IT-1025: INFORMATION TECHNOLOGY CONCEPTS FOR PROGRAMMERS

Cuyahoga Community College

Viewing: IT-1025 : Information Technology Concepts for Programmers

Board of Trustees:
May 2023

Academic Term:
Fall 2023

Subject Code
IT - Information Technology

Course Number:
1025

Title:
Information Technology Concepts for Programmers

Catalog Description:
Introduces students to computing including networking, software engineering, databases, web programming, computer architecture, security, ethics, and career awareness through hands-on projects and inquiry.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
None.

Outcomes

Course Outcome(s):
Apply knowledge of computer networking and programming concepts to succeed in upper-level coursework and to build a foundation in secure software development.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Civic Responsibility: Analyze the results of actions and inactions with the likely effects on the larger local and/or global communities.

Cultural Sensitivity: Demonstrate sensitivity to the beliefs, views, values, and practices of cultures within and beyond the United States.

Objective(s):
a. Differentiate the components of an information system and examine the history of computing.
b. Demonstrating an understanding of computing ethics, legal considerations, civic responsibility, and cultural awareness as it applies to computing.
c. Distinguish and evaluate various types of computer hardware, examine data representation, compute data conversions, and identify network communications methodologies.
d. Differentiate computer software including operating systems, graphics, cloud computing, virtualization, file structure, and software development tools.

e. Describe the software development life cycle as it applies to software engineering, specifically Object-Oriented Programming, and diagram and implement programming logic.
f. Identify information security tools and encryption methodologies as well as the supporting network protocols.
g. Articulate the components of Internet architecture including URLs and file paths and, create a web page using current web development technologies.
h. Describe the various types of databases including the process of normalization and create basic SQL statements in response to business problems.

Course Outcome(s):

Develop an awareness of careers in IT and explore the paths to these careers.

Essential Learning Outcome Mapping:

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

a. Demonstrate an understanding of careers in computing and the academic and professional support services available to assist in achieving career goals.
b. Formulate a resume appropriate for a job application.

Methods of Evaluation:

a. Discussion
b. Hands-on practice
c. Quizzes
d. Group and independent projects

Course Content Outline:

a. History of computing and computers
    i. Origins of computing machines
    ii. History of operating systems
b. Data Storage
    i. Memory organization and capacity
    ii. Binary and hexadecimal representation and their uses
    iii. Mass storage technologies
    iv. Bit patterns
    v. Data compression
c. Computer Architecture
    i. CPU / Processors
    ii. Arithmetic / Logic instructions
    iii. Memory
    iv. Peripheral devices
    v. Gates and circuits
d. Operating system architecture
    i. Computer operating systems
    ii. File structure
    iii. Command-line access and use including directory listing, creation, and traversal
    iv. Absolute vs. relative file paths
    v. Virtualization
e. Networking
    i. Network classifications and topologies
    ii. Protocols including HTTP, HTTPS, SSL, and FTP
    iii. Internet architecture
        1. Client-server relationship
        2. Cloud computing
    iv. Terminology including but not limited to packet, packet-switching, IP address, DNS, and URL components

v. Networking hardware
    1. Routers
    2. Switches
    3. Hubs
vi. Internet protocols
    1. TCP and OSI models
    2. IP and IP versions
vii. Encryption and Security
    1. Authentication
    2. Security Triad
    3. ACL and RBAC
    4. Ciphertext
    5. Public and private encryption/decryption keys
    6. Cryptography
    7. Frequency Fingerprint
    8. Ceasar and Polyalphabetic ciphers
    9. Brute-Force attacks
    10. SQL-Injections

f. Software (includes but not limited to) - explain and practice:
    i. GitHub version control software - intent in IT1025 is an introduction and use as a portfolio repository
    ii. Screen capture
    iii. Compression such as WinZip
    iv. Graphics software such as Vectr to create a logo for use in Web development
    v. Diagramming software such as Visio or Lucidchart to create:
        1. Networking topology using Cisco symbols
        2. Programming flowchart
        3. UML Class diagram to depict classes, inheritance, and modularity
    vi. Web development: HTML, XML, and CSS
        1. HTML basic tags including but not limited to: html, head, title, body, p, h1-h6, anchor and img
        2. Color representation
        3. External, internal, and inline CSS
    vii. Structured Query Language including:
        1. SELECT statements with inclusive and specific field criteria
        2. Tuple limits with WHERE clauses for numeric and string data
        3. ORDER BY clause
    viii. Python programming including but not limited to methods, properties, variables, variable types, concatenation, assignment statements, functions, and decision structure
g. Algorithm representation
    i. Pseudocode
    ii. Flowcharts
    iii. UML
h. Computer programming
    i. Methodologies (includes but not limited to procedural and object-oriented)
    ii. Object-oriented concepts
        1. Classes, objects, properties, and methods
        2. Inheritance
    iii. Data types and storage
    iv. System analysis and design
    v. Software engineering
    vi. Artificial Intelligence
i. Database Systems
    i. The relational model
    ii. Structured Query Language syntax
    iii. Database normalization
    iv. Relationship between data, information, and knowledge
    v. Primary and foreign key relationships between tables
    vi. SQL, NoSQL, and Big Data technologies
j. Graphic modeling and rendering

   i. Raster vs. Vector graphics
   ii. Compression types
   iii. File formats
   iv. Image layers and properties
k. Legal and Ethical responsibilities in computing
   i. ACM (American Computing Machinery) - Code of Ethics
   ii. AUP (Acceptable Use Practices)
   iii. Intellectual Property and the WIPO (World Intellectual Property Organization)
   iv. Copyrights and Trademarks
   v. COPPA, FERPA, and HIPPA
l. Career and continuous learning opportunities
   i. Exploration of careers in IT - Bureau of Labor Statistics
   ii. Tri-C Co-Op readiness requirements
   iii. Handshake (Online Job Board)
   iv. Tri-C degrees, certificates, and student organizations
   v. Industry certifications including but not limited to CISCO and CompTIA
   vi. Professional organizations including but not limited to: IEEE, ACM, W3C, NSA/CSS, CERT/CISP, and WIPO

Resources

Schneider, G. Michael and Judith Gersting. *Invitation to Computer Science*. 8th ed. Cengage Learning, 2019.

Reynolds, George. *Ethics in the AI, Technology, and Information Age*. Roman & Littlefield Publishers, 2022.

O'Leary, Timothy, Linda O'Leary and Daniel O'Leary. *Computing Essentials 2021*. 28th ed. McGraw-Hill Education, 2021.

Hare, Kevin. *Computer SciencePrinciples - The Foundation Concepts of Computer Science*. 12th ed. Atlanta: Yellow Dart Publishing, 2020.

Rainer, Kelly and Efraim Turban. *Introduction to Information Systems*. 8th ed. Wiley, 2020.

Resources Other

a. Free Creative Commons course textbook - Information Systems for Business and Beyond (updated in 2020 to meet accessibility guidelines): https://digitalcommons.biola.edu/open-textbooks/1/
b. GitHub account creation and reference: https://docs.github.com/en/free-pro-team@latest/github/getting-started-with-github/signing-up-for-a-new-github-account (https://docs.github.com/en/free-pro-team@latest/github/getting-started-with-github/signing-up-for-a-new-github-account/)
c. Computer History: https://learn.g2.com/history-of-computers (https://learn.g2.com/history-of-computers/).
d. Browser-based software development: https://replit.com/
e. Browser-based software development and reference: https://www.w3schools.com/ (https://replit.com/)
f. Software reference: https://edu.gcfglobal.org/en/
g. Python: https://automatetheboringstuff.com/chapter1/
h. Python OOP. https://www.digitalocean.com/community/tutorials/how-to-construct-classes-and-define-objects-in-python-3 (https://www.digitalocean.com/community/tutorials/how-to-construct-classes-and-define-objects-in-python-3/)
i. Markdown language: https://github.com/adam-p/markdown-here/wiki/Markdown-Cheatsheet
j. Everyday Ethics for Artificial Intelligence: https://www.ibm.com/watson/assets/duo/pdf/everydayethics.pdf
k. Virtualization: https://www.redhat.com/en/topics/virtualization/what-is-virtualization (https://www.redhat.com/en/topics/virtualization/what-is-virtualization/)
l. Bureau of Labor Statistics: https://www.bls.gov/ooh/occupation-finder.htm
m. CompTIA Certification: https://www.comptia.org/certifications/cybersecurity-analyst (https://www.comptia.org/certifications/cybersecurity-analyst/)
n. Cisco Certifications: https://www.cisco.com/c/en/us/training-events/training-certifications/certifications.html

o. Tri-C Student Organizations: https://www.tri-c.edu/student-life/student-clubs/index.html (https://www.tri-c.edu/student-life/student-clubs/)
p. CCDC National Collegiate Cyber Defense Competition: https://www.nationalccdc.org/index.php/competition/about-ccdc/mission (https://www.nationalccdc.org/index.php/competition/about-ccdc/mission/)
q. Image File Compression: https://www.jotform.com/blog/everything-you-need-to-know-about-image-compression/
r. Vectr browser-based vector image creation software: https://vectr.com/tmp/a23IZIDALX/e5DVroX4Pt?modal=welcome (https://vectr.com/tmp/a23IZIDALX/e5DVroX4Pt/?modal=welcome)
s. Lucidchart - Visio compatible browser-based diagram/flowchart creation software: https://www.lucidchart.com/pages/
t. Cryptography concepts and practice: https://www.khanacademy.org/computing/computer-science/cryptography/modern-crypt/v/diffie-hellman-key-exchange-part-1 (https://www.khanacademy.org/computing/computer-science/cryptography/modern-crypt/v/diffie-hellman-key-exchange-part-1/)
u. Invent with Python - Hacking the Ceasar Cipher with Brute-Force: https://inventwithpython.com/cracking/chapter6.html
v. ICANN Internet Protocols: https://www.icann.org/en/system/files/files/ip-addresses-beginners-guide-04mar11-en.pdf
w. TCP/IP Model: https://www.icann.org/en/system/files/files/ip-addresses-beginners-guide-04mar11-en.pdf
x. CERT/CISA - Securing Your Web Browser: https://us-cert.cisa.gov/publications/securing-your-web-browser (https://us-cert.cisa.gov/publications/securing-your-web-browser/)
y. World Wide Web Consortium (W3C): https://www.w3.org/Consortium/facts (https://www.w3.org/Consortium/facts/)
z. Big Data: https://www.guru99.com/what-is-big-data.html#:~:text=Big%20Data%20is%20a%20collection,it%20or%20process%20it%20efficiently. (https://www.guru99.com/what-is-big-data.html#:~:text=Big%20Data%20is%20a%20collection,it%20or%20process%20it%20efficiently)
aa. Tri-C Career Services: https://www.tri-c.edu/career-services/student-career-services/experiential-learning/index.html (https://www.tri-c.edu/career-services/student-career-services/experiential-learning/)
bb. Handshake (Online Job Board): https://www.tri-c.edu/career-services/student-career-services/job-search-preparation.html (https://www.tri-c.edu/career-services/student-career-services/job-search-preparation.html)
cc. IEEE: https://www.ieee.org/about/ieee-history.html
dd. ACM: https://www.acm.org
ee. World Intellectual Property Organization (WIPO): https://www.wipo.int/about-wipo/en/
ff. Teaching Responsible Computing Playbook: https://foundation.mozilla.org/en/what-we-fund/awards/teaching-responsible-computing-playbook (https://foundation.mozilla.org/en/what-we-fund/awards/teaching-responsible-computing-playbook/)
gg. Data Kind: httpsa://datakind.org (http://catalog.tri-c.eduhttpsa://datakind.org)

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