Introduction to operating system security

**Module Description:** This module discusses the security functions implemented in operating systems. It is broken into two micro modules: security functions in operating system and secure operating system design. The first micro module focuses on the existing security functions and protections provided in the operating system. Then the second micro module discusses how to design a secure operating system and several evaluation criteria.

**Prerequisite Knowledge:**  Students are expected to understand the introduction to cybersecurity concepts module and know operating system well.

**Length of Completion:** This module includes 2 micro-modules. The total length of the module is around 4 hours.

**Level of Instruction:** This module intended for upper division undergraduate students majoring in computer science or computer engineering.

**Learning Setting:** This module is suitable for many forms of delivery: online/in-class/hybrid.

**Lab Environment:** None

**Activity/Lab Tasks:** There will be in-class discussion and an out-of-class written assignment.

**Lab Files that are Needed:** None

# learning outcomes

MODULE learning oUTCOMES

* Students will be able to identify the system resources which require protection by the operating systems.
* Students will be able to describe the security functions provided by the operating system.
* Students will be able to understand operating system security design principles.
* Students will be able to describe what multilevel security systems are.
* Students will be able to understand trusted computing.
* Students will be able to know several evaluation criteria.

# module Details

**Instructional Files and Online Resources that are Needed:**

Slides:

Lesson 1: Security functions in OS (CSP-M4-L1.pptx)

Lesson 2: Secure OS design principles (CSP-M4-L2.pptx)

**Assessment:**

Written homework questions (CSP-HW4.docx)

# lessons

**Overview of Lessons:**

Lesson 1: Security functions in OS

Lesson 2: Secure OS design principles

**Lesson 1 Learning Outcomes:**

Upon completion of this lesson:

* Students will be able to identify the system resources which require protection by the operating systems.
* Students will be able to describe the security functions provided by the OS.

**Lesson 1 Details:**

**Warm Up:**

Give a brief overview of operating systems.

**Lesson:**

Topics to be covered in this lesson include:

* An overview of operating systems.
* System resources which need protection from the OS.
* Security functions provided by OS
* Virtualization
* Segmentation
* Paging
* Tagged architecture

**Active Learning Activity:**

Discussion:

Give students an example in which there are multiple users sharing an operating system, ask them what the protections are provided by the operating system to protect different users’ data.

**Lesson 2 Learning Outcomes:**

Upon completion of this lesson:

* Students will be able to understand operating system security design principles.
* Students will be able to describe what multilevel security systems are.
* Students will be able to understand trusted computing.
* Students will be able to know several evaluation criteria.

**Lesson 2 Details:**

**Warm Up:**

Ask students what kind of OS in their mind is a good/secure OS.

**Lesson:**

Topics to be covered in this lesson include:

* Operating system design principles
* Trusted computing
* Evaluation criteria
* Multilevel security models
  + Bell-LaPadula (BLP) Model
  + Biba Integrity Model
  + Chinese Wall Model (CWM)

**Active Learning Activity:**

Discussion:

In the previous modules, we have discussed secure software design principles. Discuss how they can be connected to secure OS design.

Please attribute Dr. Jim Alves-Foss and Dr. Jia Song, University of Idaho  
  
  
  
Except where otherwise noted, this work is licensed under <https://creativecommons.org/licenses/by-nc-sa/4.0/>  
  
Notwithstanding the non-commercial license terms, non-profit educational institutions are granted a non-exclusive, royalty-free license to adapt and use this material, with attribution.  
  
Creative Commons and the double C in a circle are registered trademarks of Creative commons in the United States and other countries. Third party marks and brands are the property of their respective holders.