



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Postgraduate

Branch: Computer Engineering (Cybersecurity)

Course / Subject Code: ME01059061

Course / Subject Name: Operating System Security

| | |
|------------------------|------------------------------|
| WEF Academic Year | : 2024-25 |
| Semester | : 1 |
| Category of the Course | : Program Elective Course-II |

Prerequisite:

- Operating System Fundamentals and Understanding OS Functionality.

Rationale:

- This course aims to study, learn, and understand the main concepts of secure operating systems design and Hardware as well as software features that support these systems.
- To understand BIOS boot environments and how they interact with the platform architecture.

Course Outcome:

After completion of the Course, Students will be able to:

| No | Course Outcomes | RBT Level* |
|----|--|------------|
| 01 | Understand the concept of secure operating system & virtualization | UN |
| 02 | Understand various security features in Multics, Windows and Linux OS. | UN |
| 03 | Analyze different models for securing commercial Operating Systems | AN |
| 04 | Differentiate the System Management Mode (SMM), chip-set architecture | AN |
| 05 | Critiquing how the BIOS interacts with the Trusted Platform Module (TPM) and the measured boot process | EV |

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Course Scheme:

| Teaching Scheme | | | Total Credits | Assessment Pattern and Marks | | | | Total Marks |
|-----------------|----|----|---------------|------------------------------|-------|-----------|--------|-------------|
| L | T | PR | C | Theory | | Practical | | |
| | | | | ESE (E) | PA(M) | ESE (V) | PA (I) | |
| 03 | 00 | 02 | 04 | 70 | 30 | 30 | 20 | 150 |

Course Content:

| Sr No | Course Content | No of Hours | % |
|-------|--|-------------|----|
| 1 | UNIT-I: Introduction: Operating System Fundamentals, Concept of Trusted Operating Systems and Secure Operating Systems, Understanding of Trust and Threat Models | 06 | 15 |



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| 2 | UNIT-II: Access Control Fundamentals: Protection System – Lampson’s Access Matrix, Mandatory protection systems, Reference monitor. | 06 | 15 |
| 3 | UNIT-III: Multics: Multics systems, Multics security, Multics vulnerability analysis | 06 | 15 |
| 4 | UNIT-IV: Security Analysis in ordinary Operating System: Case Study – UNIX and Window Operating System and latest Operating Systems | 06 | 15 |
| 5 | UNIT-V: Verifiable security Goals Information flow concept, Denning’s Lattice model, Bell-Lapadula model, BIBA Integrity model, Covert Channels, security kernels – Secure communication process (SCOMP) and GEMINI operating system | 06 | 15 |
| 6 | UNIT-VI: Secure capability System Fundamentals, Security challenges, Secure Virtual Machine Systems | 05 | 10 |
| 7 | UNIT-VII: Understanding on Mobile Operating Systems and Security Concern with Challenges | 03 | 08 |
| 7 | UNIT-VII: BIOS Introduction, BIOS Identification and trusted platform, Roots of trust, Challenges in bootstrapping trust in secure hardware. | 02 | 07 |

Reference Book:

1. Trent Jaeger, Operating System Security, Morgan & Claypool Publishers, 2008.
2. Bryan Parno, Jonathan M. McCune, Adrian Perrig, Bootstrapping Trust in Modern Computers, Springer Science & Business Media, 2011.
3. BRAGG, Network Security: The Complete Reference, McGraw Hill Professional, 2012.
4. Online Learning Resources

Suggested Course Practical List:

- The practical work will be carried out based on the content covered during the academic sessions.

List of Laboratory/Learning Resources Required:

- Course-related online MOOCs on NPTEL/SWAYAM platform
- Tools: GnuPG, TrueCrypt, Application security, Host security
- OWASP
- Pentester Online Academy platform
- Recently Published papers/articles in reputed journals
