



Advanced Cloud Computing

PEIMS Code: N1302813

Abbreviation: ADCLDCMP

Grade Level(s): 10–12

Award of Credit: 1.0

Approved Innovative Course

- Districts must have local board approval to implement innovative courses.
- In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.
- Innovative courses may only satisfy elective credit toward graduation requirements.
- Please refer to TAC §74.13 for guidance on endorsements.

Course Description:

The Advanced Cloud Computing course is an exploration of cloud computing. Upon completion of the course, students are prepared to sit for cloud computing industry-based certifications. In this course, students explore cloud computing services, applications, and use cases. Students dive deeply into cloud computing best practices and learn how cloud computing helps users develop a global infrastructure to support use case at scale while also developing and inventing innovative technologies.

Essential Knowledge and Skills:

- (a) General Requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in grades 10-12. Recommended Prerequisites: At least one credit in a Level 2 or higher course in computer science, programming, software development, or networking systems.
- (b) Introduction.
 - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - (2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.
 - (3) The Advanced Cloud Computing course is an exploration of cloud computing. Upon completion of the course, students are prepared to sit for cloud computing professional certifications. In this course, students explore cloud computing services, applications, and use cases. Students dive deeply into cloud computing best practices and learn how cloud computing helps users develop

Advanced Cloud Computing

a global infrastructure to support use case at scale while also developing and inventing innovative technologies.

- (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
- (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and Skills.

- (1) The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:
 - (A) demonstrate and explain the importance of positive workplace behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;
 - (B) demonstrate and explain the importance of positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills;
 - (C) employ and describe effective reading and writing skills;
 - (D) solve problems and think critically; and
 - (E) demonstrate and explain the importance of leadership skills and function effectively as a team member.
- (2) The student defines cloud computing and its impacts and benefits and compares the major services offered by cloud computing providers. The student is expected to:
 - (A) describe the benefits of cloud computing and the reasons companies have started to switch from on-premise computing to cloud computing;
 - (B) demonstrate knowledge of and explain the three major types of cloud computing;
 - (C) generate sample cloud usage plans for a business case study, describing how each of the four services can be used to improve the business; and
 - (D) explain the purpose of a region, availability zone, and edge location.
- (3) The student demonstrates how to store and share content in the cloud. The student is expected to:
 - (A) identify features and functions of commonly used cloud services;
 - (B) access and navigate to commonly used services in cloud computing consoles;
 - (C) analyze how cloud services are used in real-world industries;
 - (D) explain the functions of a domain name system (DNS);
 - (E) create an object storage bucket;
 - (F) explain benefits and uses of a content delivery network;
 - (G) configure web content distribution via edge locations and attach it to a website;
 - (H) identify the benefits, features, and use cases of different types of block storage;

Advanced Cloud Computing

- (I) analyze a use case and recommend the best type of virtual storage for the particular situation;
 - (J) create a block storage volume or physical record;
 - (K) attach a block storage volume to a virtual computing instance; and
 - (L) create a virtual computing instance that hosts a simple website.
- (4) The student applies cloud security best practices in relation to identity and access management (IAM) and knows how to use the top cloud monitoring services. The student is expected to:
- (A) identify best practices for IAM;
 - (B) analyze the cultural and societal impacts of cloud security;
 - (C) differentiate among a role, user, and policy in cloud security;
 - (D) use a process to resolve vulnerabilities in a web server;
 - (E) determine whether security best practices are being followed and recommend steps to fix any security lapses;
 - (F) identify the best cloud security service for a given scenario;
 - (G) use an IAM system to set up a text alert event; and
 - (H) compare monitoring and logging services.
- (5) The student describes when to use various databases, the benefits of caching data, and how to build a virtual private cloud (VPC). The student is expected to:
- (A) compare online transactional processing and online analytical processing;
 - (B) describe the benefits of caching data;
 - (C) attach a load balancer to a webpage;
 - (D) evaluate the performance of a load balancer;
 - (E) describe features and benefits of load balancing;
 - (F) create an application using a Platform as a Service (PaaS); and
 - (G) use a template infrastructure as code (IaC) tool to build a virtual private cloud (VPC).
- (6) The student describes the landscape of emerging technologies in the cloud. The student is expected to:
- (A) define machine learning and discuss its impacts on society, business, and technology;
 - (B) identify potential use cases for emerging technology in the cloud;
 - (C) assess value propositions of using cloud technology using calculator tools;
 - (D) identify cloud services that can analyze and protect data and manage networks;
 - (E) define blockchain technology and explain its benefits; and
 - (F) explain the infrastructure of cloud development kits or services and use a software development framework to model and provision a cloud application.
- (7) The student resolves common security alerts, diagrams instance states and transitions, and explains how to choose the most cost-efficient instance type. The student is expected to:

Advanced Cloud Computing

- (A) describe the shared responsibility security model;
 - (B) determine security responsibility for cloud resources;
 - (C) analyze how the shared security model accounts for common threats to the cloud computing model;
 - (D) list the steps required to resolve an automated security alert;
 - (E) describe the six instance states, including pending, running, stopping, stopped, shutting down, and terminated;
 - (F) diagram the transitions between instance states from launch to termination;
 - (G) explain instance usage billing for each instance state; and
 - (H) determine the most appropriate instance state for a given situation.
- (8) The student differentiates between dynamic and static websites. The student is expected to:
- (A) recall the process for setting up a static website;
 - (B) compare static and dynamic websites;
 - (C) create a content delivery network distribution to increase the speed of a website;
 - (D) use a process to launch a dynamic web server;
 - (E) create a serverless compute function using a serverless compute console;
 - (F) describe the main functions of auto scaling;
 - (G) create a launch template and an auto scaling group; and
 - (H) develop a plan for monitoring an auto scaling instance or group.
- (9) The student demonstrates the benefits and risks of using big data. The student is expected to:
- (A) define big data and identify use cases for it within various industries;
 - (B) evaluate the pros and cons of big data;
 - (C) explain how blockchain ensures the validity and immutability of transactions, particularly in the cloud; and
 - (D) evaluate the pros and cons of blockchain business applications.

Recommended Resources and Materials:

- Provide computers for each student with access to an internet-connected device and a physical keyboard in a classroom with high-speed bandwidth
- Amazon Web Services (AWS) Academy Introduction to Cloud Semesters 1 & 2 (free; these instructional materials align with the essential knowledge and skills of the Advanced Cloud Computing course)

Recommended Course Activities:

Within the Advanced Cloud Computing course, it is recommended that students –

- determine the cloud best practice for a business use case given a relevant scenario;
- determine the best cloud service to serve a business use case given a relevant scenario;
- debate the ethical implications of cloud technologies and their real-world applications;

Advanced Cloud Computing

- create a cloud storage system for objects;
- launch a virtual compute instance to host a website;
- create a service or application architectures template;
- develop a machine learning application using a cloud platform;
- develop and launch a static website using a cloud platform;
- create a virtual reality scene using a cloud platform; and
- create a web content distribution to cache information at an edge location.

Suggested methods for evaluating student outcomes:

Assessment methods include the following:

- Module tests
- Scenario-based exercises
- Research activities
- Identifying errors in a program
- Portfolio presentation

Within the Advanced Cloud Computing recommended resources, the following assessment opportunities are provided for educators to use to evaluate student outcomes:

- Discussion questions are provided within each module of content to facilitate a conversation and evaluate the beginning knowledge level of each student. Recommended assessment strategy for these discussions is provided within the recommended resources.
- Within the direct instruction portions of the recommended resources, students are provided with self-discovery and research activities. Student work within these activities can be used as formative assessment data to evaluate student progress toward the module outcomes. Recommended assessment strategy for these activities and assignments are provided within the curricula.
- Lab activities are provided for students to complete application-based practice. These activities evaluate a student's ability to apply their understanding of outcomes to scenario-based exercises. Recommended assessment strategies for these labs are provided within the recommended resources.
- At the conclusion of each module, a summative assessment is provided for teachers to track student progress toward the expected outcomes. Module assessments are a combination of multiple choice, multiple response, and essay questions.

Teacher qualifications:

- Business Education (Grades 6-12).
- Secondary Industrial Arts (Grades 6-12).
- Secondary Industrial Technology (Grades 6-12).
- Technology Education: Grades 6-12.
- Technology Applications: Early Childhood-Grade 12.
- Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
- Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.

Advanced Cloud Computing

- Vocational Trades and Industry. This assignment requires appropriate work approval.
- Computer Science: Grades 8-12.
- Secondary Computer Information Systems (Grades 6-12).

Additional information:

Access to self-paced learning content through cloud providers, e.g.:

- AWS Academy Introduction to Cloud (Semesters I & II) (free)
- AWS Academy Cloud Foundations (free)
- AWS Cloud Practitioner Essentials (free)