



College Curriculum

**INFORMATION
TECHNOLOGY
CORE
CURRICULUM**



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Information Technology Core

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This report presents the competencies for an Information Technology Core Curriculum and was developed by the Curriculum Group of the NorthWest Center for Emerging Technologies at Bellevue Community College. This competency-based curriculum was translated from the skill standards outlined for several IT career clusters published in *Building a Foundation for Tomorrow: Skill Standards for Information Technology* by NWCET in 1997.

This report includes the following:

- **Program Learning Components:** meaningful categories of related skills and knowledge.
- **Learner Program Outcomes:** what the learners must be able to know and demonstrate at the end of the program.
- **Key Competencies:** specific, observable knowledge and skills that support and lead to the program learner outcomes.

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PROGRAM LEARNING COMPONENTS

The Learning Components are meaningful categories of related skills and knowledge that are best taught/learned together and represent logical pieces of curriculum.

Program Learning Components

Analytical Skills and Problem Solving

Analytical and Logical Thinking
Conceptualization
Data Gathering, Analysis and Organization
Estimation and Cost/Benefit Analysis
Hypothesis Development and Design of Experimentation
Pattern Recognition and Modeling
Problem Solving
Statistical Analysis

Business Environment Skills

Business Organization and Environment
Computer Trends in Business and Society
Principles of Accounting
Professional Development
Professionalism

Coordination and Communication Skills

Customer Relations
Oral Communication
Project Management
Task Management
Teamwork
Written Communication

Core Computer Software and Hardware Skills

Database Applications
Email
Hardware Installation and Configuration
Internet
Network Technologies
Presentation Software
Principles of Programming
Software Installation and Configuration
Spreadsheet Applications
Windows Environment
Word Processing

Project and Process Flow Skills

Analysis and Synthesis
Design and Development
Planning and Organization
Project Documentation
Proposal Writing
Quality Assurance
Research
Technical Documentation
User Testing and Validation

LEARNER PROGRAM OUTCOMES

Learner Program Outcomes are statements that support the Learning Components by describing what students must know and be able to do by the end of the program.

Learner Program Outcomes

Analytical and Logical Thinking – *Analytical and Problem Solving Skills*

- Demonstrate the ability to apply analytical and logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans

Conceptualization– *Analytical and Problem Solving Skills*

- Demonstrate the ability to visualize and articulate complex problems and concepts

Data Gathering, Analysis and Organization– *Analytical and Problem Solving Skills*

- Demonstrate the ability to gather, analyze and organize data using a logical and systematic process

Estimation and Cost/Benefit Analysis– *Analytical and Problem Solving Skills*

- Demonstrate the ability to develop estimates and projections, and to conduct cost/benefit analysis on specific alternatives

Hypothesis Development and Design of Experimentation– *Analytical and Problem Solving Skills*

- Demonstrate the ability to develop hypotheses and design test experiments

Pattern Recognition and Modeling– *Analytical and Problem Solving Skills*

- Demonstrate the ability to recognize patterns in complex sets of data and develop practical models

Problem Solving– *Analytical and Problem Solving Skills*

- Demonstrate the ability to select, implement and evaluate appropriate problem solving techniques and tools
- Demonstrate the ability to effectively adapt problem solving techniques to specific situations

Statistical Analysis– *Analytical and Problem Solving Skills*

- Demonstrate the ability to apply statistical methods to analyze and resolve business and technical problems

Business Organization and Environment – *Business Environment Skills*

- Demonstrate the ability to present and discuss contemporary business principles, practices and organization
- Demonstrate the ability to present and discuss how computer systems impact the operation and management of business and society

Computer Trends in Business and Society– *Business Environment Skills*

- Demonstrate the ability to discuss the issues affecting the selection of a computer system for a specific environment
- Demonstrate the ability to present current computer technology and systems trends
- Demonstrate the ability to discuss the impact of information technology on society and the workplace

Principles of Accounting– *Business Environment Skills*

- Demonstrate the ability to explain and apply basic accounting principles
- Demonstrate the ability to explain how computer applications support the financial workings of a business organization

Professional Development– *Business Environment Skills*

- Demonstrate the ability to identify and close gaps between one's knowledge and skills, and those required by the situation
- Demonstrate the ability to identify sources of learning/training most appropriate for the topic and context, and for one's personal learning style
- Demonstrate the ability to formulate and implement a personal development plan

Professionalism– *Business Environment Skills*

- Demonstrate successful work environment-related attitudes and skills
- Demonstrate the ability to establish and maintain professional relationships

Customer Relations – *Coordination and Communication Skills*

- Demonstrate the ability to effectively listen and ask critical questions to identify customer issues and concerns
- Demonstrate the ability to resolve customer issues and concerns in a timely and appropriate manner

Oral Communication– *Coordination and Communication Skills*

- Demonstrate the ability to select and evaluate appropriate oral communication strategies and styles for a specific purpose
- Demonstrate the ability to develop and deliver effective oral presentations
- Demonstrate the ability to effectively adapt oral communication strategies and styles to specific audiences

Project Management– *Coordination and Communication Skills*

- Demonstrate the ability to explain the basic terminology, principles and techniques of project management
- Demonstrate the ability to select, implement and evaluate appropriate project management techniques and tools
- Demonstrate the ability to effectively adapt project management techniques to specific situations

Task Management– *Coordination and Communication Skills*

- Demonstrate the ability to organize multiple tasks in the most effective way, and allocate time and energy according to task complexity and priority
- Demonstrate the ability to evaluate task outcomes and continuously improve organization process

Teamwork– *Coordination and Communication Skills*

- Demonstrate the ability to work collaboratively in a team setting

Learner Program Outcomes

- Demonstrate the ability to work and communicate effectively with people of different backgrounds and expertise in a group environment
- Demonstrate the ability to recognize expertise and to learn from others

Written Communication– *Coordination and Communication Skills*

- Demonstrate the ability to select and evaluate appropriate written communication strategies and styles for a specific purpose
- Demonstrate the ability to develop effective written communication pieces
- Demonstrate the ability to effectively adapt written communication strategies and styles to specific audiences

Database Applications – *Core Computer Software and Hardware Skills*

- Demonstrate the ability to define and use the basic terminology of relational databases
- Demonstrate the ability to use the tools and skills needed to create and utilize databases

E-mail– *Core Computer Software and Hardware Skills*

- Demonstrate a basic understanding of e-mail system components and organization
- Demonstrate the ability to use e-mail effectively and appropriately

Hardware Installation and Configuration– *Core Computer Software and Hardware Skills*

- Demonstrate knowledge of individual parts that make up a stand-alone PC computer system, and the relationships between components
- Demonstrate the ability to install and configure hardware in a PC computer system
- Demonstrate basic knowledge of PC hardware troubleshooting and maintenance

Internet– *Core Computer Software and Hardware Skills*

- Demonstrate the ability to use the Internet as a research tool in an efficient manner
- Demonstrate the ability to create and maintain Web pages

Network Technologies– *Core Computer Software and Hardware Skills*

- Demonstrate an understanding of the overall design and components of a LAN and WAN system
- Demonstrate the ability to perform basic setup and configuration of network hardware and software

Presentation Software– *Core Computer Software and Hardware Skills*

- Demonstrate the ability to use the components of presentation software creatively and effectively
- Demonstrate proficiency in using presentation software functions

Principles of Programming– *Core Computer Software and Hardware Skills*

- Demonstrate a knowledge of basic programming principles and programming structures
- Demonstrate the ability to design, code, build, test and troubleshoot basic custom applications

Software Installation and Configuration– *Core Computer Software and Hardware Skills*

- Demonstrate the ability to install software programs and perform basic configuration operations
- Demonstrate a basic understanding of compatibility issues
- Demonstrate the ability to troubleshoot basic configuration problems

Spreadsheet Applications– *Core Computer Software and Hardware Skills*

- Demonstrate the ability to design, create, modify and troubleshoot spreadsheets
- Demonstrate the ability to create graphs and charts
- Demonstrate the ability to apply spreadsheet principles to real-life situations and to solve business problems

Windows Environment– *Core Computer Software and Hardware Skills*

- Demonstrate the ability to perform basic operations and troubleshoot basic problems in a Windows environment
- Demonstrate the ability to customize the operating system environment
- Demonstrate the ability to run multiple applications at the same time, and import and export data between applications

Word Processing– *Core Computer Software and Hardware Skills*

- Demonstrate basic word processing skills, such as document formatting, editing and using tables
- Demonstrate the ability to create simple word processing documents such as letters, memos and basic reports
- Demonstrate the ability to create compound documents, such as newsletters, with graphics and objects from multiple software applications

Analysis and Synthesis – *Project and Process Flow Skills*

- Demonstrate the ability to gather data to identify project requirements, and to interpret and evaluate the requirements
- Demonstrate the ability to identify constraints, generate alternatives, consider risks and evaluate options
- Demonstrate the ability to define the scope of work to meet project requirements and constraints, and develop a project outline

Design and Development – *Project and Process Flow Skills*

- Demonstrate the ability to apply the design and development process from beginning to end
- Demonstrate the ability to evaluate and assess the effectiveness of the design and development process

Planning and Organization – *Project and Process Flow Skills*

- Demonstrate the ability to develop a project plan that is realistic and that effectively serves the project goals
- Demonstrate the ability to organize the different phases of the project in an efficient manner

Learner Program Outcomes

Project Documentation – *Project and Process Flow Skills*

- Demonstrate the ability to select and use documentation formats, meeting the intended purpose and the guidelines of the organization
- Demonstrate the ability to develop effective and accurate documentation appropriate to various audiences and purposes

Proposal Writing – *Project and Process Flow Skills*

- Demonstrate the ability to explain the necessary elements of a proposal and their respective purpose
- Demonstrate the ability to develop a proposal that meets the client's requirements and effectively presents the phases of the project

Quality Assurance – *Project and Process Flow Skills*

- Demonstrate the ability to explain and apply quality assurance processes as they relate to the development process
- Demonstrate the ability to discuss quality issues in a technology organization

Research – *Project and Process Flow Skills*

- Demonstrate the ability to identify and use traditional and non-traditional sources of information
- Demonstrate the ability to apply effectively and choose appropriately from a variety of research methods and tools
- Demonstrate the ability to analyze, organize and present research material

Technical Documentation – *Project and Process Flow Skills*

- Demonstrate the ability to select and use technical documentation formats meeting the intended purpose and the guidelines of the organization
- Demonstrate the ability to develop effective and accurate technical documentation appropriate to various audiences and purposes

User Testing and Validation – *Project and Process Flow Skills*

- Demonstrate the ability to develop and implement an effective testing and user validation program that supports all phases of the development process

KEY COMPETENCIES

Key Competencies are specific, observable behaviors, knowledge, abilities and skills that detail and support the Program Outcomes.

Analytical and Logical Thinking

Learner Program Outcomes

- Demonstrate the ability to apply analytical and logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans

Key Competencies

Demonstrate the ability to:

- Separate the whole into logical parts
- Examine a complex problem, its elements and their relationships
- Determine the validity of arguments
- Develop a logical argument based on relationships between elements and propositions
- Identify implications, relationships, redundancies and contradictions
- Probe for consistency and inconsistency
- Probe ambiguous statements
- Make logical connections between a hypothesis and supporting data
- Sustain a consistent approach in analyzing and solving complex, multi-step problems
- Approach problems in a systematic and rigorous manner
- Diagram a problem and develop associated solutions
- Use logic to develop and test a range of potential solutions to a given problems
- Formulate a logical plan based on proposed solutions

Conceptualization

Learner Program Outcomes

- Demonstrate the ability to visualize and articulate complex problems and concepts

Key Competencies

Demonstrate the ability to:

- Reduce complex relationships and problems into simpler parts with fewer variables
- Work with parts of a problem and apply results to more complex problems
- Visualize new and existing concepts and designs
- Develop concepts for prototypes based on partial information
- Anticipate problems and develop contingencies
- Link ideas and concepts to analyze current situation
- Use past experience and knowledge to predict future outcomes
- Modify prototype and design concepts to meet changing needs
- Document and communicate problem components and concepts

Data Gathering, Analysis and Organization

Learner Program Outcomes

- Demonstrate the ability to gather, analyze and organize data using a logical and systematic process

Key Competencies

Demonstrate the ability to:

- Specify and characterize needed data
- Identify relevant sources for data
- Observe, record and organize data
- Make insightful observations and connections
- Recognize unexpected evidence
- Evaluate data in a way that leads to conclusions and decisions consistent with the data
- Judge when there is sufficient or insufficient data
- Judge validity, relevance and completeness of data
- Perform logical analysis of data
- Make and evaluate conclusions and recommendations
- Display data for maximum understanding and analysis
- Categorize types of problems
- Eliminate extraneous data

Estimation and Cost/Benefit Analysis

Learner Program Outcomes

- Demonstrate the ability to develop estimates and projections, and to conduct cost/benefit analysis on specific alternatives

Key Competencies

Demonstrate the ability to:

- Develop reasonable estimates
- Evaluate computed results for validity and probability
- Compute probabilities and predict outcomes based on results
- Diagram and apply cause and effect relationships
- Select appropriate and relevant data to support estimations
- Identify project costs and benefits including intangibles
- Recognize when an estimate needs to be revised
- Analyze cost/benefit information and develop recommendations
- Run what-if scenarios on cost analysis information
- Identify critical factors and associated cost to possible problems

Hypothesis Development and Design of Experimentation -

Learner Program Outcomes

- Demonstrate the ability to develop hypotheses and design test experiments

Key Competencies

Demonstrate the ability to:

- Differentiate between facts and assumptions
- Discern between a scientific and a non-scientific hypothesis
- Develop a logical hypothesis based on observations
- Formulate meaningful and relevant questions
- Develop abstract hypotheses from actual data
- Specify the data that would verify a hypothesis
- Develop and test an experimental process to support the testing of the hypotheses
- Develop appropriate experiments based on hypothesis
- Develop conclusions in terms of observable and quantifiable data
- Develop new approaches to looking at a given problem
- Confirm or refute hypotheses using experimental data
- Identify critical factors in the experimentation design
- Make accurate measurements and analyze results

Pattern Recognition and Modeling

Learner Program Outcomes

- Demonstrate the ability to recognize patterns in complex sets of data and develop practical models

Key Competencies

Demonstrate the ability to:

- Look for and recognize patterns within data
- Recognize elements as consistent or inconsistent with knowledge and past experience
- Recognize links between root causes and secondary effects
- Identify and eliminate unnecessary variables
- Justify the extent of the generalizations
- Use statistics to analyze and select data to support the modeling process
- Generalize specific instances into models
- Make appropriate inferences from available data
- Represent relationships and data using model techniques
- Apply general models to specific instances

Problem Solving

Learner Program Outcomes

- Demonstrate the ability to select, implement and evaluate appropriate problem solving techniques and tools
- Demonstrate the ability to effectively adapt problem solving techniques to specific situations

Key Competencies

Demonstrate the ability to:

- Recognize a wide range of problems and assess their impact on the system
- Use a wide range of troubleshooting methods and tools to isolate problems
- Select the appropriate approach to identify causes of the problem based on the given situation
- Perform systematic analysis and a logical process to identify problem causes using the best available tools and resources
- Listen for input and ask critical questions to identify the problem and its possible causes
- Select the tools and methods most appropriate to resolve the problem
- Identify, develop and test potential solutions, and develop resolution plan in line with available resources
- Identify the potential risks in implementation, assess the cost/benefit of implementation alternatives (including non-implementation), and make recommendations
- Assess the risks and benefits of parallel solutions
- Communicate and implement solution in a manner that minimizes risk and disruption to productivity
- Document and communicate problem, analysis and resolution process, solution and outcome
- Develop a solution implementation strategy, and document and communicate the implementation plan
- Monitor the implementation process and readjust to better meet goals
- Communicate problem causes and resolution with users and other critical parties
- Follow-up after resolution to ensure system performance and user satisfaction
- Develop recommendations for prevention of problem recurrence
- Evaluate effectiveness of processes, tools and communication used in problem resolution and develop recommendations for continuous improvement
- Assess the team process in problem solving and make recommendations for improvement

Statistical Analysis

Learner Program Outcomes

- Demonstrate the ability to apply statistical methods to analyze and resolve business and technical problems

Key Competencies

Demonstrate the ability to:

- Present statistical information in various statistical formats
- Define and appropriately use basic statistical terms and functions
- Apply and compute central tendencies such as mean and mode
- Apply and compute dispersion indicators such as variance and standard deviation
- Apply appropriate sampling methods and distributions to specific problems
- Apply statistical hypothesis testing methods
- Determine and compute the appropriate confidence level
- Interpret basic statistical indicators
- Differentiate between independent and dependent events
- Make appropriate inferences from statistical information
- Apply statistics to test the validity of statements
- Determine the appropriate statistical analysis method and indicators to
- Meet specific needs
- Design surveys based on statistical principles and specific project goals
- Document statistical methods, assumptions and results in accepted formats

Business Organization and Environment – *Business Environment Skill*

Learner Program Outcomes

- Demonstrate the ability to present and discuss contemporary business principles, practices and organization
- Demonstrate the ability to present and discuss how computer systems impact the operation and management of business and society

Key Competencies

Demonstrate the ability to:

- Present contemporary business economic issues, principles and practices
- Explain the internal and external forces and economic conditions that affect the operation of a business
- Explain the legal and social aspects of the business environment
- Discuss the social responsibility of business and business ethics
- Explain different legal entities for business organizations, their respective advantages and disadvantages, and how they operate
- Discuss the main differences between small businesses and mid-to-large size businesses
- Discuss the issues particular to corporations doing business internationally
- Explain the purpose of functional business areas including marketing, finance, accounting, research and development, manufacturing and management
- Discuss the role and interactions between different functional groups
- Discuss the concepts and issues of business management
- Discuss the concepts and issues of human resource management
- Explain the concepts and issues of marketing products and services
- Explain the basics of promotion and distribution
- Explain and appropriately use general business terminology
- Explain how and where computers are used in today's business environment
- Describe how computer systems are used in different functions of a business
- Discuss the impact of information systems on business operations
- Describe the impact of computers on access to information and information exchange worldwide
- Present ethical issues as they relate to the use of computers and information in today's society
- Define information privacy and describe how it has been and is currently affected by computers
- Discuss intellectual property issues in business
- Present the positive and negative impacts of computer technology on business and society

Computer Trends in Business and Society

Learner Program Outcomes

- Demonstrate the ability to discuss the issues affecting the selection of a computer system for a specific environment
- Demonstrate the ability to present current computer technology and systems trends
- Demonstrate the ability to discuss the impact of information technology on society and the workplace

Key Competencies

Demonstrate the ability to:

- Explain the distinction between information and data
- Explain the meaning and scope of information technology
- Explain the functions and limitations of computers in general terms
- Explain the purpose of gathering and managing information as an integral part of conducting business
- Explain how information systems are used in different areas of business (customer service, inventory control, manufacturing and quality control, research and development, payroll, marketing, etc.)
- Explore the issues of privacy and right of access to information
- Discuss ethics issues as they relate to information technology
- Explain the main impacts of information technology on society and the workplace
- Describe the main impacts of the Internet and multimedia on society, education and business
- Explain the evolution of computing system architectures
- Discuss the trends in information technology hardware and software
- Explain the main advantages and disadvantages of different system architectures
- Conduct a simple cost/benefit analysis for different systems in different business environments
- Explain the key differences and tradeoffs between centralized and decentralized information systems
- Explore the cost and benefit issues involved in purchasing or upgrading a computer system
- Explain the impact on efficiency during the transition to a new information system
- Generate recommendations for the design of information systems for specific business needs and environments
- Explain the concepts of technology patenting, copyrighting and software licensing
- Explain the projected impact of the Internet on computer systems and applications

Principles of Accounting

Learner Program Outcomes

- Demonstrate the ability to explain and apply basic accounting principles
- Demonstrate the ability to explain how computer applications support the financial workings of a business organization

Key Competencies

Demonstrate the ability to:

- Define and use appropriately basic accounting terminology
- Record business transactions using recognized accounting principles
- Explain and apply the principles of payroll accounting
- Explain the characteristics of different accounting systems
- Present the basic advantages and disadvantages of sole proprietorship, partnership and corporation from an accounting perspective
- Explain how the accounting process is affected by the type of business entity
- Develop simple income statements, statements of capital and balance sheets
- Analyze income statements, statements of capital and balance sheets
- Develop basic models to represent financial administration systems
- Use software tools to record financial transactions in a business environment
- Use software tools to analyze the financial health of an organization
- Explain how the different units of a business interact with the financial department
- Discuss the forces and economic conditions that exist in operating a business
- Make general business strategy recommendations based on financial statements
- Explain how the operational organization of a business impacts its financial organization
- Present the differences from a financial perspective between for-profit and non-profit organizations

Professional Development

Learner Program Outcomes

- Demonstrate the ability to identify and close gaps between one's knowledge and skills, and those required by the situation
- Demonstrate the ability to identify sources of learning/training most appropriate for the topic and context, and for one's personal learning style
- Demonstrate the ability to formulate and implement a personal development plan

Key Competencies

Demonstrate the ability to:

- Describe different learning styles and explain which learning strategies best apply to each style
- Identify one's own learning style and preferences in acquiring information
- Assess the effectiveness of various learning forums in light of the subject or skill being taught
- Recognize what skills and knowledge are needed to work on a specific project or in a specific environment
- Anticipate the needs for new skills and knowledge based on changes in responsibilities and/or technologies
- Assess personal skills and knowledge against identified needs
- Research options for training and education
- Evaluate effectiveness of training and education in the context of identified needs, and available time and resources
- Acquire new knowledge and skills in a wide range of contexts and formats
- Take advantage of on-the-job or on-the-project self-learning opportunities
- Ask for informal training from others, and learn from others' experience and knowledge
- Build upon one's strengths to effectively meet the needs of the project and the environment
- Assess one's readiness for further training
- Evaluate the portability of one's skills to new areas of application
- Develop a personal training and education plan
- Follow through with commitments to develop new skills and knowledge, or further develop existing skills and knowledge
- Select training or education forums that best meet needs, and available time and resources
- Explain the importance of continuous learning in a technology environment
- Explain the impact of the organization culture on skill expectations

Professionalism

Learner Program Outcomes

- Demonstrate successful work environment-related attitudes and skills
- Demonstrate the ability to establish and maintain professional relationships

Key Competencies

Demonstrate the ability to:

- Explain the basics of, and rationale for work ethics
- Give examples of behaviors that support and behaviors that undermine the functioning of the organization
- Discuss issues of confidentiality, and explore behaviors and procedures to support the company's policies in data confidentiality
- Explain the purpose of a hierarchical structure and the various forms of organizational structures
- Explain what contributes to a productive environment
- Give examples of behaviors that contribute to professionalism
- Explain how personal values impact one's work performance
- Explain cultural differences and how they affect an organization
- Explain how cultures and organization goals will impact performance and attitude expectations
- Identify characteristics of effective leaders
- Identify employer expectations regarding job performance and attitudes
- Define one's role and responsibilities in a given context
- Take pride in one's work and assume responsibility for personal actions
- Work effectively within the organization hierarchy and reporting procedures
- Display a positive attitude and a professional image, and foster a productive environment
- Make effective decisions and display initiative in a wide range of contexts
- Display leadership skills in a variety of contexts
- Assess one's performance against expectations
- Ask for and accept constructive criticism, and exhibit continual growth based on feedback and performance evaluation
- Seek and use feedback on personal performance and effectiveness from a wide range of sources
- Develop personal strategies to improve performance
- Explain the need and benefits of maintaining a strong professional network
- Recognize and effectively use opportunities and forums to establish professional relationships
- Foster and develop a successful professional network
- Adapt one's professional network to one's professional goals

Customer Relations

Learner Program Outcomes

- Demonstrate the ability to effectively listen and ask critical questions to identify customer issues and concerns
- Demonstrate the ability to resolve customer issues and concerns in a timely and appropriate manner

Key Competencies

Demonstrate the ability to:

- Explain the importance of customers in business
- Identify internal and external customer groups in various types of organizations
- Explain the responsibilities of business towards customers
- Summarize and analyze customer inputs
- Ask questions that solicit productive input and feedback from customers
- Differentiate between customer requirements and desires
- Communicate product features-cost compromises
- Communicate alternatives and options
- Respond effectively to customer needs and concerns
- Negotiate with customers in a productive manner to arrive at a best-fit solution
- Recognize when customer requests are unreasonable or counter-productive, and use creative and effective interpersonal techniques to resolve differences
- Recognize when conflicts or issues with customers need to be escalated, and appropriately involve higher levels in the organization
- Communicate project plan, status, risks and contingencies to the customer in a timely manner and with an appropriate level of detail
- Solicit feedback from customers and apply input to improve the quality of service
- Schedule and manage effectively multiple customer requests
- Recognize the customer level of experience and expertise, and tailor training and communication accordingly
- Deliver solutions that meet customer needs in a timely and appropriate manner
- Recognize when a customer concern needs to be referred to someone else in or outside the organization
- Act as a liaison between technical groups to coordinate delivery of service or product
- Recognize proprietary information and respect customer confidentiality
- Assess the effectiveness of the customer interaction process
- Make recommendations and develop procedures for improvement in the customer relation process
- Follow-up with customers to evaluate the effectiveness of product or service over time

Oral Communication

Learner Program Outcomes

- Demonstrate the ability to select and evaluate appropriate oral communication strategies and styles for a specific purpose
- Demonstrate the ability to develop and deliver effective oral presentations
- Demonstrate the ability to effectively adapt oral communication strategies and styles to specific audiences

Key Competencies

Demonstrate the ability to:

- Explain the purpose and different uses of oral communication in business and industry, and give examples
- Identify the appropriate communication process for a specific purpose and situation
- Communicate effectively using a wide range of oral communication styles
- Use clear, focused, specific and grammatically correct language
- Use precise and accurate technical terminology
- Listen and paraphrase effectively to enhance communication process
- Sustain a definite focus and link ideas in a progressive, logical sequence
- Present information persuasively and sustain an argument using appropriate evidence or examples
- Be courteous and professional when communicating with others using a degree of formality appropriate to the situation
- Ask relevant and clarifying questions, and listen effectively for content and underlying issues
- Recognize and appropriately respond to audience focus, level of expertise and need for detail
- Communicate effectively with audiences with various degrees of expertise in a wide range of technical and business contexts
- Compose and present well organized presentations
- Use various presentation technologies
- Evaluate effectiveness of communication on a continuous basis by observing the audience and asking for feedback
- Be responsive to audience and adjust communication style and content accordingly
- Effectively address and resolve conflicts in communication
- Prepare and deliver professional presentations that are appropriate to purpose and intended audience
- Show creativity and a positive attitude when technical problems, or other unforeseen difficulties, arise during a formal presentation, and communicate the message effectively through informal methods
- Project a professional and confident attitude during presentations

Project Management

Learner Program Outcomes

- Demonstrate the ability to explain the basic terminology, principles and techniques of project management
- Demonstrate the ability to select, implement and evaluate appropriate project management techniques and tools
- Demonstrate the ability to effectively adapt project management techniques to specific situations

Key Competencies

Demonstrate the ability to:

- Explain and appropriately use project management terminology
- Explain the different phases and elements of project management
- Evaluate project requirements, and clearly define and articulate project scope and goals
- Identify stakeholders, decision-makers and escalation procedures
- Develop detailed task list and analyze relationships between tasks and the overall project
- Organize and prioritize tasks, develop general project flow chart, identifying critical tasks and task interdependencies
- Identify project time, personnel, budget and equipment requirements
- Map resource requirements to resource availability, secure necessary resources and use resources effectively
- Identify, evaluate and monitor risks throughout the project, and prepare contingency plans
- Develop performance measurement processes
- Identify critical milestones and project performance, budgets and the use of resources
- Anticipate and resolve conflicts as they arise
- Identify and implement escalation procedures when appropriate
- Use evaluation information to adjust activities to meet goals
- Identify a critical path failure and implement contingency plans when necessary
- Participate in and actively contribute to project reviews
- Document and report project status in a timely manner using appropriate channels
- Work effectively within the system and with members of the team and organization
- Adapt project management style to the project team and the specific environment
- Adapt and redirect the project management process and project tasks to meet changing requirements and unanticipated events
- Analyze project management process and make recommendations for improvement

Task Management

Learner Program Outcomes

- Demonstrate the ability to organize multiple tasks in the most effective way, and allocate time and energy according to task complexity and priority
- Demonstrate the ability to evaluate task outcomes and continuously improve organization process

Key Competencies

Demonstrate the ability to:

- Break down projects and activities into a series of meaningful tasks
- Develop task list that is realistic and in line with expectations
- Identify task priorities and interdependencies, and organize in a logical sequence
- Explain impact of one's work on the project and other project members
- Estimate time and resources necessary to complete specific tasks
- Recognize conflicts in the use of resources or in goals between separate tasks
- Develop personal work schedule and processes that meet expectations and align with personal work style
- Conduct effectively and monitor several tasks simultaneously
- Show initiative in task accomplishment and scheduling
- Accomplish tasks in an efficient manner and on schedule
- Assess one's work process in terms of effectiveness
- Devise ways to improve one's work processes
- Develop and implement monitoring processes and checkpoints
- Monitor and evaluate task performance and completion against project plan and standards
- Make process improvements and adjustments as tasks progress
- Document, communicate and report problems in a timely manner
- Generate and communicate task status reports to peers and managers
- Recognize when a task is completed to expectations
- Be flexible in task organization and be responsive to unplanned demands
- Anticipate and prepare for changing work loads
- Assess task assignments against perceived role and responsibilities
- Delegate responsibilities to others when appropriate

Teamwork

Learner Program Outcomes

- Demonstrate the ability to work collaboratively in a team setting
- Demonstrate the ability to work and communicate effectively with people of different backgrounds and expertise in a group environment
- Demonstrate the ability to recognize expertise and to learn from others

Key Competencies

Demonstrate the ability to:

- Explain the role of team work in various settings and organizations
- Explain different team processes, roles and group dynamics, their purposes, advantages and disadvantages
- Select a specific team process to meet the team's goals
- Use effectively a variety of listening, communication and interactive styles and strategies, and recognize their appropriateness depending on environment and goals
- Listen actively and contribute ideas in an effective manner
- Take risks in contributing to the team process
- Support other team members when appropriate
- Ask for help from the team when needed
- Learn from and teach other members of the team
- Share knowledge with others in a collaborative environment
- Give and receive feedback in a team environment
- Communicate with other team members in a timely manner
- Be flexible with one's own style of participation to accommodate changes in the team dynamics and focus
- Acknowledge and respect differences in backgrounds, opinions and communication styles
- Recognize and respect cultural, ethnic and linguistic diversity
- Recognize and leverage strengths in one's self and others to further the goals of the team
- Foster an environment that supports risk taking in freely disclosing ideas and opinions
- Identify and support productive ideas and processes that contribute to the team goals
- Function effectively in different roles within the team, demonstrate leadership when appropriate, and show flexibility in accepting others' leadership
- Manage conflicts in a productive manner, and work collaboratively to set and accomplish team goals
- Discuss the advantages of a diverse culture and its benefits to the overall productivity of the organization
- Present the issues encountered in a diverse organizations and effective strategies to address these issues
- Recognize and foster processes that contribute to the overall team purpose
- Assess the effectiveness of the team process in a given context and make recommendations for improvements
- Organize, manage and facilitate a wide range of team processes

Written Communication

Learner Program Outcomes

- Demonstrate the ability to select and evaluate appropriate written communication strategies and styles for a specific purpose
- Demonstrate the ability to develop effective written communication pieces
- Demonstrate the ability to effectively adapt written communication strategies and styles to specific audiences

Key Competencies

Demonstrate the ability to:

- Explain and appropriately use written communication terminology
- Explain the purpose and different uses of written communication in business and industry, and give examples
- Identify the appropriate written communication format for a specific purpose and situation
- Communicate effectively using a wide range of written communication formats
- Use the right balance of information and personal interpretation to achieve intended purpose
- Use clear, specific and grammatically correct language
- Use precise and accurate technical terminology
- Sustain a definite focus and point of view, and link ideas in a progressive, logical sequence
- Be courteous and professional when communicating with others using a degree of formality appropriate to the situation
- Analyze written communication to effectively extract content and underlying issues
- Adapt style and content of communication to audience need and feedback
- Recognize and appropriately address audience focus, level of expertise and need for detail
- Compose and present well organized written pieces
- Balance visual and text elements in written communication
- Be responsive to audience, and adjust communication format and content accordingly
- Evaluate effectiveness of communication on a continuous basis by asking for feedback
- Present information persuasively and sustain an argument using appropriate evidence or examples
- Prepare professional memos and reports that are appropriate to purpose and intended audience

Database Applications

Learner Program Outcome

- Demonstrate the ability to define and use the basic terminology of relational databases
- Demonstrate the ability to use the tools and skills needed to create and utilize databases

Key Competencies

Demonstrate the ability to:

- Present the basic principles of database theory and database organization
- Present and discuss issues of database and server security
- Explain database design concepts and define database components
- Utilize relational databases effectively
- Design simple database structures
- Create and edit tables
- Identify and create relationships between tables
- Create and modify simple queries
- Explain the different types of queries and their purpose
- Use appropriate Boolean functions (AND, OR, NOT) in designing query statements
- Create, modify and customize simple reports
- Create, modify and customize simple forms
- Import and export database information from and to other applications
- Explain the use of databases and information in the business environment
- Develop database business applications
- Establish different levels of user access for reading and entering data into a database

E-mail

Learner Program Outcomes

- Demonstrate a basic understanding of e-mail system components and organization
- Demonstrate the ability to use e-mail effectively and appropriately

Key Competencies

Demonstrate the ability to:

- Describe and explain the purpose and basic features of e-mail systems
- Create short, simple, concise messages
- Send, receive, reply, forward, save and delete messages
- Create, send and save attachments
- Use the login and password system
- Print messages, documents and files
- Create, save and use distribution lists
- Explain and use priority levels on messages
- Explain and actively follow guidelines for legal usage
- Develop a folder for saved messages and documents, and organize messages
- Access e-mail system support help facilities and e-mail tools
- Explain and use appropriate e-mail etiquette
- Use e-mail appropriately according to organization guidelines
- Use e-mail options such as “reply requested” and “out-of-office reply”
- Explain the issues of virus contamination through e-mail, and discuss protection strategies
- Explain the role of e-mail as an integral part of the organization communication system
- Recognize data integrity and security issues which affect e-mail usage

Hardware Installation and Configuration

Learner Program Outcomes

- Demonstrate knowledge of individual parts that make up a stand-alone PC computer system, and the relationships between components
- Demonstrate the ability to install and configure hardware in a PC computer system
- Demonstrate basic knowledge of PC hardware troubleshooting and maintenance

Key Competencies

Demonstrate the ability to:

- Diagram, label and describe the functions of the components of a PC system
- Install, upgrade and configure hardware
- Collect and analyze system information
- Describe and use appropriate safety precautions when working with PCs
- Explain how hardware components interact and how conflicts arise
- Identify and address various error messages and symptoms of hardware failures
- Identify and perform preventative maintenance procedures
- Install and configure peripheral devices such as mice and printers
- Access and configure the CMOS set up
- Perform advanced preventative maintenance for hard disks using utilities software
- Research and document solutions to error messages or symptoms of a hardware problem

Internet

Learner Program Outcomes

- Demonstrate the ability to use the Internet as a research tool in an efficient manner
- Demonstrate the ability to create and maintain Web pages

Key Competencies

Demonstrate the ability to:

- Use the main functions of Internet browsers
- Move between Web pages using addresses and links
- Save and edit text and images from Web pages
- Use basic search engines and explain search results
- Refine searches to obtain more specific information
- Produce a list of appropriate Internet addresses for a specific research topic
- Make appropriate, responsible, ethical choices of what information (content and level) to pursue, use and distribute, depending on context and target user
- Explain the features, advantages and disadvantages of different browsers
- Describe different search engines specific strengths, weaknesses and special features
- Choose the best search engine for a specific research assignment and justify choice
- Use Boolean functions in search engines
- Use appropriate reference material and help in solving browser problems
- Use and distribute Internet information within the guidelines of the organization
- Discuss ethical issues around use and distribution of information through the Internet, and propose guidelines within a specific organizational context
- Locate and download software upgrades from the Internet
- Create Web pages including internal and external links, using Web page development tools

Network Technologies

Learner Program Outcomes

- Demonstrate an understanding of the overall design and components of a LAN and WAN system
- Demonstrate the ability to perform basic setup and configuration of network hardware and software

Key Competencies

- *Demonstrate the ability to:*
- Explain networking concepts and principles, and different network structures
- Present and explain the design and features of LAN and WAN systems
- Determine hardware requirements for a workstation operating system
- Setup and configure a basic workstation connected to the network
- Perform and document basic troubleshooting activities at the workstation level
- Setup and configure network components such as network interface cards, printers and CD-ROM devices
- Determine the type of network topology needed, such as peer-to-peer and server based
- Explain the type of wiring needed for the physical connection of the network
- Implement a basic security system, backup procedures and maintenance
- Perform a standard tape backup
- Recognize the advantages and disadvantages of peer-to-peer network operating systems

Presentation Software

Learner Program Outcomes

- Demonstrate the ability to use the components of presentation software creatively and effectively
- Demonstrate proficiency in using presentation software functions

Key Competencies

Demonstrate the ability to:

- Explain the features and functions of a presentation software package
- Create, edit and save presentation slides and handouts
- Use master slide to create new slides and notes
- Use the different templates and slide backgrounds
- Use and modify the slide master
- Apply different formats on a slide
- Create slides that are easy to read and choose effective fonts and layouts
- Use the outline feature to move text and slides
- Sort and organize slides
- Organize the presentation in a logical sequence according to purpose and audience
- Use slide transitions and build effects
- Apply the principles and fundamentals of graphics design in creating slides
- Import graphics, spreadsheets and charts
- Create effective presentations communicating clearly the topic
- Create interesting presentations appealing to the target audience
- Analyze the effectiveness of the design of a presentation and make recommendations for improvement

Principles of Programming

Learner Program Outcomes

- Demonstrate a knowledge of basic programming principles and programming structures
- Demonstrate the ability to design, code, build, test and troubleshoot basic custom applications

Key Competencies

Demonstrate the ability to:

- Explain the purpose and applications of computer programs
- Describe and explain the steps of program development and program life cycle
- Describe and explain the main differences between programming languages and programming styles
- Explain the main features of the different programming languages
- Explain and apply the principles and process of program design
- Explain the principles of project-oriented programming style
- Describe the functions of and apply programming tools
- Describe the required formats for and explain the purpose of data types, variables and arrays
- Describe the different types of controls and commands, and explain their purpose
- Appropriately use operators, functions and procedures
- Explain and appropriately use different decision and looping structures
- Develop accurate program flow charts
- Design, code and debug simple programs
- Present and appropriately use debugging tools and principles
- Explain and apply the documentation process throughout the program life cycle
- Document the design, development and testing process

Software Installation and Configuration

Learner Program Outcomes

- Demonstrate the ability to install software programs and perform basic configuration operations
- Demonstrate a basic understanding of compatibility issues
- Demonstrate the ability to troubleshoot basic configuration problems

Key Competencies

Demonstrate the ability to:

- Document complete hardware specifications required for successful software installation
- Document complete software specifications including operating systems and currently installed programs
- Analyze and inventory hardware and software to determine compatibility
- Install new software on standalone computers
- Install software in DOS and a variety of Windows type environments
- Read and follow documentation that accompanies software products
- Install software using default options
- Install software using customize options
- Configure software to appropriate operating system settings
- Modify software configuration to meet user needs and preferences
- Troubleshoot unexpected results during installation procedure and formulate a resolution plan
- Document step by step installation and configuration procedures
- Disable currently installed software that may interfere with installation of new software
- Research and obtain help from manufacturers' technical help lines
- Identify differences between an upgrade and new installation, and adapt installation procedure accordingly
- Identify differences between stand-alone and network installation procedures
- Install application and system software on a variety of platforms
- Develop an installation plan minimizing impact on system and user

Spreadsheet Applications

Learner Program Outcomes

- Demonstrate the ability to design, create, modify and troubleshoot spreadsheets
- Demonstrate the ability to create graphs and charts
- Demonstrate the ability to apply spreadsheet principles to real-life situations and to solve business problems

Key Competencies

Demonstrate the ability to:

- Explain and apply spreadsheet design principles
- Develop, edit, save and retrieve spreadsheets
- Print spreadsheets using print options
- Format spreadsheets
- Use simple and advanced formulas
- Create graphs and charts from spreadsheets
- Troubleshoot spreadsheets and resolve errors
- Import and export data and objects to/from other applications
- Embed spreadsheets in other applications
- Link several spreadsheets
- Create simple spreadsheets for personal applications
- Use online help to learn about features and correct problems
- Apply spreadsheet principles to business decision making
- Apply spreadsheet principles to real-life situations

Windows Environment

Learner Program Outcomes

- Demonstrate the ability to perform basic operations and troubleshoot basic problems in a Windows environment
- Demonstrate the ability to customize the operating system environment
- Demonstrate the ability to run multiple applications at the same time, and import and export data between applications

Key Competencies

Demonstrate the ability to:

- Coordinate mouse and keyboard operations
- Browse through files and locate specific files
- Create folders, and organize files on disks and in folders
- Move, copy, rename and delete files and folders
- Back up files
- Format floppy disks
- Open and close files and applications in a Windows environment
- Add commands to the start menu
- Add programs to the program menu
- Manage the hard drive using system tools
- Switch to a different printer on the network
- Customize the desktop environment
- Create shortcuts on the desktop
- Set date and time
- Use Windows accessories
- Identify problems and conduct basic troubleshooting procedures
- Use help to learn about a specific procedure and troubleshoot problems
- Run MS-DOS-based programs from Windows
- Move between files and applications, and transfer data between applications
- Use dial-up networking
- Describe the purpose of different types of files and recognize a file type through its extension

Word Processing

Learner Program Outcomes

- Demonstrate basic word processing skills, such as document formatting, editing and using tables
- Demonstrate the ability to create simple word processing documents such as letters, memos and basic reports
- Demonstrate the ability to create compound documents, such as newsletters, with graphics and objects from multiple software applications

Key Competencies

Demonstrate the ability to:

- Create, edit, save and print documents
- Locate and open existing documents
- Create, edit, delete and move text
- Format text and paragraphs
- Use the tab setting functions
- Create bulleted items and change bullet format
- Format a page, including setting margins, page numbers, headers and footers
- Use styles, forms and templates
- Use find and replace functions and options
- Use navigation keys and functions
- Format and print envelopes and labels
- Use utility tools, including spell checker, thesaurus and grammar checker
- Create, format, modify, delete and move columns
- Create, format and edit tables
- Use print preview and print options
- Use help to learn about functions and to troubleshoot problems
- Work with outlines, footnotes and endnotes
- Embed graphics and charts in documents
- Embed objects from other applications and Internet sources
- Create a mail merge
- Create different types of business documents in standard formats and styles, including standard memos, reports, letters and newsletters

Analysis and Synthesis

Learner Program Outcomes

- Demonstrate the ability to gather data to identify project requirements, and to interpret and evaluate the requirements
- Demonstrate the ability to identify constraints, generate alternatives, consider risks and evaluate options
- Demonstrate the ability to define the scope of work to meet project requirements and constraints, and develop a project outline

Key Competencies

Demonstrate the ability to:

- Identify relevant sources of information for the project
- Gather data and extract relevant information to identify project requirements, resources and risks
- Analyze information for completeness, relevance, accuracy and consistency and synthesize the information
- Identify missing information and find sources to complete requirement set
- Identify and analyze areas of conflict in specifications and requirements, make individual assessments of the information, and synthesize into solutions and recommendations
- Identify time, technology and resource constraints
- Analyze and resolve conflicts between requirements and constraints
- Synthesize information and validate requirement set with clients
- Develop concepts including alternatives
- Prepare a cost/benefit estimate for each alternative and make recommendations
- Identify risks and their impact on the overall project
- Analyze and synthesize information and make recommendations, including need for further information
- Define general scope of work to meet requirements and constraints
- Develop project outline including recommendations, alternatives, risks, cost/benefit summary and scope of proposed work
- Summarize and communicate the information presented in the project outline
- Develop feedback strategies to monitor the processes of analysis and synthesis
- Evaluate the processes of analysis and synthesis, and make recommendations for improvement

Design and Development

Learner Program Outcomes

- Demonstrate ability to apply the design and development process from beginning to end
- Demonstrate ability to evaluate and assess the effectiveness of the design and development process

Key Competencies

Demonstrate the ability to:

- Identify the phases and objectives of the systems development life cycle
- Explain the advantages and disadvantages of developing your own information system versus purchasing or leasing from a vendor
- Describe the reasons for developing custom software and hardware
- Define and evaluate a variety of analysis and design tools appropriate to the project
- Use a variety of analysis and design tools, such as data flow diagrams and prototyping
- Describe how prototyping is used in the systems development life cycle
- Explain the importance of project documentation during the design/development process
- Develop and evaluate design alternatives
- Propose, design and test solutions
- Document solutions, design and testing processes, and test results
- Perform post-implementation evaluation
- Define the contents of the systems design specification document and explain its purpose
- Evaluate the system documentation for accuracy, completeness and timeliness of information
- Develop test specifications for a given system
- Make recommendations for system maintenance based on design parameters
- Design and build a system that meets the end user's needs
- Compare the delivered system to the requested system and determine whether the new system meets the specified requirements
- Evaluate effectiveness of design/development tools and processes, and make recommendations for improvement
- Compare prototype with design requirements and make recommendations
- Develop a trade-off analysis and recommendations for in-house development versus outside lease/purchase for a given system within a specific organizational context

Planning and Organization

Learner Program Outcomes

- Demonstrate the ability to develop a project plan that is realistic and that effectively serves the project goals
- Demonstrate the ability to organize the different phases of the project in an efficient manner

Key Competencies

Demonstrate the ability to:

- Explain the principles of planning for a project and identify critical elements of a successful plan
- Identify necessary hardware and software, and what is currently available to the project team
- Identify current team skills and the need for outside help
- Estimate time and resources for each phase of the project
- Refine and finalize plan based on available and negotiable resources and time
- Develop project plan organizing project elements, development tasks, resources, deliverables, schedule and cost in a coordinated framework
- Identify necessary feedback and checkpoints at critical steps in the project
- Use software tools to support the planning phase and represent the overall project plan
- Communicate project plan with team and solicit feedback from team members to refine plan
- Explain the purpose and processes of prototyping and pilots
- Develop and organize detailed task list and task schedule, and allocate resources according to task schedule and priority
- Identify critical path failure and develop contingency plans
- Document project plan with the level of detail required by the project scope and complexity, and by organization policies
- Organize the team to most effectively accomplish the project tasks within schedule and budget

Project Documentation

Learner Program Outcomes

- Demonstrate the ability to select and use documentation formats, meeting the intended purpose and the guidelines of the organization
- Demonstrate the ability to develop effective and accurate documentation appropriate to various audiences and purposes

Key Competencies

Demonstrate the ability to:

- Explain the purpose and different uses of documentation formats in business and industry
- Give examples of different documentation formats and select appropriate format for specific purpose
- Use various project documentation styles and formats, and analyze effectiveness in meeting the intended purpose and the needs of the target audience
- Develop an outline for the project document that meets the purpose
- Use clear, focused, specific and grammatically correct language and terminology
- Develop complete and accurate technical specifications
- Present information in a well organized pattern and sustain a definite focus
- Summarize, paraphrase and synthesize information effectively
- Present complex ideas and pose critical questions
- Present information persuasively and objectively
- Integrate multiple items of information and reconcile conflicting information
- Write in a concise and precise form appropriate for project communication with the appropriate level of technical detail and complexity
- Incorporate appropriate visual elements in documents to support the text
- Adapt writing style and technical content to suit different technical levels and different audiences
- Discuss the impact of and use appropriate guidelines in the development of documents
- Learn and use effective strategies for collaborative work in preparing documents
- Use appropriate proofing, editing and review procedures to ensure effective documentation

Proposal Writing

Learner Program Outcomes

- Demonstrate the ability to explain the necessary elements of a proposal and their respective purpose
- Demonstrate the ability to develop a proposal that meets the client's requirements and effectively presents the phases of the project

Key Competencies

Demonstrate the ability to:

- Explain the purpose of a proposal
- Explain the proposal development process
- Identify the key parts of a proposal and what contributes to an effective proposal
- Develop a proposal idea and an effective outline for the proposal
- Develop concepts for the project and analyze effectiveness of each concept
- Evaluate and select the best approach for the proposal
- Effectively present and justify selected concepts
- Summarize relevant background and research material to support proposal
- Include supporting material and necessary justification in the proposal
- Develop a realistic estimate for budget, schedule and resources
- Present clearly the different phases of the project and their interdependencies
- Present the overall proposal in a level of detail that meets the needs of the audience
- Develop proposal that is cohesive, complete and easy to read
- Analyze a proposal for effectiveness and completeness
- Identify risk of the proposal and develop contingencies
- Analyze the customer culture and expectations, and apply to proposal design, content and layout
- Negotiate elements of the proposed work with clients and project team, and refine proposal accordingly

Quality Assurance

Learner Program Outcomes

- Demonstrate the ability to explain and apply quality assurance processes as they relate to the development process
- Demonstrate the ability to discuss quality issues in a technology organization

Key Competencies

Demonstrate the ability to:

- Discuss quality processes, issues, challenges and trends in today's business environment
- Present the different issues and challenges that affect quality of design, testing and implementation
- Present the critical elements of design and development for quality
- Establish processes and check points to monitor quality through all phases of the development process
- Develop quality monitoring systems
- Apply quality check points throughout the development process
- Adhere to quality policies and procedures
- Analyze models, description and prototypes for consistency, completeness and conformance to accepted rules of methodology
- Discuss how communication impacts quality of process and product
- Propose communication scenarios to improve quality of process and product
- Identify quality problems as they arise
- Propose realistic and effective solutions to identified problems
- Analyze the effectiveness of different quality assurance systems
- Make recommendations for quality assurance improvement
- Continuously monitor quality throughout the design, development, testing and implementation phases

Research

Learner Program Outcomes

- Demonstrate the ability to identify and use traditional and non-traditional sources of information
- Demonstrate the ability to apply effectively and choose appropriately from a variety of research methods and tools
- Demonstrate the ability to analyze, organize and present research material

Key Competencies

Demonstrate the ability to:

- Clearly state the purpose of the research for a given project
- Estimate the scope for the research based on goals and available resources
- Identify resources and topics in line with scope of the project
- Use effectively a wide range of research strategies and sources of information
- Use effectively oral, written and on-line sources of information
- Identify non-traditional sources of information such as business leaders, community leaders, museum staff, field trips and advisory committees
- Use various Internet search techniques and tools to locate information
- Develop and implement the research process
- Gather and organize research information
- Analyze the information for relevance to project
- Analyze the research results for completeness and accuracy
- Recognize and resolve conflicts between information from different sources
- Present and analyze different points of view on a given topic
- Synthesize and summarize the information
- Present the research results in an appropriate format and language, including references
- Analyze the effectiveness of different research tools and sources based on the research goals
- Reformat the research and summary findings for different purposes and audiences

Technical Documentation

Learner Program Outcomes

- Demonstrate the ability to select and use technical documentation formats meeting the intended purpose and the guidelines of the organization
- Demonstrate the ability to develop effective and accurate technical documentation appropriate to various audiences and purposes

Key Competencies

Demonstrate the ability to:

- Explain the purpose of technical documentation
- Write in a concise and precise form appropriate for technical documentation
- Explain and use the processes and techniques of technical documentation
- Record system specifications accurately and completely
- Prepare materials written to convey specific technical problems, their related issues and their solutions
- Explain the purpose of logs, reports, training manuals and other forms of technical documentation
- Adhere to documentation guidelines and standards from industry and the organization
- Adapt technical documentation to the requirements of the project and the organization
- Document design changes using proper documentation process
- Create and update documentation through all phases of the systems life cycle
- Effectively organize the data in the systems repository
- Update documentation on a timely basis
- Develop documentation that is accurate and complete
- Evaluate effectiveness of different technical documentation processes
- Analyze the organization of the system repository for effectiveness and usability

User Testing and Validation

Learner Program Outcomes

- Demonstrate the ability to develop and implement an effective testing and user validation program that supports all phases of the development process

Key Competencies

Demonstrate the ability to:

- Develop a test plan that meets the goals and scope of the project, and follows company policies
- Develop specific testing processes and procedures
- Design specific performance and usability tests to measure critical elements of the project at critical times in the project schedule
- Design testing program to uncover hardware and software compatibility and functionality problems during the development phase of the project
- Select and apply efficiently appropriate testing tools and techniques
- Conduct tests in the most efficient way
- Analyze and document test results in a complete and objective manner
- Define the sample population characteristics for user validation testing
- Define the target audience, the feedback process and the testing procedure for each series of validation tests
- Plan and coordinate client acceptance testing
- Summarize test results and draw appropriate recommendations
- Implement changes based on test results, and communicate results and recommendations to appropriate team members
- Evaluate the effectiveness of the testing plan and procedures on a continuous basis
- Assess overall product effectiveness and performances, and perform summative evaluation
- Explain the impact of company policies on test plans
- Identify appropriate timing at different phases of the project to implement testing
- Develop cost/benefit analysis of alternate testing plans