



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

SOFTWARE DEFINED NETWORKS								
VI Semester: CSE (CS)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACCD13	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisites: Network Security								

I. COURSE OVERVIEW:

This course emphasizes on different control planes in Centralized and Distributed systems. Network programmability and the concepts related to Datacenters are explained. It also gives information about Network function virtualization and the topology used. Finally, this course tells about how to build a software defined network using network virtualization.

II. COURSE OBJECTIVES:

The students will try to learn:

- I** The introduction of distributed control planes
- II** The architectures, algorithms, protocols and applications of data center networks
- III** The concepts of Software defined network framework
- IV** The network virtualization for handling bigdata

III. COURSE OUTCOMES:

At the end of the course, students should be able to:

- CO1 **Analyze** centralized and distributed control planes for scalable network design
- CO2 **Demonstrate** network programmability and SDN solutions for modern data centers
- CO3 **Apply** NFV and topology abstraction to optimize virtualized networks.
- CO4 **Develop** SDN frameworks using tools and policies for bandwidth management
- CO5 **Evaluate** DevOps solutions and advanced SDN use cases for orchestration
- CO6 **Design** NFV-based solutions for monitoring, security, and threat mitigation

IV. COURSE CONTENT:

MODULE – I: CENTRALIZED AND DISTRIBUTED CONTROL PLANES (09)

Introduction, distributed control planes; Centralized control planes open flow: Introduction; Hybrid Approaches SDN Controllers: Introduction General Concepts Layer 3 Centric Plexxi Cisco OnePK.

MODULE – II: NETWORK PROGRAMMABILITY AND DATA CENTER CONCEPTS (10)

Network programmability: Introduction, the management interface, the application-network divide, modern programmatic interfaces, I2RS, modern orchestration; Data center concepts and constructs: Introduction, the multitenant data center, the virtualized multitenant data center, SDN solutions for the data center network, LANs, EVPN, VxLan, NVGRE.

MODULE – III: NETWORK FUNCTION VIRTUALIZATION AND NETWORK TOPOLOGY (09)

Network function virtualization: Introduction, virtualization and data plane I/O, services engineered path, service locations and chaining, NFV at ETSI, Non-ETSI NFV Work.

Network topology and topological information abstraction: Introduction, network topology, traditional methods, LLDP, BGP-TE/LS, ALTO, I2RS topology

MODULE - IV: BUILDING AN SDN FRAMEWORK (10)

Building an SDN framework: Introduction, build code first; ask questions later, the Juniper SDN framework, IETF SDN framework(s), open daylight controller/framework, policy, use cases for bandwidth scheduling, manipulation, and calendaring: introduction, bandwidth calendaring, big data and CSPF, expanding topology, use cases for data center overlays, big data, and network function virtualization, introduction, data center orchestration, puppet (DevOps Solution).

MODULE – V: NETWORK FUNCTION VIRTUALIZATION (NFV) (10)

Network Function Virtualization (NFV): Optimized big data, use cases for input traffic monitoring; Classification and triggered actions: Introduction, the firewall, firewalls as a service, network access control replacement, extending the use case with a virtual firewall, feedback and optimization, intrusion detection/threat mitigation

V. TEXTBOOKS:

1. Thomas D. Nadeau, Ken Gray,” Software Defined Networks an Authoritative Review of Network Programmability Technologies”, O'Reilly Media Publisher, 2nd Edition, 2013.

VI. REFERENCE BOOKS:

1. Paul Goransson, Chuck Black,” Software Defined Networks: A Comprehensive Approach”, Morgan Kaufmann Publishers, 1st Edition, 2014.
2. Raj Jain, Subharthi Paul, Rubens Fontes, Jeevankumar Tekchandani, "Network Function Virtualization (NFV) with a Touch of SDN", Wiley-IEEE Press, 1st Edition, 2019.

VII. ELECTRONIC RESOURCES:

1. <https://opennetworking.org/>
2. <https://www.juniper.net/us/en/solutions/sdn/>
3. <https://www.opendaylight.org/>
4. <https://www.etsi.org/technologies/nfv>

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments

5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)