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CSE 694K: Network Security

Description

An introduction to network security; security threats, services, protocols, verification and design, architectures, technologies, testing, advances; elements of cryptosecuring network systems and applications.

Level, Credits, Class Time Distribution, Prerequisites

Level	Credits	Class Time Distribution	Prerequisites
UG	3		CIS 677 or permission of instructor

Quarters Offered

- Sp

General Information, Exclusions, Cross-listings, etc.

Intended Learning Outcomes

- Master some protocols for security services.
- Be familiar with fundamentals of cryptography.
- Be familiar with network security threats and countermeasures.
- Be familiar with network security designs using available secure solutions (PGP, SSL, IPSec, and firewalls).
- Be familiar with advanced security issues and technologies (such as DDoS detection and containment, anonymous communications, and security patch testing, verification and design).
- Be exposed to original research in network security.

Texts and Other Course Materials

- *Cryptography and Network Security: Principles and Practice, Third Edition* Prentice Hall, 2002. ISBN: 0-13-091429-0 (text book) - William Stallings
- *Applied Cryptography, (2nd Edition)*, Wiley 1996 ISBN 0-471-11709-9 - Eric Schneier,
- *Security + Guide to Network Security Fundamentals*, Thomson, ISBN 0-07-7 - Paul Campbell, Ben Calvert, Steven Boswell,
- *Network Security - Private Communication in a Public World*, Prentice Hall

ISBN 0-13-061466-1 - Charlie Kaufman, Radia Perlman and Mike Specine

Topics

Number of Hours	Topic
1	Security principles and security threats: (1) Security services: privacy, confidentiality, authentication, integrity, availability, non-repudiation, access control, etc (2) Security threats: traffic analysis, IP spoofing of service, routing attacks, information leakage, remote arbitrary execution, viruses, etc. (3) Social, ethical, policy and legal issues we will teach and will not teach
3	Elements of cryptography: (1) Classic ciphers, modern ciphers and ciphers and one-way functions (2) Secret key (symmetric): DES/AE public key (asymmetric): RSA
9	Protocols for Security Services: (1) Key distribution and management: Diffie-Hellman key exchange and certificate (2) Non-repudiation and digital signatures, ElGamal signature (3) Authentication and its protocols: Kerberos and Needham-Schroeder (4) Integrity (5) Privacy (6) Authorization
7	Securing network systems and applications: (1) Email security: Pretty Good Privacy (PGP) (2) Web security: Secure Sockets Layer (SSL) (3) IP security and VPN: IPsec (4) Security in routing: OSPF and BGP (5) Firewalls: intrusion detection
6	Advanced security issues and technologies: (1) Large scale attacks on the Internet and their defense (2) DDoS attack and its defense: types of DDoS attacks, trace-back and attack containment (3) Active worms (4) Anonymous communication (5) Wireless security
3	Security with constrained resources: case studies in sensor networks
1	Exam

Representative Lab Assignments

- Implementation of a key exchange protocol in wireless sensor networks
- Modification of a protocol for Logical Grid Routing
- Implementation of the strong hop-by-hop integrity protocol

Grades

Homework assignments	20%
Lab exercises	25%
Midterm exam	30%
Research project	25%

Relationship to ABET Criterion 3

a	b	c	d	e	f	g	h	i	j	k
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[detail](#)

Relationship to CSE Program Outcomes/Objectives

1a	1b	1c	2a	2b	2c	3a	3b	4a	4b	5a	5b	5c
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[detail](#)

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