

NDG Linux Essentials Course: Alignment to Education Standards

STEM Career Cluster Knowledge and Skills Topics

Common Core Anchor College and Career Readiness Standards

21st Century Science & Engineering Practices

Purpose of this Document

- * To help educators and those leading education efforts define a STEM education program that aligns to standards and provides students with a path either into a career or advanced education. See additional ways you can use this document below.

Tab 2: Alignment Matrix

- * Illustrates coverage of education standards

Tab 3: STEM Alignment

- * Identifies connections between recognized STEM Career Cluster standards and NDG Linux Essentials curriculum.

Tab 4: Common Core and 21st Century Science Alignment

- * Identifies connections between Common Core anchor standards, 21st Century Science & Engineering Practices, and NDG Linux Essentials curriculum objectives and activities.

How you can use this tool:

Instructors

- * Identify a relevant STEM education program that engages students
- * Plan lessons that meet standards recognized by business and industry
- * Identify opportunities for interdisciplinary teaching to reinforce critical skills across disciplines
- * Integrate Linux content and activities so that students master recognized college and career readiness skills
- * Track completion of STEM career cluster knowledge and skills topics necessary for future education and employment

Administrators

- * Document how instruction is relevant to community and industry expectations
- * Monitor knowledge and skills development for continuous improvement
- * Identify, observe and evaluate curriculum that enacts standards-based instruction
- * Provide engaging, relevant career-oriented reinforcement of academic standards
- * Support interdisciplinary instruction across academic and career and technology programs

State / Federal

- * Document program relevance for state- and national-level educational initiatives
- * Recognize the contribution of Linux curricula to national educational reform
- * Observe and evaluate how teachers and students actually respond to standards-based instruction
- * Document curriculum and instruction that supports strategies and plans related to the discretionary grant process
- * Support interdisciplinary instruction across academic and career and technology programs

Alignment of NDG Linux Essentials Course to Education Standards: STEM

Embedded STEM Cluster Topics

	SCC01 Academic Foundations	SCC02 Communica- tions	SCC03 Problem- Solving & Critical Thinking	SCC04 Information Technology Applications	SCC05 Systems	SCC06 Safety, Health & Environmental	SCC07 Leadership and Teamwork	SCC08 Ethics & Legal Responsi- bilities	SCC09 Employability & Career Development	SCC10 Technical Skills
NDG Linux Essentials	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LPI.ORG Linux Essentials Professional Development Certificate Objectives	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Alignment of NDG Linux Essentials Course to Education Standards: Common Core Anchor College and Career Readiness Skills 21st Century Science & Engineering Practices

Embedded Standards

	Reading	Writing	Speaking and Listening	Language	Mathematical Practice	21st Century Science & Engineering Practices
NDG Linux Essentials	✓	✓	✓	✓	✓	✓
LPI.ORG Linux Essentials Professional Development Certificate Objectives	✓	✓	✓	✓	✓	✓

Specific Examples of NDG Linux Essentials Coursework Alignment to STEM Cluster Topics

Comparison does not include all qualifying coursework; use as example only.

STEM Career Cluster Topics		Sample NDG Linux Essentials Content Demonstrating Skills & Standards	Related LPI.ORG Linux Essentials Professional Development Certificate Exam Objectives
Cluster Knowledge & Skills Topics	Students preparing for STEM cluster careers should be able to demonstrate these skills		
SCC01 Academic	Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities	Lab 9.3 Use the vi text editor to edit basic shell scripts. Lab 15.3.10-11 Use octal notation to calculate and change user and group permissions.	3.3 Turning commands into a script 5.3 Managing file permissions and ownership
SCC02 Communications	Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.	Ch. 1.3.1-1.3.2 List the key features and functions of the operating system that are handled by the kernel. Ch. 6.3 Describe the differences between the Linux <i>filesystem</i> and a typical Windows directory structure. Ch. 8.12 Explain how each of the following characters can be used to match simple or complex patterns within Basic Regular Expressions: ., [,], *, ^, \$.	1.1 Linux evolution and popular operating systems 4.1 Choosing an operating system 2.3 Using directories and listing files 3.2 Searching and extracting data from files
SCC03 Problem-Solving & Critical Thinking	Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.	Lab 4.7 Demonstrate the use of control statements to separate multiple commands that are conditionally executed. Lab 5.3.7 Use a <i>keyword</i> argument to locate information about a command whose exact name cannot be recalled. Lab 10.3.4 Obtain information about devices connected to the PCI bus in order to diagnose possible driver conflicts.	2.1 Basics of using the Linux command line 2.2 Using the command line to get help 4.2 Understanding computer hardware
SCC04 Information Technology Applications	Use information technology tools specific to the career cluster to access, manage, integrate, and create information.	Lab 4.6 Demonstrate the use of three types of quotes within the Bash shell Ch. 9.3 Describe how the use of scripts can simplify administrative operations. Lab 12.3.9-11 Determine which TCP ports are available for incoming connections by using variations of the <i>netstat</i> command.	2.1 Basics of using the Linux command line 3.3 Turning commands into a script 4.4 Your computer on the network
SCC05 Systems	Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.	Ch. 1.3 Explain the relationship between Linux kernel, Linux distribution, and UNIX. Ch. 14.8.1 Explain the pre-planning process administrators should use when creating a new user.	1.1 Linux evolution and popular operating systems 1.2 Major open source applications 5.2 Creating users and groups
SCC06 Safety, Health & Environmental	Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.	Ch. 3.7 List three basic security best practices Linux users can implement. Ch. 11.9 Describe how log files can help to support system security. Ch. 14.9 List the parameters for user passwords that support system security and safety. Ch. 16.3 Compare and contrast the advantages and drawbacks of using <i>setuid</i> permissions on files.	1.4 ICT skills and working in Linux 4.3 Where data is stored 5.2 Creating users and groups 5.4 Special directories and files
SCC07 Leadership & Teamwork	Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.	Lab 14.3 Describe how a network-based authentication server can enhance user and group collaboration. Ch. 16.7 Explain how the use of sticky bit permission supports user and group collaboration.	5.2 Creating users and groups 5.4 Special directories and files
SCC08 Ethics & Legal Responsibilities	Know and understand the importance of professional ethics and legal responsibilities.	Lab 11.8 Explain why a system administrator must know where log files are stored and how to maintain them. Ch. 13.5 Describe why an administrator should choose to use the <i>sudo</i> command rather than logging in as the root user.	4.3 Where data is stored 5.1 Basic security and identifying user types
SCC09 Employability & Career Development	Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.	Ch. 2.4.4 Describe how you, as a student or career person, could apply entrepreneurship skills to the ability to develop open source software. Ch. 3.5 Describe how cloud computing and virtualization can benefit an enterprise. Ch. 7.4 Describe why archiving is a critical administrative task.	1.3 Understanding open source software and licensing 1.4 ICT skills and working in Linux 3.1 Archiving files on the command line 1.4 ICT skills and working in Linux
SCC10 Technical Skills	Use the technical knowledge and skills required to pursue the targeted careers for all pathways in the career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster.	Lab 5.3.16 Use the <i>--help</i> option to obtain information about a command. Ch. 5.4 Demonstrate methods used to search for files within the system. Ch. 6.5.2 Describe and demonstrate two ways to prevent accidentally overwriting data. Ch. 11.7 Describe how use of the <i>top</i> command can help an administrator monitor and troubleshoot processes running on a system. Lab 12.3.1 Determine the IP address of a PC through the <i>ifconfig</i> command. Lab 13.4.1 Determine who is logged into a system through the <i>who</i> command.	2.2 Using the command line to get help 2.2 Using the command line to get help 2.3 Using directories and listing files 2.4 Creating, moving, and deleting files 4.3 Where data is stored 4.4 Your computer on the network 5.1 Basic security and identifying user types

Specific Examples of NDG Linux Essentials Coursework Alignment to Common Core Anchor Standards

Comparison does not include all qualifying coursework; use as example only.

Common Core Anchor Career & College Readiness Standards 21st Century Science & Engineering Standards		Sample NDG Linux Essentials Content Demonstrating Standards	Related LPI.ORG Linux Essentials Professional Development Certificate Exam Objectives
Reading	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.	Ch. 2.4.4 Describe how you, as a student or career person, could apply entrepreneurship skills to the ability to develop open source software. Ch. 3.7 List three basic security best practices Linux users can implement.	1.3 Understanding open source software and licensing 1.4 ICT skills and working in Linux
	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.	Ch. 1.3.1-1.3.2 List the key features and functions of the operating system that are handled by the kernel. Ch. 7.4 Describe why archiving is a critical administrative task.	1.1 Linux evolution and popular operating systems 4.1 Choosing an operating system 3.1 Archiving files on the command line 1.4 ICT skills and working in Linux
	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.	Ch. 6.3 Describe the differences between the Linux filesystem and a typical Windows directory structure.	2.3 Using directories and listing files
	Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words	Ch. 12.3 Based on text and diagrams, explain how network hosts acquire and share network services.	4.4 Your computer on the network
	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.	Ch. 1.3.3 Explain how open source philosophy has influenced the development of Linux.	1.1 Linux evolution and popular operating systems 1.2 Major open source applications
Writing	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	Ch. 1.4.1 <i>Suggestion:</i> Compose a memo recommending an operating system for a specific situation. Use each of the "decision points" as the basis for the argument.	1.1 Linux evolution and popular operating systems 4.1 Choosing an operating system
	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.	Ch. 16.3 <i>Suggestion:</i> Compose a "decision matrix" comparing the advantages and drawbacks of using <i>setuid</i> permissions on files.	5.4 Special directories and files
	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	Ch. 12.7.4 <i>Suggestion:</i> Compose a graphic or slide illustrating the most important information derived from using the <i>netstat</i> command with the <i>-i</i> option and the <i>-r</i> option. Include descriptions of how these outputs can aid in troubleshooting.	4.4 Your computer on the network
	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.	Lab 9.3 Use the vi text editor to edit basic shell scripts.	3.3 Turning commands into a script
	Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.	Ch. 2.1 <i>Suggestion:</i> Choose one of the following companies and research how Linux is employed in their products and applications: Amazon, NetFlix, Google, Facebook.	1.2 Major open source applications 1.3 Understanding open source software and licensing
Draw evidence from literary or informational texts to support analysis, reflection, and research.	Ch. 14.9 List the parameters for user passwords that support system security and safety.	5.2 Creating users and groups	
Speaking and Listening	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.	Ch. 5.4 <i>Suggestion:</i> Work with a partner. Assume that your partner has called you over to help locate a file on his system. Demonstrate how to accomplish this using the <i>locate</i> command. Use the <i>info</i> command to view information on the usage of the <i>locate</i> command.	2.2 Using the command line to get help
	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.	Ch. 15.7.1.1-15.7.1.6 Interpret possible user access privileges in a series of scenarios, based on diagrams of user permissions.	5.3 Managing file permissions and ownership
	Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.	Ch. 2.1 <i>Suggestion:</i> Produce a short illustrated presentation showing how a major IT corporation implements Linux.	1.2 Major open source applications 1.3 Understanding open source software and licensing
	Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations	Lab 14.3 <i>Suggestion:</i> Create and present a slide deck illustrating how a network-based authentication server can enhance user and group collaboration. Depict the paths of data flow between hosts and the server.	5.2 Creating users and groups
Language	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.	Ch. 1.3 Explain the relationship between Linux kernel, Linux distribution, and UNIX.	1.1 Linux evolution and popular operating systems 1.2 Major open source applications
	Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	Ch. 3.5 Describe how cloud computing and virtualization can benefit an enterprise. Ch. 12.4 Explain the differences between DHCP and DNS.	1.4 ICT skills and working in Linux 4.4 Your computer on the network
		Ch. 1.3 Explain the relationship between Linux kernel, Linux distribution, and UNIX.	1.1 Linux evolution and popular operating systems 1.2 Major open source applications

Mathematical Practice	Make sense of problems and persevere in solving them.	Lab 5.3.7 Use a <i>keyword</i> argument to locate information about a command whose exact name cannot be recalled.	2.2 Using the command line to get help
	Reason abstractly and quantitatively.	Lab 7.3.7-7.3.8 Compare the results of using gzip/gunzip and bzip/bunzip in order to determine which utility to choose.	3.1 Archiving files on the command line
	Construct viable arguments and critique the reasoning of others.	Ch. 13.5 Explain why an administrator should choose to use the <i>sudo</i> command rather than logging in as the root user.	5.1 Basic security and identifying user types
	Model with mathematics.	Lab 12.3.1 Compare the format for IPv4 and IPv6 addresses.	4.4 Your computer on the network
	Use appropriate tools strategically.	Ch. 5.6.2 Demonstrate methods used to search for files within the system. Ch. 9.3 Describe how the use of scripts can simplify administrative operations.	2.2 Using the command line to get help 2.3 Using directories and listing files 3.3 Turning commands into a script
	Attend to precision.	Lab 4.6 Compare and contrast the effects of using single, double, and back quotes in the Bash shell.	2.1 Basics of using the Linux command line
	Look for and make use of structure.	Ch. 8.12 Explain how each of the following characters can be used to match simple or complex patterns within Basic Regular Expressions: ., [, *, ^, \$. Lab 4.5 Use <i>glob</i> characters to match filenames using patterns.	3.2 Searching and extracting data from files
	Look for and express regularity in repeated reasoning.	Lab 4.7 Demonstrate the use of control statements to separate multiple commands that are conditionally executed.	2.1 Basics of using the Linux command line
21st Century Science & Engineering Practices	Asking questions and defining problems	Ch. 8.3 Explain how the use of pipes interconnects commands and aids in searching for specific data.	3.2 Searching and extracting data from files
	Developing and using models	Lab 11.8 Explain why a system administrator must develop a consistent process for storing and maintenance of log files.	4.3 Where data is stored
	Planning and carrying out investigations	Lab 12.3.9-11 Determine which TCP ports are available for incoming connections by using variations of the <i>netstat</i> command.	4.4 Your computer on the network
	Analyzing and interpreting data	Lab 12.3.3 Interpret the results of a <i>ping</i> command. Lab 13.4.1 Determine who is logged into a system through the <i>who</i> command.	4.4 Your computer on the network 5.1 Basic security and identifying user types
	Using mathematics and computational thinking	Lab 10.3.3 Interpret the results of the <i>free</i> command to decide whether a system has sufficient RAM. Lab 15.3.11 Modify user permissions by computing a new octal number and applying it using the <i>chmod</i> command.	4.2 Understanding computer hardware 5.3 Managing file permissions and ownership
	Constructing explanations and designing solutions	Ch. 14.8.1 Explain the pre-planning process administrators should use when creating a new user.	5.2 Creating users and groups
	Obtaining, evaluating, and communicating information	Lab 10.3.4 Obtain information about devices connected to the PCI bus in order to diagnose possible driver conflicts.	4.2 Understanding computer hardware