

# 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

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  - 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

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  - 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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**Design a software application using the software development process to deliver a product to the customer.** ITPR.02

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

- 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
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**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
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**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

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**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
  - 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
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**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
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**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
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**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

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**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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**Design, develop, and maintain a database to store information.** ITPR.06

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

- 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