

# Linux Programming and Administration

Free Program Overview

## *Software Development (includes Linux Programming and Administration)*

This free event is an informal information session for new or returning students who are interested in our software development programs, including Computer Programming, Internet Programming and Development, Software Engineering and Quality, Linux Programming and Administration, and Database Systems. During this interactive session, instructors and staff will highlight new content developments in each area. They will also explain the curriculum, requirements, recommended course sequences, and certificate completion timeframes. In addition to understanding specific training benefits, you will learn how these programs can help you advance your current career or break into a new field.

**Course 3085  
and 22404**



ENGINEERING AND TECHNOLOGY



### **Linux: Emerging as the Preferred OS for Embedded Devices and Internet Services**

Linux is the environment of choice for today's hardware and software developers. Despite many rivals, Linux is the dominant OS for Web servers, network infrastructures, and data centers. Linux servers are capable of supporting many simultaneous users of databases and other Web applications, and are known for their scalability, performance and large installed base. Linux has also emerged as the preferred OS platform for many embedded systems, including mobile devices.

### **Strong Demand for Linux Programmers and Systems Administrators**

Given this breadth of application, the need for trained Linux programmers and system administrators will remain strong for the foreseeable future. To help meet that need, the Certificate Program in Linux Programming and Administration at UCSC Extension provides a solid foundation in configuring, operating and programming these open, multi-user, multi-tasking Linux operating systems.

Companies that deploy Linux on infrastructure or devices nearly always require some level of customization. This creates demand for system and kernel level programming, and for device drivers. Our structured curriculum will help you become a confident Linux developer.

### **Training Provided at Three Levels of Expertise**

We accommodate the training needs of professionals with varied experience, and our Linux program is designed for multiple levels of expertise:

- Basic knowledge, skills and tools needed to administer Linux systems and networks in a heterogeneous networked environment
- Programming knowledge for new devices, systems or services operating on Linux
- Advanced system or server configuration in enterprise or virtualization environments.

### **Benefits of Studying at UCSC Extension**

- Learn the complete Linux package from installation to device programming
- System knowledge is scalable from personal to enterprise
- Gain hands-on experience in lab and programming classes
- Acquire employable skills in an emerging field

### **Who Should Attend This Program**

- Linux novices who are new to the field
- Working professionals who want to keep up with the latest developments
- Hardware engineers who interface with Linux systems or networks
- Software developers who program devices or applications on Linux
- System administrators who set up or maintain Linux systems

# Linux Programming and Administration

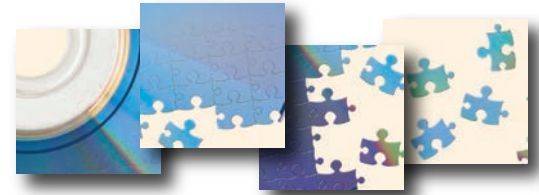
ENGINEERING AND TECHNOLOGY

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## About UCSC Extension Silicon Valley

The vital learning community at UCSC Extension Silicon Valley is well known for its collegial atmosphere and rigorous preparation. Our faculty of expert practitioners teaches state-of-the-art solutions to the everyday problems confronting technology professionals working in Silicon Valley. The professional education programs we offer build expertise, open doors to new opportunity, and deliver tangible value. Our broad portfolio of open-enrollment courses and certificates, affordable pricing, experience-based instruction, and central location in Silicon Valley help turn jobs into careers.

## Linux Programming and Administration Certificate

### Certificate Requirements

To obtain the Certificate in Linux/UNIX Programming and Administration, you must complete **14 units** representing 140 hours of instruction.

**GPA:** 3.0, with a C or better in all courses.

### Prerequisites

Each course has different prerequisites. Please review the course descriptions to ensure that you meet the requirements, whether through job experience or education. For details see full course descriptions at [ucsc-extension.edu/engineering](http://ucsc-extension.edu/engineering).

### Recommended Course Sequence

We recommend you take courses in the order presented on the course chart. However, the sequence may vary based on student background and professional interest.

**Note:** Some courses may be listed in more than one program, however, only one course may be shared between two Engineering and Technology certificate programs unless otherwise noted.

### Program Contact

Engineering and Technology Department,  
(408) 861-3860 or e-mail  
[program@ucsc-extension.edu](mailto:program@ucsc-extension.edu)

### Programs Update and Enrollment Information

Visit [ucsc-extension.edu/engineering](http://ucsc-extension.edu/engineering), for the most up-to-date information about our courses and programs, including textbooks, instructors, schedules and locations.

Enroll online at [ucsc-extension.edu](http://ucsc-extension.edu).

Send questions to  
[program@ucsc-extension.edu](mailto:program@ucsc-extension.edu)

### Curriculum

	Units	Course
<b>System Administration</b>		
Linux, Introduction .....	2.5	2215
Linux System and Network Administration .....	3.0	13515
Computer Networking Essentials .....	3.0	2458
Linux System Performance and Tuning .....	3.0	5632
VMware vSphere:		
Configuration and Management [V4.1] .....	3.5	22869
Cloud Computing, Introduction .....	0.5	22413
<b>Linux Programming</b>		
Linux Systems Programming.....	3.0	3493
Linux Kernel Architecture and Programming.....	3.0	1397
Linux Device Drivers .....	3.0	2470
Linux Device Drivers, Advanced .....	3.0	1016
Embedded Linux Design and Programming, Introduction.....	3.0	3364
Linux Kernel Programming, Advanced .....	2.5	23103
<b>Application Programming in Linux/UNIX</b>		
Linux-Based Web Application Development—Apache, MySQL, PHP.....	3.0	21958
Perl Programming I.....	2.0	2856
Perl Programming II .....	2.0	2110
C Programming for Beginners .....	3.0	5208
Python for Programmers.....	3.0	3064

### C Programming for Beginners

This course is for individuals who want to learn C programming language but have little or no programming background. The course begins with an overview of programming and tools. It introduces functions, data types, input/output, strings, operators, precedence, and expressions. It also demonstrates the use of control statements, arrays, and pointers for problem solving. You will receive assignments to write non-trivial programs and learn to create modular programs with efficiency and readability.

Course 5208

### Cloud Computing, Introduction

This course introduces students to the concepts and technologies involved in cloud computing, which refers to scalable and virtualized computing over the Internet. The course begins with surveys of technologies deployed by Amazon, Google, Microsoft, and various academic and open-source providers. It explains how cloud computing services can provide on-demand access to data storage, computing resources, and messaging. It also introduces the enabling technologies: Web 2.0, virtualization, grid and utility computing that comprise the infrastructure behind a cloud computing service. The course examines various case studies and technical-business models.

Course 22413

### Computer Networking Essentials

This foundation course introduces computer networking, networking technologies, and the Internet. It provides a comprehensive survey of the data and computer communications field. Emphasizing both the fundamental principles and the critical role of performance in driving protocol and network design, it explores the technical areas in data communications, wide-area networking, local-area networking, and protocol design. Participants will also gain a strong foundation in networking protocols, hardware, cabling, industry standards, and connectivity solutions. Topics include introduction to the OSI and TCP/IP models of Internet-working; physical layer fundamentals; connectors and cabling; the medium access sublayer and data-link layers; bridging and switching; the network, transport, and upper layers; and network management techniques and technologies.

Course 2458

# Course Descriptions

## Embedded Linux Design and Programming, Introduction

This course covers the fundamentals of building and installing an embedded Linux operating system version 2.6 on an ARM 9 processor platform, and provides hands-on experience creating cross-platform environments using the GNU tools. Basic concepts in designing, testing, and customizing embedded Linux will be covered, including how the Linux scheduler is implemented, and how to write Linux kernel modules and remotely debug the embedded Linux applications.

Course 3364

## Linux Based Web Application Development—Apache, MySQL, PHP

Linux, Apache, MySQL and PHP, collectively known as LAMP, comprise the majority of servers, databases and scripting languages on the Internet today. LAMP belongs to open-source and is very robust, available free, easily configured, deployed and maintained. This course teaches LAMP basics including installation, deployment and developing a Web site. You will learn the basics of programming MySQL (a popular Web database) and PHP (Hypertext Preprocessor, a Web site scripting language). Teaching method includes theory, practices and case studies. You will be able to develop basic to intermediate level 3-tier Web sites and Web applications with a database in the back-end.

Course 21958

## Linux Device Drivers

This course covers the design and implementation of device drivers for the Linux operating system, and the interfaces to the Linux kernel for writing them. Students will be given an outside project to write a device driver, including the analysis, coding, and debugging of a networking device driver. Topics include compiling the kernel; building and running; character and block device driver concepts; PCI, I/O, and timer routines; hardware management and interrupt handling; networking drivers; PROC file system and IOCTL interface; and kernel mechanisms and advanced topics.

Course 2470

## Linux Device Drivers, Advanced

This course will enhance your understanding of the art of writing Linux device drivers. Students explore the framework that can be used to develop a commercial grade driver. The course includes detailed discussion of the USB and PCI family (PCI-E, PCIe) subsystems, as well as Linux kernel services and

facilities. The course includes a board project, and code review of real-world drivers. Additional discussions cover live debugging with Kprobes, profiling with Oprofile, and a survey of industry trends including virtualized drivers, iSCSI and serial IO buses.

Course 1016

## Linux, Introduction

This course introduces the Linux operating system. Linux is gaining popularity on personal computers, devices, embedded systems and enterprise servers. The course gives students an opportunity to use Linux for personal or professional purposes. Students will learn basic Linux administration, Linux file and directory structure, basic network configuration, and how to utilize office-related tools available in Linux. The course employs a hands-on approach for learning Linux through assignments and projects.

Course 2215

## Linux Kernel Architecture and Programming

This course provides an introduction to kernel-level programming in Linux and writing kernel modules. Core kernel is covered at both the conceptual and practical/coding levels. The course starts with the kernel source code organization and how it functions. It covers topics in memory management, file systems, process creation and scheduling, interrupts, kernel synchronization, IPC (Inter Process Communication), device drivers, program execution, and performance tuning. Discussion addresses various data structures and algorithms used in the Linux kernel. Students gain hands-on experience with kernel programming through a class project.

Course 1397

## Linux Kernel Programming, Advanced

For Linux projects that demand high performance or custom features from the kernel, developers must work at a much deeper level. After a brief review of key topics, this course covers the data structures and inter-workings of the kernel with respect to file system creation, process scheduling, memory management, and network stack management. Students will also learn multicore, multi-threaded management techniques. Inter-processor scheduling at the kernel and process level with the latest Linux 2.6 kernel will also be addressed. The instructor will present practical examples of each topic throughout the course.

Course 23103

## Linux System and Network Administration

This course provides the foundation for building and maintaining a server for Linux professionals and system administrators. The focus of this course is on basic network configuration, services security, remote access configuration and administration of Linux servers. Students perform basic administrative tasks for users, file systems, security policy, shell and Perl scripts, and network facilities such as NFS, DNS and DHCP. By the end of the course, participants will be able to administer and manage networked services on Linux-based platforms in a business environment.

Course 13515

## Linux System Performance and Tuning

This course covers the fundamentals of Linux performance and the use of monitoring tools and tuning options available in Red Hat Enterprise Linux. Understanding the way Linux kernel manages system resources will help you identify suboptimal interactions among various Linux subsystem and the performance trade-offs of tuning. You will review the characteristics of commercial workload such as Oracle database, Apache Web server and NFS server, and learn to eliminate performance inhibitors. The course provides hands on experience using various tools for performance measurement, profiling and system tracing. The instructor will present practical examples, case studies and market trends.

Course 5632

## Linux Systems Programming

System calls are functions called from within a C program, which provide access to the lowest level resources of the OS. This class will enable a C programmer to understand and implement standard utilities (e.g. ls, wc, cat). It includes conceptual background, functional interfaces and topics in I/O control, file systems, access, docking, signal handling, process and threads management, IPC using pipes and TCP/UDP sockets. Additional discussions will cover makefiles, man pages and rpm packaging utilities. This course covers the development of a complete ftp package, including a client-side interface and the server-side components.

Course 3493

## Perl Programming I

This course introduces users, programmers and system administrators to the popular interpreted language called Perl, the Practical Extraction and Report Language. Perl is hailed as the system administrator's language and is the de facto standard for writing dynamic Web pages. This practical course is also useful for anyone working with UNIX text files, databases and processes. Although the course is taught on a UNIX system, Perl is very portable. The fundamental topics covered in this course are data types, operators, regular expressions and pattern handling, conditional and looping constructs, file handles and filters, file testing, command-line arguments, subroutines and packages, the UNIX system interface, formatting and database management files.

Course 2856

## Perl Programming II

This hands-on course is designed for those interested in advanced applications for Perl. It is a highly beneficial continuation of the "Perl Programming I" course. Students learn to read and write Perl modules, both procedural and object oriented. Topics include Perl subroutines and packages, references (pointers), objects, modules, pragmas and the standard Perl library. Students learn how to document their programs using Perl's Plain Old Documentation format and store them in a library. There will be an overview of the Perl DBI for connecting to any database and performing SQL queries, retrieving result sets, and displaying the results in a browser using the CGI.pm module.

Course 2110

## Python for Programmers

Because of its clear and elegant syntax, dynamic typing, automatic memory management, and straightforward module architecture, Python enhances program correctness and increases efficiency. Its code is easy to read, write, extend, and modify. This lab-based course offers proficiency in Python, and the skills and knowledge for building applications using task-specific Python libraries. Topics include the Python environment and code introspection; syntax, flow control, function protocols, exception handling and functional programming. Also covered are object-oriented features, classes, inheritance and overriding; and building applications, packages, and libraries.

Course 3064

## VMware vSphere: Configuration and Management [V4.1]

Server virtualization has become a critical technology to reduce IT costs and support the rise of cloud computing. The VMware vSphere course includes lectures and hands-on labs covering the installation, configuration, and management of VMware ESXi 4.1 and vCenter Server 4.1. In hands-on lab sessions, each student has his own ESXi servers, vCenter Server, and SAN storage to create standard and distributed virtual switches, establish storage access, and apply access controls. Virtual machines are created and used for resource monitoring, VMotion, load balancing, and high availability. This course helps prepare students for the VMware Certified Professional (VCP4) exam and satisfies the VCP4 course requirement.

Course 22869

**UCSC**extension  
Silicon Valley

# Silicon Valley's #1 Professional Engineering Educator

## Dynamic, Highly Educated Student Body

Nearly 100 percent of the students who enter our programs have Bachelor's degrees—and more than 40 percent already hold graduate degrees. So when studying at UCSC Extension Silicon Valley, you will learn and network with the best and brightest. Working professionals come here to build their careers rather than earn a degree—yet our certificates' quality and recognition have proven instrumental in helping them advance careers.

## Wide Variety of Flexible, Competitively Priced Learning Options

We offer highly practical, real-world instruction in dozens of disciplines of high interest and demand in Silicon Valley. Our applied courses provide a theoretical foundation to enhance on-the-job performance. In addition, our programs are very competitively priced—often less than half that of comparable training available elsewhere—with many offered both in classrooms and online. You can take individual courses in any program or earn a full certificate.

## Comprehensive Programs for Technology Industries

Our career-oriented education is organized under eleven certificate programs, each representing a significant technology discipline or industry. Course levels vary from basic to advanced. Students can either be beginners in the field, practicing engineers, or job seekers wanting a rigorous program to broaden their skills and enhance their value in the marketplace. Together these programs offer the broadest technology curriculum in Silicon Valley.

## How to Get Started

Go to [ucsc-extension.edu](http://ucsc-extension.edu). You'll find detailed information about the full range of certificates and courses we offer, including class schedules and online registration. Or call us at (408) 861-3860 for more information. Our program representatives will personally help you plan a schedule that meets your needs.

UCSC EXTENSION SILICON VALLEY  
2505 Augustine Drive, Suite 100  
Santa Clara, CA 95054

## Program Contact

Engineering and Technology Department,  
(408) 861-3860 or e-mail  
[program@ucsc-extension.edu](mailto:program@ucsc-extension.edu).