:643
Course Title: Information Security

COURSE DESCRIPTION

Recent years have witnessed widespread use of computers and their interconnecting networks. This demands additional computer security measures to protect the information and relevant systems. This course prepares the students to meet the new challenges in the world of increasing threats to computer security by providing them with an understanding of the various threats and countermeasures. Specifically, students will learn the theoretical advancements in information security, state-of-the-art techniques, standards and best practices. In particular, the topics covered in this course include: Study of security policies, models and mechanisms for secrecy, integrity and availability; Operating system models and mechanisms for mandatory and discretionary controls; Data models, concepts and mechanisms for database security; Basic cryptology and its applications; Security in computer networks, emerging applications and smart devices; Identity theft; Control and prevention of viruses and other rogue programs.

COURSE MATERIALS

Text Book:

William Stallings and Lawrie Brown, Computer Security: Principles and Practice, 4th edition

Reference Books:

1. Matthew Bishop, Introduction to Computer Security, Addison-Wesley
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a Public World," Prentice-Hall.
3. Plus selected readings

Other sources:

1. The DBLP Bibliography
2. Google Scholar

Related Journals and Conferences:

1. ACM Conference on Computer and Communications Security (CCS)
2. IEEE Symposium on Security and Privacy (S&P)
3. ACM Symposium on Access Control Models and Technologies (SACMAT)
4. IFIP WG11.3 Working Conference on Data and Application Security and Privacy (DBSEC)
5. Annual Computer Security Applications Conference (ACSAC)

6. Computer Security Foundations Workshop
 7. ACM Conference on Data and Application Security and Privacy (CODASPY)
 8. ACM Transactions on Information Systems Security (TISSEC)
 9. IEEE Transactions on Dependable and Secure Systems (TDSC)
 10. Journal of Computer Security
 11. Computers & Security
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LEARNING GOALS AND OBJECTIVES

- This course is designed to help students develop skills and knowledge in the following area(s):
 1. Advanced Knowledge in Specialized Areas
 2. Advanced Research Skills
 3. Ethical Judgement
- Students who complete this course will demonstrate the following:
 - a. Students will develop advanced theoretical or practical research skills in the area of security.
 - b. Students will make original research contributions.
 - c. Doctoral students will complete dissertation proposals, an original intellectual contribution to their field of knowledge.
- Students develop these skills and knowledge through the following course activities:
Lectures, Quizzes, Exams, and Term project. Students will also work on a term project in which they try to identify a security problem and review and critique the research solutions on this problem, write a research paper, and present it. Students may also propose novel solution to address the problem. Projects can be done individually or as a group of two students.
- Your project should proceed in two phases:
 1. In the first phase, you form the team, identify the research problem, related research papers and write title, abstract, reference list and outline of the paper.
 2. At the end of the semester, you submit the full paper and give a presentation.

After completing the course, students will be able to:

- o Become familiar with the basics of security.
- o Learn the security tools, techniques and attack

PREREQUISITES

Undergraduate level knowledge in basic statistics and databases is needed

ACADEMIC INTEGRITY

I do NOT tolerate cheating. Students are responsible for understanding the RU Academic Integrity Policy (<http://academicintegrity.rutgers.edu/>)

I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, “On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment.” I will screen all written assignments through *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large database of past work. Don’t let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

ATTENDANCE AND PREPARATION POLICY

- Expect me to attend all class sessions. I expect the same of you. If I am to be absent, my department chair or I will send you notice via email and Canvas as far in advance as possible. If you are to be absent, report your absence in advance at <https://sims.rutgers.edu/ssra/>. If your absence is due to religious observance, a Rutgers-approved activity, illness, or family emergency/death and you seek makeup work, also send me an email with full details and supporting documentation within a week of your first absence.
 - For weather emergencies, consult the campus home page. If the campus is open, class will be held.
 - Expect me to arrive on time for each class session. I expect the same of you.
 - Expect me to remain for the entirety of each class session. I expect the same of you. Expect me to prepare properly for each class session. I expect the same of you. Complete all background reading and assignments. You cannot learn if you are not prepared. The minimum expectation is that for each 3-hour class session, you have prepared by studying for at least twice as many hours.
 - Expect me to participate fully in each class session. I expect the same of you. Stay focused and involved. You cannot learn if you are not paying attention.
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CLASSROOM CONDUCT

- Students are responsible for reviewing the specified chapters covered by the lecture. Please note that you are responsible for the ENTIRE content of each chapter plus any additional handouts, unless otherwise notified. You are not allowed to possess, look at, use, or in any other way derive advantage from the solutions prepared in prior years, whether these solutions are former students’ work or copies of solutions that were made available by instructors.
- You should exchange ideas and engage in a class discussion for the topics (and related papers) discussed in class. Participation is graded, in the sense that informative comments are valued.
- Electronic Devices: In order to minimize the level of distraction, all watches, beepers and cellular phones must be on quiet mode during class meeting times. Students who wish to use a

computer/PDA for note taking need prior approval of the instructor since key clicks and other noises can distract other students.

- Recording of lectures by any method requires prior approval of the instructor.
- Email Messages: Remember to put the course number (643) in the subject field of every e-mail message that you send me. E-mail messages that are missing this information are likely to be automatically redirected to a folder the instructor will seldom check, and it is not our responsibility to respond to these.

EXAM DATES AND POLICIES

There are 3 Quizzes in this course. The dates and covered material is indicated in the schedule.

During exams and quizzes the following rules apply:

- If you have a disability that influences testing procedures, provide me an official letter from the Office of Disability Services at the start of the semester.
- No cell phones, smart watches or other electronics are allowed in the testing room.
- Alternate seating; do not sit next to another student or in your usual seat.
- Use the bathroom prior to the exam start; bathroom breaks,
- Your exam will not be accepted unless you sign the Honor Pledge.

GRADING POLICY

Course grades are determined as follows:

Research Paper and Presentation 30%

Quizzes 60%

Attendance and Class participation 10%

Note: There will be no extra credit assignments, quizzes, or exams. Therefore, please plan to put in your best effort right from the start. Your final grade is not subject to negotiation. If you feel I have made an error, submit your written argument to me within one week of receiving your final grade. Clarify the precise error I made and provide all due supporting documentation. If I have made an error, I will gladly correct it. But I will adjust grades only if I have made an error. I cannot and will not adjust grades based on consequences, such as hurt pride, lost scholarships, lost tuition reimbursement, lost job opportunities, or dismissals. Do not ask me to do so. It is dishonest to attempt to influence faculty in an effort to obtain a grade that you did not earn, and it will not work.

COURSE SCHEDULE



Basic Security Concepts – Chapter 1 + Selected Reading

Introduction to Cryptography, Secret Key and Public Key Cryptography – Chapters 2, 20, 21 + Selected Reading



Introduction to Cryptography, Secret Key and Public Key Cryptography (continued)



Digital Signatures and Certificates – Chapters 2, 21 + Selected Reading



Identification and Authentication – Chapters 3, 23 + Selected Reading

Research Paper Title, Abstract and Reference List due



Quiz 1

Internet Security – Chapters 7, 9, 22 + Selected Reading



Internet Security (continued)



Research Paper Outline due

Security Models – Chapter 4 + Selected Reading



Security Models (Continued)



NO CLASS



Database Security – Chapter 5 + Selected Reading



Quiz 2

Database Security (Continued)



Cloud Security – Chapter 13 + Selected Reading



Crypto Currency - Selected Reading



Quiz 3

Crypto Currency (Continued)



Research Paper Due

Research Paper Presentations: Each group will have 20 minutes to present



Research Paper Presentations: Each group will have 20 minutes to present

Topics for the Research paper include:

1. Best Source: The session topics in the conferences listed above
2. Security Models for New Application domains
3. Cloud Security
4. Identify Management
5. Role based access control
6. Attribute based access control
7. Security policy configuration, mining
8. Security for Smart Devices
9. Security and Internet of Things
10. Security for Social Networks
11. Big Data Security
12. Security for Digital Money
13. Inference Control
14. Security in WWW
15. Security for Mobile Systems
16. Security for Spatial/temporal Systems
17. Intrusion Detection
18. Security for Web services
19. Biometrics
20. Viruses
21. Computer Ethics
22. Spam and Phishing
23. Identity theft
24. Security Policy Management
25. Human Aspects of Security
26. Crypto currency
27.

SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. More information can be found at ods.rutgers.edu.

[Rutgers University-New Brunswick ODS phone (848)445-6800 or email dsoffice@echo.rutgers.edu]

[Rutgers University-Newark ODS phone (973)353-5375 or email ods@newark.rutgers.edu]

If you are *pregnant*, the Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy.

[Rutgers University-New Brunswick Title IX Coordinator phone (848)932-8200 or email jackie.moran@rutgers.edu]

[Rutgers University-Newark Office of Title IX and ADA Compliance phone (973)353-1906 or email TitleIX@newark.rutgers.edu]

If you seek *religious accommodations*, the Office of the Dean of Students is available to verify absences for religious observance, as needed.

[Rutgers University-New Brunswick Dean of Students phone (848)932-2300 or email deanofstudents@echo.rutgers.edu]

[Rutgers University-Newark Dean of Students phone (973)353-5063 or email DeanofStudents@newark.rutgers.edu]

If you have experienced any form of *gender or sex-based discrimination or harassment*, including sexual assault, sexual harassment, relationship violence, or stalking, the Office for Violence Prevention and Victim Assistance provides help and support. More information can be found at <http://vpva.rutgers.edu/>.

[Rutgers University-New Brunswick incident report link: <http://studentconduct.rutgers.edu/concern/>. You may contact the Office for Violence Prevention and Victim Assistance at (848)932-1181]

[Rutgers University-Newark incident report link: https://cm.maxient.com/reportingform.php?RutgersUniv&layout_id=7. You may also contact the Office

of Title IX and ADA Compliance at (973)353-1906 or email at TitleIX@newark.rutgers.edu. If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or email run.vpva@rutgers.edu]

If students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate, you should submit a request via <https://temporaryconditions.rutgers.edu>.

If you are a military **veteran** or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. <http://veterans.rutgers.edu/>

If you are in need of **mental health** services, please use our readily available services.

[Rutgers University-Newark Counseling Center: <http://counseling.newark.rutgers.edu/>]

[Rutgers Counseling and Psychological Services–New Brunswick: <http://rhscaps.rutgers.edu/>]

If you are in need of **physical health** services, please use our readily available services.

[Rutgers Health Services – Newark: <http://health.newark.rutgers.edu/>]

[Rutgers Health Services – New Brunswick: <http://health.rutgers.edu/>]

If you are in need of **legal** services, please use our readily available services: <http://rusls.rutgers.edu/>

Students experiencing difficulty in courses due to **English as a second language (ESL)** should contact the Program in American Language Studies for supports.

[Rutgers–Newark: PALS@newark.rutgers.edu]

[Rutgers–New Brunswick: eslpals@english.rutgers.edu]

If you are in need of additional **academic assistance**, please use our readily available services.

[Rutgers University-Newark Learning Center: <http://www.ncas.rutgers.edu/rlc>

[Rutgers University-Newark Writing Center: <http://www.ncas.rutgers.edu/writingcenter>]

[Rutgers University-New Brunswick Learning Center: <https://rlc.rutgers.edu/>]

[Optional items that many faculty include:

- Students must sign, date, and return a statement declaring that they understand the RU Academic Integrity Policy.

- Students must sign, date, and return a statement declaring that they understand this syllabus.]