Course Description

IS511 Introduction to Information Security

This course covers the overall contents of information security. Students will be exposed to fundamental concepts in information security including cryptography, system security, software security, web security and network security. This course introduces how security attacks occur in the modern computing environments. Students will also have opportunities to understand techniques to discover and disable such security attacks.

IS521 Information Security Laboratory

The primary goal of this course is "to learn by doing". Students will learn fun-damental ideas in computer systems and security by creating and solving CTF problems. Students will create their own CTF problems and they will solve each other's problems.

IS522 Introduction to Systems Security

The main purpose of this course is to review the fundamental concepts in operating systems with the view of security perspective and learn about system exploitations and the defense methods in ofder to cultivate the ability to design a robust system against security attacks. Teh course also covers kernel reference monitors and trusted execution environments which can be employed to design secure systems.

IS523 Hacking Exposed

Every scientific research starts from finding new problems. Likewise, the most important step in security research is to discover new attacks. Today, media is filled with attacks on various systems: Web servers, DNS, Internet banking, e-voting systems, cellular networks, social networks, mobile phones, nuclear power plants, and implantable medical devices. These attacks are originated from various vulnerabilities, such as user interface design, ignorance or security by obscurity, deployment mistakes, and physical exposure. The main objective of this course is to learn how to think like an adversary. In other words, we will look at various ingenuous attacks and discuss why and how such attacks were possible. This is first crucial step to design and deploy systems robust against various attacks.

IS531 Computer Architecture and Security

This course covers the computer architecture essential for system security, addressing the basic understanding of computer organization, and the advanced issues for hardware security. For the basic computer architecture, this course covers processor architecture, cache and memory organization, virtual memory and hardware support for virtualization, and I/O subsystems. This course also addresses hardware-rooted security techniques.

IS532 Information Security policy and management

In the first half of this lecture, we first look at various social and national issues related to information security and learn about national policies to respond to them. And in the second half, we look at various management response methods for a company or public institution to achieve

information protection.

IS534 Machine learning for computer security

Introduce students the fundamental concepts and intuition behind modern machine learning techniques and algorithms, beginning with topics such as perceptron to more recent topics such as boosting, support vector machines and Bayesian networks. Statistical inference will be the foundation for most the algorithms covered in the course.

IS537 Information Theory for Security

This course covers the core concept of information theory, including the fundamental source and channel coding theorems, coding theorem for Gaussian channel, rate distortion theorem, vector quantization, multiple user channel and multiple access channe.

IS539 Network Security

This course aims to prepare undergrad/grad students for research and development in network security by investigating security and privacy research problems in network and distributed systems.
At the end of the module, students will be able to:
- explain the security challenges and opportunities of various emerging network and distributed systems;
- critique state-of-the-art attack/defense mechanisms and identify possible gaps that could be addressed in future work; and
- find interesting research problems and propose novel solutions.

IS541 Wireless Mobile Internet and Security

This course is intended for graduate students who want to understand Wireless Mobile Internet and related security issues. It provides a comprehensive technical guide covering introductory concepts, fundamental techniques, recent advances and open issues in wireless networks with their security matters. The course consists of lectures, exams and term project.

IS542 Web Service Security and Privacy

The course provides in-depth studies of numerous web attacks and defenses. The course covers comprehensive security vulnerabilities and privacy risks that exist on the Web. We will also discuss how to detect those vulnerabilities and alleviate the privacy risks.

IS551 User-Centric Security

Despite continuous effort to develop user-centric security mechanisms, bridging the chasm between security and usability is still a core scientific challenge. Regardless of the level of protection that a security system can provide, its security guarantee is bounded by the humans who operate the system. Hence, usability and security must be considered concurrently. This course introduces a variety of usability issues related to security and current research efforts in this area. Students also get an opportunity to conduct a research project to analyze and improve a variety of usability issues in the current security systems.

IS561 Binary Code Analysis and Secure Software Systems

This course provides an in-depth study of attacks and defenses in software. The major themes this course will teach include memory safety vulnerabilities, control-flow hijacking, malicious software, web attacks, program analysis techniques, and software model checking. We will offer significant hands-on experience on each topic: students will work on CTF (Capture The Flag) style hacking challenges during the semester.

IS571 Advanced Cyber Security Practice

This course covers a variety of topics to discover unknown vulnerabilities. We will learn memory analysis and debugging skills to analyze vulnerabilities. We will discuss some tools, technical documents, and papers discussed actively in industry. Finally, we will study how to find vulnerabilities automatically.

IS572 Embedded Systems Security

Embedded systems are just everywhere around us. All we have smart phones, and we are surrounded by IoT devices, network appliances, military systems, vehicular devices, and/or industrial control devices. Recently, media covers the security problems in deploying such embedded systems almost everyday. This course aims to raise the ability of security analysis in view of offensive manner so that students also can design any defense measures around this area.

IS581 Security Proof and Attacks in Cryptography

This course deals with provable security and generic attacks in cryptography. We will prove security for various cryptographic constructions. The topics include block cipher structures such as Feistel networks and key alternating ciphers, message authentication codes, block cipher-based hash functions, key length extension schemes such as triple encryption.

IS593 Introductory Special Topics in Security and Privacy

Area of security and privacy has been changed rapidly. News areas are showing up every year and a lot of convergence with different field is happening. To address these, this course covers topics of interest in security and privacy at the graduate level. The course content is specifically designed by the instructor.

IS631 Kernel System Security

Operating system kernel is the most critical component in the system as it provides the basic functionalities and the secure environment in which applications run and operate. In this course, the fundamentals of OS kernel and system programming, principles and operation of the open-source Linux operating system are taught with an emphasis on security aspect, so that students can acquire a comprehensive understanding of operating system kernel, analysis methods and countermeasures against various rootkit malware that compromise and manipulate operating system.

IS632 Hypervisor System Security

Hypervisor is a software platform that virtualizes computer hardware to support multiple instances of operating system running concurrently on a shared hardware system. Hypervisors are also widely used for cloud-based hosting service. This hypervisor platform can be utilized for higher degree of

isolation for computer security monitoring and analysis. It provides an adequate environment for building kernel integrity monitors. This course will provide the fundamentals and inner-workings of hypervisors in the context of designing new security, monitoring, and analysis tools.

IS639 Advanced Network Security
In this class, students will learn about recent and emerging networking technology and related security issues through research papers. In addition, students will learn how to realize the covered techniques by implementing real network security applications.

IS661 Advanced Software Security
The goal of this course is to develop scientific communication skills. Students will learn how to write a research paper, give a technical talk, and review a research paper. Students will propose and complete a research project during the semester.

IS681 Content Security
In this course, multimedia data protection and related security issue will be studied for privacy and commercial property protection. Particulary, image video, and related media protection mechanism will be focused including the digital watermarking, fingerprinting, etc.

IS711 Advanced Theory for Information Security Technology Convergence
A study for advanced information security theory including technology, policy and manager and cyber hacking response process, Future information security technology. Case study for Real cyber hacking incident and proposal for cyber hacking response measure

IS893 Special Topics in Security and Privacy
Area of security and privacy has been changed rapidly. News areas are showing up every year and a lot of convergence with different field is happening. To address these, this course covers topics of interest in security and privacy at the graduate level. The course content is specifically designed by the instructor.

IS960 M.S. Thesis Research
IS966 Seminar (M.S.)
IS980 Ph.D. Dissertation Research
IS986 Seminar (Ph.D.)