Course Title: Blockchain, Machine Learning, the Internet of Things, and More: Meet the New Technologies Shaping Our World
Course Code: CS 02
Instructor: Saleem Mohamed

Course Summary:
If you live in Silicon Valley, you can’t avoid hearing about new technologies (cloud computing, the Internet of Things (IoT), Artificial Intelligence, Machine Learning, Blockchain and more), that are changing the way we live and do business. In this course, we will breakdown what each technology is, how it works and why is it useful. By the end of the course, you will have an understanding and appreciation of the technology innovations with real-world usage.

*Please see course page for full description and additional details.

Grade Options and Requirements:

- No Grade Requested (NGR)
  - This is the default option. No work will be required; no credit shall be received; no proof of attendance can be provided.
- Credit/No Credit (CR/NC)
  - Students must attend at least 80% of class sessions.
- Letter Grade (A, B, C, D, No Pass)
  - Students must attend at least 80% of class sessions and complete a piece of written work (to be discussed further in class).

*Please Note: If you require proof that you completed a Continuing Studies course for any reason (for example, employer reimbursement), you must choose either the Letter Grade or Credit/No Credit option. Courses taken for NGR will not appear on official transcripts or grade reports.
Tentative Weekly Outline:

Week 1: Cloud Computing

- Introduction to the course
- Cloud computing
  - What is cloud computing?
    - Overview and definition of Cloud computing
    - History of cloud and comparison with traditional computing
  - How does cloud work?
    - Cloud Service models - IaaS, PaaS, SaaS
    - cloud characteristics and capabilities
  - What are the types of cloud?
    - Cloud Delivery models - Public, Private and Hybrid cloud
    - What technologies are used?
  - Who are the major cloud service providers?
    - Discussion on major cloud service providers
      - Amazon cloud - AWS
      - Microsoft cloud - Azure
      - Google cloud
    - Brief description of other public clouds
    - Industry trends and technology innovations
  - How to use cloud?
    - How to create applications for cloud?
    - How to access and use cloud services?
    - How to deploy business applications to cloud?
  - Demonstration
    - Demo of one or more public cloud
    - Creating an account
    - Accessing key cloud services and/or components (Server, Network, Storage)
    - Exploring briefly other cloud capabilities
  - How is it being used?
    - Industry use cases
    - Cloud in everyday life
    - Security in cloud
    - Benefits of cloud
  - Wrap-up
    - Summary
    - Q&A
    - Wrap-up of Cloud computing session
Week 2: The Internet of Things (IoT) and the Industrial Internet of Things (IIoT)

- The Internet of Things (IoT)
  o What is IoT?
    ▪ Overview and definition of IoT
    ▪ What are IoT devices?
  o How does IoT work?
    ▪ How to connect IoT devices to applications?
    ▪ Relationship between IoT and cloud
  o Who are the major cloud IoT service providers?
    ▪ Industry trends
    ▪ Business and Technology innovations with IoT
  o How to set-up and use an IoT solution?
  o Demonstration
    ▪ Demo of an IoT solution with physical or simulated IoT device/s
    ▪ Registering the IoT device
    ▪ Accessing data from the device and executing a business function
  o How is it being used?
    ▪ Industry use cases,
    ▪ IoT in everyday life
    ▪ Benefits of IoT technology

- The Industrial Internet of Things (IIoT)
  o What is IIoT?
    ▪ Overview and definition of IIoT
    ▪ History of IIoT
  o How does IIoT work?
    ▪ What are Digital Twins
    ▪ Relationship between IIoT and cloud
  o Who is the major cloud IIoT service provider?
    ▪ Overview of GE and Predix solution
    ▪ Benefits of IIoT
  o Wrap-up
    ▪ Summary
    ▪ Q&A
    ▪ Wrap-up of IoT and IIoT session

Week 3: Artificial Intelligence, Machine Learning and Deep Learning

  o What is Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL)?
    ▪ Overview of AI, ML and DL
    ▪ History of AI
  o Fields of AI
- Natural Language Processing (NLP)
- Computer Vision
- Speech-to-Text and Text-to-Speech
- Expert Systems
- Machine Learning

- Discussion on Machine Learning
  - What is Machine Learning?
  - What is Deep Learning (DL)?
  - What is Neural networks?
  - Training, Learning and cognitive skills

- Understanding DL by solving a simple classification problem with Deep Learning
  - Walkthrough of a sample Deep Learning solution
  - Introduction to Deep Learning algorithms
  - What technologies are used?
  - Relationship between AI and cloud

- Who are the major AI cloud service providers?
  - The major AI cloud players
  - What AI services do they offer?
  - How to create an AI solution?

- Future of AI
  - Industry trends
  - Research and Technology innovations
  - Relationship between Humans and Machines

- How is AI used?
  - Industry use cases
  - AI in everyday life
  - Benefits of AI
  - What does the future look like?

- Wrap-up
  - Summary
  - Q&A
  - Wrap-up of AI, ML and DL session

**Week 4: Blockchain**

- What is Blockchain?
  - Overview
  - History of Blockchain
  - Common use of Blockchain

- How does Blockchain work?
  - Conceptual view of Blockchain under the covers
  - Understanding Blockchain with simple explanation from a real-world example
  - Who are miners?
  - What does distributed chain mean?
How does a block look?
- Why is it important?
  - Benefits of Blockchain
  - Real-world examples and applications of Blockchain
  - Where are we, in Blockchain usage, in the industry?
- Who are the major players?
- Future of Blockchain
  - Industry trends
  - Technology innovations
  - How do we, as consumers, use Blockchain, today and in the future
- Wrap-up
  - Summary
  - Q&A
  - Wrap-up of Blockchain session

Week 5: Edge and Fog Computing, DevOps

- Edge and Fog Computing
  - What is Edge and Fog computing?
    - Overview and definition
    - History of Edge and Fog
    - Why is it needed?
  - How does Edge and Fog work?
    - A high-level conceptual view
  - Who are the players?
  - Industry trends and technology innovations
  - How is it being used?

- DevOps
  - What is DevOps?
    - Overview and definition of DevOps
    - History of DevOps and comparison with traditional operational model
  - How does DevOps work?
    - Cultural, Organizational and Processes point-of-view
    - Technology and Tools
    - What is Continuous Integration (CI) and Continuous Delivery (CD)?
  - Benefits of DevOps
    - Why DevOps?
    - What is DevSecyOps?
    - Who uses DevOps?
    - How to become a DevOps organization?
DevOps in Cloud
  o Who are the major DevOps players?
    ▪ What capabilities do they provide?
    ▪ Industry adoption and Industry trend
  o Wrap-up
    ▪ Summary
    ▪ Q&A
    ▪ Wrap-up of Edge/Fog and DevOps session

Wrap-up of Edge/Fog and DevOps session

Week 6: Serverless computing, Microservices and Containers

- Serverless computing
  o What is Serverless computing?
    ▪ Overview and definition of Serverless computing
    ▪ History and where did it start?
    ▪ What is FaaS (Function as a Service)?
  o How does Serverless computing work?
    ▪ Are there no servers?
    ▪ What happens under the covers?
    ▪ How do you execute a serverless function?
    ▪ What are triggers?
    ▪ What are the characteristics of serverless function?
  o Who are the major cloud service providers enabling this capability?
    ▪ Brief discussion of at least one major cloud service provider enabling this capability:
      • Amazon cloud - AWS (or)
      • Microsoft cloud - Azure (or)
      • Google cloud
    ▪ What do the following mean:
      • AWS lambda?
      • Google Cloud Functions?
      • Azure Functions?
    ▪ Industry trends and technology innovations
  o How to use it?
    ▪ How to create a serverless function in cloud?
  o Demonstration
    ▪ Demo of serverless function in cloud to solve a business problem
    ▪ Creating and executing a serverless function
  o How is it being used?
    ▪ Class discussion on usage scenarios

- MicroServices
  o What are Microservices?
    ▪ Overview and definition of Microservices
- Benefits of MicroServices
  - Containers
    o What are Containers?
      ▪ Overview and definition of Containers
      ▪ Difference between Virtual Machines and Containers
    o Major players in Container field
      ▪ Docker Container
    o Relationship between Containers and MicroServices
    o How do you manage a fleet of Containers?
      ▪ Orchestration
      ▪ Kubernetes engine
      ▪ What are nodes and pods?
    o How do you use Containers in Public Cloud?
  o Benefits of Containers
  o Wrap-up
    ▪ Summary
    ▪ Q&A
    ▪ Wrap-up of Serverless computing, MicroServices and Containers session
  - Closing comments and course wrap-up