

# Career & Technical Education | Information Technology

## Systems Analysis & Design

**Subject Code: 145075**

### Outcome & Competency Descriptions

#### Course Description:

Students will learn the theory and practice of software testing and develop an understanding of the analysis and design phases of software development. Students will effectively use appropriate programming languages and software patterns to improve software development. A variety of commercial and opensource programs, applications, and tools will be used.

#### 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: 1.1.

##### Employability Skills

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

#### Competencies

- 1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.
- 1.1.9. Give and receive constructive feedback to improve work habits.
- 1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.
- 1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

#### Outcome: 1.2.

##### Leadership and Communications

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

#### Competencies

- 1.2.2. Deliver formal and informal presentations.
- 1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
- 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.

**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**

- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 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**

- 1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).
- 1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).
- 1.4.3. Verify compliance with security rules, regulations and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to the industry pathway.
- 1.4.5. Use information technology tools to maintain, secure and monitor business records.
- 1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).

### **Outcome: 1.5. Global Environment**

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

#### **Competencies**

- 1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.
- 1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.
- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.
- 1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
- 1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.
- 1.5.7. Use intercultural communication skills to exchange ideas and create meaning.

### **Outcome: 1.6. Business Literacy**

Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

#### **Competencies**

- 1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.
- 1.6.6. Identify the target market served by the organization, the niche that the organization fills and an outlook of the industry.
- 1.6.7. Identify the effect of supply and demand on products and services.

### **Outcome: 1.7. Entrepreneurship / Entrepreneurs**

Analyze the environment in which a business operates, and the economic factors and opportunities associated with self-employment.

#### **Competencies**

- 1.7.13. Protect intellectual property and knowledge (e.g., copyright, patent, trademark, trade secrets, processes).

## **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 2.4. 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: 2.9. Project Concept Proposal**

Develop a project concept proposal.

#### **Competencies**

- 2.9.1. Identify the scope and purpose of branding.
- 2.9.2. Determine the scope and purpose of the project.
- 2.9.3. Determine the target audience, client needs, expected outcomes, objectives, and budget.
- 2.9.4. Develop a conceptual model and design brief for the project.
- 2.9.5. Develop a timeline, a communication plan, a task breakdown, costs (e.g., equipment, labor), deliverables, and responsibilities for completion.
- 2.9.6. Develop and present a comprehensive proposal to stakeholders.

### **Outcome: 2.12. Performance Tests and Acceptance**

Develop performance tests and acceptance plans.

#### **Competencies**

- 2.12.1. Create a written procedure agreed by the stakeholders and project team for determining the acceptability of the project deliverables.
- 2.12.2. Develop a test system that accurately mimics external interfaces.
- 2.12.3. Develop test cases that are realistic, compare with expected performance, and include targeted platforms and device types.

- 2.12.4. Develop, perform, and document usability and testing integration.
- 2.12.5. Make corrections indicated by test results.
- 2.12.6. Seek stakeholder acceptance upon successful completion of the test plan.

**Outcome: 2.13. Rollout and Handoff**

Plan rollout and facilitate handoff to customers.

**Competencies**

- 2.13.1. Include overall project goals and timelines in the rollout plan.
- 2.13.2. Communicate rollout plans to key stakeholders in a timely manner.
- 2.13.3. Conduct final review and approvals according to company standards.
- 2.13.4. Identify support staff, training needs, and contingency plans in the rollout plan.

**Outcome: 2.14. Artificial Intelligence**

Understand and apply prescribed methods of using Artificial Intelligence.

**Competencies**

- 2.14.1. Describe how machine learning and neural networks operate differently than standard decision trees.
- 2.14.2. Analyze how artificial intelligence technology impacts society and the ethical implications of its usage.
- 2.14.3. Write and revise a prompt to generate the desired response from an AI.
- 2.14.4. Evaluate the result of an AI query on a variety of parameters (e.g. validity, relevance, authenticity, potential bias and hallucinations).
- 2.14.5. Identify and analyze opportunities to apply AI across business, industry and society.
- 2.14.6. Critically analyze scenarios involving AI usage.

## **Outcome: 2.15. UX/UI Design**

Develop basic skills and knowledge of the UX/UI Design Process.

### **Competencies**

- 2.15.1. Understand the UX/UI design process (e.g. vision, journey mapping, wireframing, prototyping, strategizing) for the targeted platform (e.g. graphics, applications, programming).
- 2.15.2. Conduct and analyze research (focus testing, beta testing) with the end user in mind.
- 2.15.3. Design user tasks and evaluate results (e.g. use-case scenarios, tabletop exercises, wireframe testing).
- 2.15.4. Develop a user persona to help inform the design process.
- 2.15.5. Conduct and analyze competition research.
- 2.15.6. Design interface elements and experiences that connect concepts with the real world (i.e. Skeuomorphic Design).
- 2.15.7. Implement UI patterns and libraries, such as navigation elements and icons.
- 2.15.8. Draft, design, and utilize design prototypes (low-fidelity, high-fidelity) to guide the design process.
- 2.15.9. Design or select appropriate icons for specific user interaction elements.
- 2.15.10. Understand how the use of appropriate iconography impacts user experience
- 2.15.11. Understand various design methodologies (Bottom-Up, Top-Down, Agile, ) and evaluate their strengths and weaknesses.
- 2.15.12. Describe how attention, memory, perception, conditioning, and learning define the user experience and affects their actions.
- 2.15.13. Describe how usability heuristics develop a better experience for the end-user.

## **Strand 5.      Programming and Software Systems**

Learners apply principles of computer programming and software development to develop code; build, test, and debug programs; create finished products; and plan, analyze, design, develop, implement, and support software applications.

### **Outcome: 5.1.      Programming Concepts**

Describe programming concepts.

#### **Competencies**

- 5.1.1. Describe how computer programs and scripts can be used to solve problems (e.g., desktop, mobile, enterprise, AI, cloud).
- 5.1.2. Explain how algorithms and data structures are used in information processing.
- 5.1.3. Model the solution using both graphic tools (e.g., flowcharts, IPO charts, UML, decision trees, logic tables), pseudocode techniques and artificial intelligence.
- 5.1.4. Describe, compare, and contrast the basics of procedural, structured, object-oriented (OO), and event-driven programming.
- 5.1.5. Describe the concepts of data management through programming languages.
- 5.1.6. Analyze the strengths and weaknesses of different languages for solving a specific problem.
- 5.1.7. Compare and contrast the functions and operations of compilers and interpreters.
- 5.1.8. Describe version control and the relevance of documentation.

### **Outcome: 5.2.      Computational and String Operations**

Develop code that performs computational and string operations.

#### **Competencies**

- 5.2.1. Compare and contrast primitive types of numeric and nonnumeric data (e.g., integers, floats, Boolean, strings).
- 5.2.2. Identify the scope of data (e.g., global versus local, variables, constants, arrays).

### **Outcome: 5.3.      Logical Operations and Control Structures**

Develop code that uses logical operations and control structures.

#### **Competencies**

- 5.3.1. Explain Boolean logic.
- 5.3.2. Solve a truth table.

**Outcome: 5.6. Software Development Lifecycle**

Apply the software development lifecycle (SDLC).

**Competencies**

- 5.6.1. Determine requirements specification documentation.
- 5.6.2. Identify constraints and system processing requirements.
- 5.6.3. Develop and adhere to timelines.
- 5.6.4. Identify a programming language, framework, and an integrated development environment (IDE).
- 5.6.5. Identify input and output (I/O) requirements.
- 5.6.6. Design system inputs, outputs, and processes.
- 5.6.7. Document a design using the appropriate tools (e.g., program flowchart, dataflow diagrams, Unified Modeling Language [UML]).
- 5.6.8. Create documentation (e.g., implementation plan, contingency plan, data dictionary, user help).
- 5.6.9. Review the design (e.g., peer walkthrough).
- 5.6.10. Present the system design to stakeholders.
- 5.6.11. Develop the application.
- 5.6.12. Compare and contrast software methodologies (e.g., agile, waterfall).
- 5.6.13. Perform code reviews (e.g., peer walkthrough, static analysis).
- 5.6.14. Ensure code quality by testing and debugging the application (e.g., system testing, user acceptance testing).
- 5.6.15. Train stakeholders.
- 5.6.16. Deploy the application.
- 5.6.17. Collect application feedback and maintain the application.

**Outcome: 5.7. Configuration Management**

Describe configuration management activities.

**Competencies**

- 5.7.1. Explain version management and interface control.



- 5.7.2. Explain baseline and software lifecycle phases.
- 5.7.3. Analyze the impact of changes.