SY204 Syllabus

Course Learning Outcomes

Through the course and collective efforts of the students, students will be able to:

- Describe computing environment foundation concepts with respect to security from the perspective of an operating system
- Design, develop, debug, and document systems level programs in C using structured programming techniques
- Develop programs to execute in a UNIX environment
- Develop programs that utilize inter process communications
- Design, develop, debug, and document a comprehensive program in a small team
- Apply principles of secure cyber design to programs used for cyber operations; i.e. design and develop with the adversary in mind

Course Themes

Across the course content the following themes are used to tie topics together:

- Viewing an operating system as a service provider, and accessing operating system internals through system calls
- Developing test cases for programs
- Designing and developing programs that are modula in design
- Developing programs consistent with the UNIX philosophy

Course Topics

SY204 is organized into five sections: Basic C Programming, Systems Programming Fundamentals, File Systems, Processes, and Inter-Process Communication. Each of the sections has topics with learning outcomes.

Basic C Programming.

- Introduction to C
- C Programs
- C Variables
- C Strings
- C Structures
- C Functions
- C Pointers
- C Arrays

- C Conditionals
- C Loops
- C Library Input/Output
- Preprocessor Directives
- Program Analysis Fundamentals
- Basic C Programming Lab

Systems Programming Fundamentals.

- Security Fundamentals
- Operating System Overview
- Systems Programming Concepts
- Descriptor Input/Output
- Systems Programming Fundamentals Lab
- Dynamic Memory

File Systems.

- File Systems - Operating System Internals
- File Systems - On Disk
- File Systems Lab 1
- File Systems - Attributes
- File Systems - Permissions
- File Systems Lab 2
- File Systems - Access Control Lists

Processes.

- Process Lifecycle
- Process Memory
- Signals
- Signal Handling
- Processes Lab 1
- Creating Processes
- Monitoring Child Processes
- Program Execution
- Processes Lab 2

Inter-Process Communication.

- I/O Duplication
- Pipes

- Inter-Process Communication Lab 1
- Sockets - Introduction
- Sockets - TCP/IP Fundamentals
- Sockets - Internet Domain
- Inter-Process Communication Lab 2