Colorado CTE

Programming & Software Engineering (2015): Grades 9, 10, 11, 12, Higher Education

Adopted 2015

Identify and analyze customer software needs and requirements to guide programming and software development. ITPR.01

01. Gather data to identify customer requirements. ITPR.01.01

a. Gather information using interviewing and questioning techniques and strategies. ITPR.01.01.A

b. Identify input and output requirements. ITPR.01.01.B

c. Identify system processing requirements. ITPR.01.01.C

d. Identify hardware, networking, and software system requirements. ITPR.01.01.D

e. Demonstrate knowledge of non-functional requirements (eg security, integrity response time, reliability, support and documentation). ITPR.01.01.E

02. Conduct requirements analysis. ITPR.01.02

a. Analyze information from users. ITPR.01.02.A

b. Perform workflow analysis. ITPR.01.02.B

c. Define the issue or opportunity to be solved by the application. ITPR.01.02.C

d. Perform a task and process analysis to understand the customer's needs and processes. ITPR.01.02.D

e. Analyze the needs document and customer's stated requirements in order to make a determination to move forward with the requested project. ITPR.01.02.E

03. Identify and assess the potential importance and impact of new IT technologies. ITPR.01.03

a. Identify new technologies and data communication trends relevant to information technology. ITPR.01.03.A

b. Assess the importance of new technologies to future developments. ITPR.01.03.B

c. Understand the importance of testing new technologies before implementation to customers. ITPR.01.03.C

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De **Utilize software development processes and methodology.** ITPR.02.01

application using the

software development process to deliver a product to the customer. ITPR.02

a. Demonstrate Problem analysis for a given software problem. ITPR.02.01.A
b. Perform analysis and comparison of Commercial Off The Shelf (COTS) applications and in-house software development. ITPR.02.01.B
c. Identify roles of team members/customers in the software development process. ITPR.02.01.C
d. Understand the Systems Development Life Cycle. ITPR.02.01.D

02. Create design specifications of a computer application. ITPR.02.02

a. Design a software application that meets the requirements of the given problem. ITPR.02.02.A
b. Analyze and prepare logic using pseudocode and/or program flowchart. ITPR.02.02.B
c. Demonstrate the use of current design tools in the design process. ITPR.02.02.C
d. Summarize the use of the principles of effective information management, information organization, and information-retrieval skills when designing a software application. ITPR.02.02.D
e. Explain computing/networking hardware and software architecture. ITPR.02.02.E

Produce (code) a computer application to demonstrate proficiency in developing an application using the appropriate programming language. ITPR.03

01. Demonstrate proficiency of programming language concepts. ITPR.03.01

a. Demonstrate knowledge of the hardware-software connections. ITPR.03.01.A
b. Demonstrate knowledge of the concepts of data and procedural representations. ITPR.03.01.B
c. Demonstrate knowledge of the basic principles for analyzing a programming program. ITPR.03.01.C
d. Demonstrate knowledge of the basics of structured or object-oriented language. ITPR.03.01.D
e. Demonstrate knowledge of the range of languages used in software development. ITPR.03.01.E
f. Demonstrate knowledge of how a programming language can support multitasking, multi-threading, memory management and exception-handling. ITPR.03.01.F

02. Demonstrate proficiency in developing an application using an appropriate programming language. ITPR.03.02

a. Demonstrate knowledge of current key programming languages and the Interactive Development Environment (IDE) they are used in. ITPR.03.02.A
b. Translate data structure and program design into code in an appropriate language. ITPR.03.02.B
c. Demonstrate knowledge of key constructs and commands specific to a language. ITPR.03.02.C

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d. Demonstrate knowledge of how to resolve program implementation issues (e.g., debugging, documentation, auditing). ITPR.03.02.D

e. Prepare code documentation. ITPR.03.02.E

f. Prepare and conduct unit testing and implement fixes. ITPR.03.02.F

Implement software testing procedures and quality assurance tasks to ensure quality service and products. ITPR.04

01. Develop a test plan and perform testing and validation. ITPR.04.01

a. Define test procedures using new or established procedures for testing, identifying, and tracking resolutions. ITPR.04.01.A

b. Develop and perform test cases using requirements and design specifications. ITPR.04.01.B

c. Perform integration and regression testing. ITPR.04.01.C

d. Document testing procedures and actions. ITPR.04.01.D

02. Summarize software quality assurance procedures. ITPR.04.02

a. Use customer satisfaction in determining product characteristics (e.g. cost, user friendliness). ITPR.04.02.A

b. Validate internal code documentation. ITPR.04.02.B

c. Recognize the relationship between dependability, functionality, and ease of use. ITPR.04.02.C

d. Conduct a validation of code and/or inspection to ensure completeness and accuracy. ITPR.04.02.D

Perform maintenance and customer support functions to maintain software applications. ITPR.05

01. Analyze and perform technical support needs. ITPR.05.01

a. Identify and document technical support requirements. ITPR.05.01.A

b. Create user support "documentation" based on project design and system requirements (i.e., written documentation, on-line tutorials, etc). ITPR.05.01.B

c. Provide technical support using appropriate methods of communication. ITPR.05.01.C

d. Perform technical functions as required by the user. ITPR.05.01.D

02. Perform software maintenance activities. ITPR.05.02

a. Identify and document maintenance requirements. ITPR.05.02.A

b. Identify, analyze, and fix problems as necessary. ITPR.05.02.B

c. Update documentation in internal code and external support media. ITPR.05.02.C

d. Release software and documentation updates according to procedures. ITPR.05.02.D

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Utilize database development processes to analyze and design a database. ITPR.06.01

store information. ITPR.06

a. Identify appropriate database type based on customer requirements, availability of software and hardware resources, and distribution specifications, etc. ITPR.06.01.A

b. Apply information and data analysis specifications to create appropriate database design (e.g. -Entity Relationship Diagramming, screen and report prototypes, etc). ITPR.06.01.B

c. Analyze and normalize the developed database model looking for and resolving potential problems. ITPR.06.01.C

d. Analyze the security needs for the database. ITPR.06.01.D

e. Verify/edit design through customer review process. ITPR.06.01.E

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02. Create, populate, and maintain a database. ITPR.06.02

a. Create a database from design specifications using both program code and Graphic User Interface (GUI) processes when provided by the database software. ITPR.06.02.A

b. Perform testing procedures including database queries to analyze database functionality and diagnose problems. ITPR.06.02.B

c. Perform database troubleshooting and system-tuning functions. ITPR.06.02.C

d. Perform technical functions required by customer/user. ITPR.06.02.D

e. Communicate and document technical support provided. ITPR.06.02.E

f. Perform standard maintenance on the database. ITPR.06.02.F

g. Release software and documentation updates according to procedures. ITPR.06.02.G

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03. Perform database interfacing with web applications ITPR.06.03

a. Develop scripts and forms that permit access via websites to the database. ITPR.06.03.A

b. Identify and analyze potential security problems for web access to the database. ITPR.06.03.B

c. Propose security solutions to web-based security problems. ITPR.06.03.C

d. Implement solutions in code and documentation. ITPR.06.03.D