

# Career & Technical Education | Information Technology

## Fundamentals of Operating Systems

**Subject Code: 145135**

### Outcome & Competency Descriptions

#### Course Description:

Students will perform desktop client administrator duties by providing support for users in various work environments including professional offices, small businesses, work groups, departments, and/or corporate information services (IS). Students will learn to install, configure, and update commercial and open-source operating systems.

#### Strand 1. Business Operations/21<sup>st</sup> Century Skills

Learners apply principles of economics, business management, marketing, and employability in an entrepreneur, manager, and employee role to the leadership, planning, developing, and analyzing of business enterprises related to the career field.

#### Outcome: 1.2. Leadership and Communications

Process, maintain, evaluate, and disseminate information in a business.  
Develop leadership and team building to promote collaboration.

#### Competencies

- 1.2.1. Extract relevant, valid information from materials and cite sources of information.
- 1.2.3. Identify and use verbal, nonverbal, and active listening skills to communicate effectively.
- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.11. Write professional correspondence, documents, job applications, and resumé.
- 1.2.12. Use technical writing skills to complete forms and create reports.

### **Outcome: 1.3. Business Ethics and Law**

Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

#### **Competencies**

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.
- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).
- 1.3.8. Verify compliance with computer and intellectual property laws and regulations.

### **Outcome: 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in business operations.

#### **Competencies**

- 1.4.6. Use an electronic database to access and create business and technical information.

## **Outcome: 1.8.      Operations Management**

Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

### **Competencies**

- 1.8.1.    Forecast future resources and budgetary needs using financial documents (e.g., balance sheet demand forecasting, financial ratios).
- 1.8.2.    Select and organize resources to develop a product or a service.
- 1.8.3.    Analyze the performance of organizational activities and reallocate resources to achieve established goals.
- 1.8.4.    Identify alternative actions to take when goals are not met (e.g., changing goals, changing strategies, efficiencies).
- 1.8.5.    Use inventory and control systems to purchase materials, supplies and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).
- 1.8.6.    Identify the advantages and disadvantages of carrying cost and Just-in-Time (JIT) production systems and the effects of maintaining inventory (e.g., perishable, shrinkage, insurance) on profitability.
- 1.8.7.    Collect information and feedback to help assess the organization's strategic planning and policymaking processes.
- 1.8.8.    Identify routine activities for maintaining business facilities and equipment.
- 1.8.9.    Develop a budget that reflects the strategies and goals of the organization.
- 1.8.10.    Analyze how business management and environmental management systems (e.g., health, safety) contribute to continuous improvement and sustainability.

## **Strand 2. IT Fundamentals**

Learners apply fundamental principles of IT, including the history of IT and its impact on society, common industry terms, systems theory, information storage and retrieval, database management, and computer hardware, software, and peripheral device configuration and installation. This base of knowledge and skills may be applied across the career field.

### **Outcome: 2.1. Security, Risks, and Safeguards**

Describe the need for security and explain security risks and security safeguards.

#### **Competencies**

- 2.1.1. Explain the need for confidentiality, integrity, and availability (CIA) of information.
- 2.1.2. Describe authentication, authorization, and auditing.
- 2.1.3. Describe multilevel security.
- 2.1.4. Identify security risks and describe associated safeguards and methodologies (e.g., auditing).
- 2.1.5. Describe major threats to computer systems (e.g., internal threats, viruses, malware, ransomware, spoofing, hacking, social engineering, phishing, Denial of Service, web application attacks, network-based attacks).
- 2.1.6. Describe the components of the physical environment (e.g., wiring closets, server rooms) and physical security systems.
- 2.1.7. Describe the need for security in networking (e.g., firewall, access controls, encryption, demilitarized zone).
- 2.1.10. Describe computer forensics, its importance in information security and cybersecurity, and its relevance to law enforcement.
- 2.1.11. Identify the need for information security and implement best practices for maintaining cyber hygiene (e.g. personal identifiable information, private financial documents, corporate records).
- 2.1.12. Describe privacy security compliance on systems (e.g., Health Insurance Portability and Accountability Act (HIPAA), Payment Card Industry [PCI], Sarbanes Oxley Act [SOX], Americans with Disabilities Act [ADA], General Data Protection Regulation [GDPR], European Union Data Protection Regulation [EUDPR]).

## **Outcome: 2.2.      Networking Fundamentals**

Apply networking fundamentals to infrastructure systems.

### **Competencies**

- 2.2.5. Identify and apply Transmission Control Protocol and Internet Protocol (TCP/IP), Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6) applications and services (e.g., rlogin, Simple Mail Transfer Protocol [SMTP], Telecommunications Network [Telnet], File Transfer Protocol [FTP], Domain Name System [DNS], Network File System [NFS], Voice over Internet Protocol [VoIP], Internet Control Message Protocol [ICMP]).

## **Outcome 2.4.      Emerging Technologies**

Identify trending technologies, their fundamental architecture, and their value in the marketplace.

### **Competencies**

- 2.4.1. Identify emerging technologies that are applicable to the marketplace.
- 2.4.2. Describe the fundamental architectures of emerging technologies and how they are integrating into the existing systems of information technology.
- 2.4.3. Research the value of emerging technologies on the marketplace.
- 2.4.4. Describe emerging technologies (e.g., Bring your Own Device [BYOD], Services Virtualization, Mixed Reality [MR], SMART Devices, Additive Manufacturing [3D Printing], Internet of Things, Large Language Models, Machine Learning, and Artificial Intelligence).

## **Outcome 2.5.      Maintain Operating Systems**

Install and maintain operating systems (OSs).

### **Competencies**

- 2.5.1. Compare Operating Systems for computer hardware (e.g., personal computers, servers, mainframes, operational technology (OT), and mobile devices).
- 2.5.2. Describe uses and functions of virtual machines.
- 2.5.3. Identify the properties of open and proprietary systems.
- 2.5.4. Maintain file structures in an Operating Systems.
- 2.5.5. Use system utilities to maintain an Operating System.
- 2.5.6. Describe Operating System interfaces (e.g., command line, Graphic User Interface [GUI]).
- 2.5.7. Install and test updates and patches to Operating Systems.

## **Outcome: 2.6.      Installation and Configuration**

Install and configure hardware and software.

### **Competencies**

- 2.6.1.    Comply with license agreements for software and hardware and describe the consequences of noncompliance.
- 2.6.2.    Identify hardware requirements for software applications.
- 2.6.3.    Install and test new software and software upgrades on stand-alone, mobile and networked systems.
- 2.6.5.    Determine compatibility (software to software, software to hardware, hardware to hardware).
- 2.6.6.    Install and test hardware peripherals.
- 2.6.7.    Document installation, configuration, and compatibility of hardware and software.

## **Outcome: 2.10.      Equipment**

Select, prepare, operate, and maintain equipment.

### **Competencies**

- 2.10.1.    Identify hardware platforms, configurations, and support models.
- 2.10.4.    Identify software application requirements.
- 2.10.5.    Prepare and operate equipment per project design specifications.
- 2.10.7.    Backup, restore, test, archive, and manage data.
- 2.10.9.    Perform routine maintenance per manufacturer specifications.

## **Outcome: 2.11.      Troubleshooting**

Select and apply troubleshooting methodologies for problem solving.

### **Competencies**

- 2.11.1.    Identify the problem.
- 2.11.2.    Select troubleshooting methodology (e.g., top down, bottom up, follow the path, spot the differences).
- 2.11.3.    Investigate symptoms based on the selected methodology.
- 2.11.4.    Gather and analyze data about the problem.
- 2.11.5.    Design a solution.
- 2.11.6.    Test a solution.
- 2.11.7.    Implement a solution.
- 2.11.8.    Document the problem and the verified solution.

### **Strand 3. Information Security**

Learners apply principles of information security to implement and maintain security compliance and network security. Learners select components and mechanisms required for a multilayer defense structure and evaluate and minimize security risks to wired and wireless networks and devices.

#### **Outcome: 3.1. Components of Information Security**

Describe the components associated with information security systems.

##### **Competencies**

- 3.1.1. Differentiate between authentication and authorization.
- 3.1.2. Compare and contrast authentication techniques (e.g., single factor, multifactor, passwords, biometrics, certificates, Radio Frequency Identification [RFID] cards).

#### **Outcome: 3.2. General Security Compliance**

Implement and maintain general security compliance.

##### **Competencies**

- 3.2.1. Identify and implement data and application security.
- 3.2.3. Describe and assign permissions (e.g., read-only, read-write).
- 3.2.4. Provide user authentication (e.g., assign and reset user accounts and passwords).
- 3.2.5. Install, test, implement, and update virus and malware detection and protection software.
- 3.2.6. Identify sources of virus and malware infection and remove viruses and malware.
- 3.2.7. Provide documentation, training, and support to users on established security procedures.
- 3.2.8. Identify the need for disaster recovery policies and procedures (e.g., business continuity plans, scenario testing).

## **Strand 4. Infrastructure Systems**

Learners apply principles of networking and infrastructure related to the installation, administration, and maintenance of computer networks and components. Knowledge and skills may be applied to network connectivity, cabling, protocols, architecture, classification, topologies, operating systems, Open Systems Interconnection (OSI) standards, data encoding, Quality of Service (QoS), Internet Protocol (IP) addressing, and wide area network (WAN) design.

### **Outcome: 4.12. Disaster Recovery**

Recommend disaster recovery and business continuity plans.

#### **Competencies**

- 4.12.1. Differentiate between disaster recovery and business continuity.
- 4.12.2. Identify common local and cloud-based backup options.
- 4.12.3. Identify the criteria for selecting a backup system.
- 4.12.4. Establish a process for archiving files.
- 4.12.5. Develop and simulate a disaster recovery plan.