

CWRU Linux Club Semester Syllabus

Fall 2025

CWRUnix Executive Board

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Contact

CampusGroups: community.case.edu/CWRUnix/club_signup

Discord: discord.gg/gsgZbJbxkU

Executive Teaching Board

Exec Member	Discord Handle	Email	Website
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Semester Overview

Meeting Times

18:15 - 21:30 Student Organization Center (West side) Tinkham Veale Student Center

Recommended Supplementary Materials

- Debian Handbook: debian-beginners-handbook.arpinux.org/trixie-en/download/the_beginners_handbook.pdf
- Arch Wiki: wiki.archlinux.org
- Linuxize: linuxize.com
- LFS: linuxfromscratch.org

Club Objectives

- Build a support community around Linux
- Promote open source software
- Extend the lifespan of computing device
- Teach about the philosophical aspects of the open source movement
- Secure our electronics from digital and physical threats

Tentative Lecture Topics

Introductory Topics

Introduction to Linux

- What is Linux?
- The Linux and UNIX philosophy
 - “Do one thing and do it well”
- Setting up WSL on Windows / QEMU on Mac

Distro Comparison

- Package managers across distros: apt, dnf, pacman, nix, rpm, etc.
- Installing and updating software

- What makes different distros different
- Why would you choose one over the other
- What are some applications of different distros

Linux Basics

- The Structure of Linux
- Processes
- Filesystem Hierarchy (FHS)
- Namespaces
- SystemD
- SSH
- TTY and terminal emulators
- User vs. Kernel Space
- Syscalls
- Cgroups
- Environmental Variables
 - PATH
 - Library Paths

Scripting and Bash Essentials

- Command line basics and utilities
 - GNU coreutils / Busybox
- Bash and its derivatives
- Environment variables, pipes, redirection
- Writing simple bash scripts
- Variables, conditionals, loops
- Common conventions of scripting
- CLI Conventions
- Esoteric scripting languages
 - Nushell
 - Fish
 - JQ
 - Regex
- Python and other higher level languages

Filesystems and File Management

- Basic Linux filesystem structure (FHS)
- File permissions (chmod, chown)
- Chroot'ing
- Mounting and navigating the filesystem
- Filesystems overview: ext4, XFS, Btrfs, ZFS
- Disk tools: lsblk, fdisk, mount, df
- FUSE
- FS structure comparison / deep dive

- Plan 9 brief rundown

Networking, Web Servers, and Security

- Linux networking tools: ip, ss, nmap, etc.
- Web servers: Apache
- Reverse proxies: Nginx
- 7 Layers of the Network Stack
- PGP
- NFtables and Firewalls
- DNS Hierarchy
- Tunnels and VPNs
- BGP / BIRD routing
- Local level network switching
- Sockets and RTC
- Packets

Desktop Linux

- Overview of DEs: GNOME, KDE, XFCE, i3
- Customizing your Linux desktop (Ricing)
- X11 vs Wayland
- XDG
- Desktop Portals
- Audio
- Common User Daemons
 - Dbus
 - Notifications
 - Bluetooth
 - Pipewire

Intermediate Topics

Linux Tools and The Linux Boot Process

- Git basics (clone, commit, push)
- Vim basics and configuration
- Crontab and job scheduling
- Wolf's Favorite CLI tools
- GRUB and EFI
- Partitioning Tools
- Init systems
- Systemd Day
 - Services
 - Timers
 - journalctl
 - Mounts

- Networkd

Linux Security

- SELinux
- Flatpak / Bubblewrap
- Linux Hardening
- PGP / GPG / SSH
- TTOP and Yubikeys
- Common Attack Vectors
- AppArmor
- Secure Boot
- TPM, Intel ME, AMD PSP
- Memory Safety
- Containerization
- Kali Tools
- Hypervisors and microkernels
 - Firecracker microVMs

Virtualization, VMs, and Containers

- QEMU / KVM / HyperV / Virtualization.Framework
- Wine / Proton
- Docker, Podman, nspawn
- OCI concepts
 - Runtimes
- Network File Shares
- P9FS

Cloud, Infrastructure, and DevOps

- Cloud Hosting
 - AWS, EC2
 - Azure
- Terraform, Ansible, Pulumi, IaC
- CI/CD concepts
 - Github Actions
 - Garnix
 - Jenkins
- Orchestraion and Kubernetes
- Nix overview

Harder Topics

Systems Programming Day

- Compilers
- Rust

- C/C++
- Go
- Zig
- ASM
- Linking, ELF, Libraries
- LSPs
- Build Systems
 - make / CMake
 - Cargo
 - Basil

Nix

- Functional Concepts
- Motivation
- Modern Software Deployment
- Treating Filesystems like memory
- The Language
- The Nix Store
- Derivations
 - Closures
 - Bundlers
- Garbage Collection
- Builders
- Environments and Profiles
- Substitutes and Binary Caches
- Distributed Deployment
- Content Addressability
- Modules, NixOS, nixpkgs
 - Anywhere
- Home-Manager and Package Management
- Packaging Software
 - The stdenv
 - mkDerivations
 - Advanced Builders
 - Nix utilities
- Flakes
- Experimental Features
 - IFD
 - Nix in Nix
 - Dynamic Derivations
 - Fetch Closure
 - Minimal Bootstrap

Kernel and LFS Deep Dive

- Modules and drivers
- Kernel parameters
- Simple kernel module programming
- Linux From Scratch (LFS) overview
 - Custom kernels
 - Building Linux manually