Topics:
1. Risks and Trust
- Risks of Computer Systems
- Vulnerabilities and System Design
- How to steal information
- Basics of Attacks
- The Shared Secret Problem

2. Threat Models
- Internet Threat Model
- Ken Thompson and Software Trust
- Viral Threat Model

3. Attacks
- Attack Mechanisms
- System attacks and Network Attacks
- Virus, Trojan, Worms, Spyware, Adware, Browser attacks
- Buffer Overflows
- The “RootKit” Attack
- Malicious processes and computational power
- Network based attacks (man in the middle, denial of service, pharming)

4. Data and Code Formats
- How memory is organized
- Code, data and other in-core structures
- How the computer operates at the binary level
- Binary and I/O conversions
- File data and how data movement occurs

5. Basic Cryptography
- Random numbers, Cryptographic Hashes
- Symmetric Encryption
- Asymmetric Encryption
- Digital Signatures
- Digital Certificates
- Certificate Authorities and Certificate Chains
- Secure Sockets Layer (SSL) and IPSec

6. Safe Programming Techniques
- Coding practices and safety
- Code bloat and safety
- Feature Creep
- Versatility and Vulnerabilities
- Overall Design of Complex Systems

7. Operating System Mechanisms
- Identity and Authentication
- Protection in Operating Systems
- Interrupt handlers and System calls
- Redirecting services
- Reliable bootstrap, Address space protection

8. **Virtual Machine Systems**
- Types of Virtual Machines
- How they work
- Host Operating Systems and VMM interactions
- Trust and Virtual Machines
- Using Virtual Machines for Integrity Enforcement

9. **Hardware Security Enforcers**
- Trust and Hardware Modules
- The TCG approach
- The CoPilot approach
- Secure wallets
- Secure co-processors

10. **Application Security**
- Firewalls
- Virus Detection
- Fallibility of Virus detection
- Signatures and Software
- Integrity checking of software
- Combining schemes to harden the software environment

11. **Personal Security**
- How safe is your information?
- What is valuable to others?
- Protecting privacy
- Protecting finances
- Repudiation, spoofing and identity theft
- Devices for personal safety and identity

12. **Smart Card Systems**
- Types of Smartcards
- Personal Security and Smartcards
- Risks and Vulnerabilities of Smart Cards
- Financial Transactions
- Mobile Authentication
- System verification
- Trust model
Further Information: Will be provided on the class web-site.

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