STRANDS AND STANDARDS
CLOUD COMPUTING 1

Course Description

The Cloud Computing 1 course is an exploration of cloud computing. Students will begin to prepare themselves to sit for cloud computing professional certifications. In this course, students explore cloud computing services, applications, technologies and use cases (Case-Base Learning). Students dive deeply into cloud computing best practices and learn how cloud computing helps users develop a global infrastructure while also developing and inventing innovative technologies.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	35.02.00.00.042
Concurrent Enrollment Core Code	35.02.00.13.042
Prerequisite	Any basic computer science or information technology course.
Skill Certification Test Number	N/A
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Information Technology Systems
Endorsement 2	OR Cybersecurity
Endorsement 3	OR Cloud Computing

STRAND 1

Cloud Structure and Features

The student defines cloud computing and its impacts and benefits and compares the major services offered by cloud computing providers.

Standard 1

Global Infrastructure

Students will review the basics of cloud computing. Including the impacts and benefits of computing in the cloud. The student will be introduced to services offered by cloud computing providers.

- Define cloud computing as the on-demand delivery of IT resources via the internet with pay-as-you-go pricing and its impacts
- Benefits of cloud computing vs. on-premise computing
    - Pay less to start up, pay more as business grows
    - Computing power and storage scales fit current needs
    - The role of virtualization in cloud computing
    - Adding new resources is fast and easy
    - Cloud providers maintain, secure, and run the computers and facilities for cloud services
    - Ease of use, flexibility
- Introduction to types of cloud computing
    - IaaS
    - PaaS
    - SaaS
- History of cloud computing

Standard 2

Structures of the Cloud

Students will dive deep into the three different types of cloud services, the geographical layout of cloud services through regions, availability zones, and edge locations.

- Recognize and compare the types of cloud computing
    - IaaS (Infrastructure as a Service)
    - PaaS (Platform as a Service)
    - SaaS (Software as a Service)
- Explain the purpose of regions, availability zones, and edge locations
    - Regions
        - 20 public and 5 non-public
    - Availability zones
        - Independent data centers
    - Edge locations
        - Nearest point to the consumer

Performance Skills

- Students will be able to generate a cloud service usage plan for a business case study; describing how each of the services could be used to improve the business.
- Students will be able to explain the purpose of a region, availability zone, and edge locations.

STRAND 2

Storing and Sharing Content in the Cloud
The student demonstrates how to store and share content in the cloud.

Standard 1

Cloud Computing Services / Consoles
Students will be introduced to common features and functions of commonly used cloud services. They will access and navigate commonly used services in cloud computing consoles.

- Data storage services
  - S3
  - EBS
- Database systems
  - RDS
  - Redshift
  - DynamoDB
- Cloud monitoring services
  - CloudTrail
  - CloudWatch

Standard 2

Virtual Servers
Students will understand an EC2 instance and how to use it to host a website and the purpose of access keys, Domain Name Systems, and Virtual Private Clouds.

- Explain how a S3 bucket and EC2 instance interact to allow for website hosting
- Types of websites
  - Static – A website that does not change based on user interactions
  - Dynamic – A website that changes based on user interactions
- Functions of a domain name system (DNS)
- Implement reservations to ensure instances keep assigned IP addresses
- Understand a virtual private cloud and its uses

Standard 3

Content Delivery
Students will learn about content delivery networks and understand why it is important to have one.

- Benefits and uses of a content delivery network, such as CloudFront
- Understand edge locations

Standard 4

Virtual Storage

Identify the different types of cloud data storage and the benefits of each. (Ex: Object Storage, File Storage, and Block Storage)

Students will understand Elastic Block Storage (EBS) and compare it to S3. Storage tiers will be introduced.

- EBS volume types:
  - General Purpose SSD
  - Provisioned IOPS SSD
  - Throughput Optimized HDD
  - Cold HDD
- Categories of volume types
  - SSD
  - HDD
- Benefits and features of EBS
  - Data Availability
  - Date Persistence
  - Data Encryption
  - Snapshots

Performance Skills

- Students will configure web content distributed via edge locations and attach it to a website.
- Students will create a block storage volume and attach it to a virtual computing instance that hosts a simple website.

STRAND 3

Securing and Monitoring in the Cloud

Apply cloud security best practices in relation to identity and access management (IAM), including best practices, roles, users, policies, and security groups.

Standard 1

Security I

Students will get an overview of cloud security in relation to Identity and Access Management (IAM). They will understand basic information on best practices, roles/users/policies, and security groups.

- Understand identity and access management (IAM) and its best practices.
  - Lock away your account root user access keys
  - Create individual IAM users
  - Use groups to assign permissions to IAM users
  - Grant least privilege
  - Review IAM permissions

        - Configure a strong password policy for your users
        - Enable multi-factor authentication (MFA)
        - Use roles to delegate permissions
        - Do not share access keys
        - Rotate credentials regularly
        - Remove unnecessary credentials
        - Use policy conditions for extra security
        - Monitor activity in your account
    - Analyze the cultural and societal impacts of cloud security
    - Differentiate among a role, user, groups, and policy in cloud security
        - Role: An IAM identity that you can create in your account that has specific permissions.
        - User: An entity that you create to represent the person or application that uses it to interact with.
        - Group: A collection of IAM users, allowing you to specify permissions for multiple users.
        - Policy: An object that, when associated with an identity or resource, defines its permissions.
    - Use a process to resolve vulnerabilities in a web server

Standard 2

Security II

The student will analyze the cultural and societal impacts of cloud security and be able to determine whether security best practices are being followed.

- Understand the areas of security that must be addressed for cloud computing:
    - Data
    - Privileges
    - Infrastructure
    - Assessment
- Understand the difference between infrastructure and assessment
    - Attacks on infrastructure and network access
- Recognize types of attacks and prevention techniques
    - DDoS
    - AWS Web Application Firewall, AWS Inspector, etc. for prevention
- Understand the process to resolve vulnerabilities in a web server
- Understand how security can impact society, determine best practiced, and make recommendations to fix security lapses

Standard 3

Monitoring the Cloud

Students will explore the tools used to keep track of activities in the cloud and their relation to costs. Monitoring, logging, and reporting will be reviewed.

- A monitoring and observability service that provides data and insights to monitor applications (for example: Amazon CloudWatch)
- A service that logs, continuously monitors, and retains account activity related to actions across infrastructure (for example: Amazon CloudTrail)
- A service that monitors and records resource configurations (for example: AWS Config)
- A managed messaging service for system-to-system and app-to-person communication (for example: Amazon SNS)

Performance Skills

- Students will determine whether security best practices are being followed and recommend steps to fix any security lapses.
- Students will be able to compare monitoring services and identify the best cloud security for any given scenario.
- Students will write a compliance program for an organization.

STRAND 4

Data Management

The student will understand the differences in databases and when to use them, the benefits of caching data, and how to build a virtual cloud (VPC).

Standard 1

Elastic Load Balancers and Databases

Students will learn about Relational Database Service (RDS) and data warehousing.

- Database Warehousing
- Database and Database Systems
    - Types of Relational Database Systems (for example: Amazon Aurora, Amazon RDS)
    - Types of Non-Relational Database Systems (for example: DynamoDB)
- Processing
    - Online transactional processing
    - Online analytical processing

Standard 2

Databases

Students will learn the purpose of elasticache services and benefits of caching data.

- Understand Elastic Load Balancing: performance, features, and benefits.
- Data Caching Services (for example: AWS Elasticache)
    - Explain the benefits of caching data, some could include:

- Improved performance
- Reduced costs
- Predictable performance
- Lower latency

Standard 3

Elastic Beanstalk and Cloud Formation

Students will understand the purpose of Elastic Beanstalk and Cloud Formation.

- Elastic Beanstalk (EBS) – its uses and benefits.
- Understand the benefits of elasticity including:
  - Automating best practices
  - Scaling infrastructure
  - Manage multiple resources including third party and private resources

Performance Skills

- Students will create an application using a Platform as a Service (PaaS) and
- Students will us a template Infrastructure as code (IaC) tool to build a virtual private cloud (VPC).

STRAND 5

Managing and Optimizing Cloud Features

The student describes the landscape of emerging technologies in the cloud.

Standard 1

Emerging Technologies in the Cloud

Students will research emerging technologies in the cloud with a focus on machine learning and its impacts on society, business, and technology.

- Supervised Machine Learning starts with training data that includes the desired output to adjust the machine learning algorithm. There are two categories:
  - Classification – examine an input and choose a response among specific preset choices
  - Regression – trained to assign value to input
- Unsupervised Machine Learning
- Semisupervised Machine Learning starts with training data that does not include the desired output, and can examine input and group related items together into groups called clusters
- Reinforcement Machine Learning uses a model to provide positive feedback (reward) the desired behavior and discovers errors
- The impacts of machine learning on society, business, and technology
- Examine the range of emerging technologies in society and in the cloud computing environment.

Standard 2

Billing and Support

Students will assess value propositions of using cloud technology using calculator tools.

- Understand the tiered support services and prices of a cloud calculating service, including:
  - Free tier – no cost, used for learning, and provides no technical support
  - Developer tier - next level up (ex: $29/month), used for experimenting, technical email support
  - Business tier – next level up (ex: $100/month), used for production, email, chat and phone support
  - Enterprise tier – highest level (ex: $15,000/month), used for mission critical workloads, email, chat, phone, support, and a dedicated technical account manager
- Identify cloud services that can analyze and protect data and manage networks
- Understand the benefits of public cloud deployment for a startup company (ex: no upfront capital, east of understanding, etc.)

Standard 3

Key Cloud Features

Students will explore services related to protecting data and managing networks. Blockchains will also be explored.

- A serverless, interactive query service to query data and analyze big data using standard SQL (for example: Amazon Athena)
- A fully managed data security and privacy service (for example: Amazon Macie)
- Blockchains – what are they, how are they used, and its benefits.
  - Blockchain is a way to manage an open distributed ledger or transactions
  - Blockchain is a growing list of records

Standard 4

Optimizing the Cloud with Kits

- Explain the infrastructure of cloud development kits or services
- Explain the benefits and constructs

Performance Skills

- Student will use a software development framework to model and provision a cloud application.

STRAND 6

Skills for Career Development

Standard 1

Students will demonstrate 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.

Standard 2

Students will demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills.

Standard 3

Students will employ effective reading and writing skills; solve problems and think critically; and demonstrate leadership skills and function effectively as a team member.

Workplace Skills

- Communication
- Problem Solving
- Teamwork,
- Critical Thinking
- Dependability
- Accountability
- Legal requirements/expectations

Skill Certificate Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
Cloud Computing 1	891	5	9	8	3	5	0					30	28

Relationship to the AWS Certified Cloud Practitioner Exam

If a candidate completes Cloud Computing 1 and Cloud Computing 2, they will be prepared to take the AWS Certified Cloud Practitioner Exam. These Strands & Standards align with a portion of the industry certification.