

# Overview

## Introduction

1. Provide an understanding of cloud computing technology and system architecture
2. Four modules, each five weeks:
  - Software defined networking
  - Cloud system software
  - Cloud applications
  - Network functions virtualization
3. Format:
  - Lecture
  - Workshop
  - Project

## Software Defined Networking

1. Introduction to cloud computing
  - Origin, benefits, security issues in cloud computing
2. Basics of network virtualization
  - Physical datacenter network topologies, traffic engineering, SDN
3. Case study: Azure networking
  - Study how networking is done in datacenters that run Azure
4. Network performance
  - Measuring network metrics (latency, bandwidth, scalability, utilization)
5. Project: Design, implement, and test a software defined network for a distributed server to cater to a variety of requests

## Cloud System Software

1. Programming frameworks
  - Software for developing distributed and parallel cloud applications
  - MapReduce, Hadoop
2. Virtualization of system services
  - Virtualization, virtual machines, hypervisors, VM management, RPC, and functional debugging of distributed systems
3. Cloud storage
  - Distributed file systems (GFS), key-value stores, and NoSQL storage such as Dynamo
4. Resource management
  - Automated provisioning, load balancing, scheduling, and elastic systems
5. Scalability
  - Benchmarking and scalability considerations
6. Project: Implement a MapReduce framework using Azure services
  - Make MapReduce runtime implementation

## Cloud Applications

1. Use cases
  - Uses for large-scale cloud computing applications
2. Resiliency
  - Fault tolerance, incremental deployment, software upgrades, recovery
3. Emerging cloud applications
  - Internet of things, stream processing
4. Trending cloud infrastructures

- Fog computing, geo-distributed computing infrastructure, latency-sensitive applications such as distributed camera networks
- 5. Project: Open-ended application

## **Network Functions Virtualization**

1. Network functions
  - Commonly deployed network functions (firewalls, VPN gateways, SPAM filters, web proxies, etc.)
2. Enablers for NFV
  - Definitions, technology enablers, NFV architecture, design considerations
3. NFV and SDN
  - Relationship between NFV and SDN and related challenges
4. NFV Case Studies
  - Study different uses and pitfalls of NFV (NFV is still in progress)
5. Project: Implement specific services and analyze pros and cons of doing the project in the cloud