INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

SOFTWARE DEFINED NETWORKS								
II Semester: CSE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BCSE33	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	-	-	3	40	60	100
Contact Classes:48	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: Computer organization and Architecture								

I. COURSE OVERVIEW:

This course introduces the principles and architecture of Software-Defined Networking (SDN), covering its design, implementation, and evolution. Students will explore OpenFlow protocols, SDN controllers, network programmability, and virtualization, along with practical use cases in enterprise and transport networks. The course emphasizes scalability, management, and real-world deployment challenges, preparing students to design and implement programmable networks.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The fundamentals and architecture of Software-Defined Networking.
II. The concepts of OpenFlow protocol operations, switch specifications, and controller communication.
IIII. The network programmability concepts, virtualization, and service chaining in SDN.

III. COURSE OUTCOMES;

CO1 Describe SDN architecture, design principles, and implementation models.
CO2 Illustrate the role of controllers, management interfaces, and the separation of control and data planes.
CO3Interpret OpenFlow protocol specifications, flow table operations, and controller communication mechanisms.
CO4 Implement programmable network solutions using SDN controllers and virtualized data planes.
CO5 Assess SDN scalability, performance optimization, and deployment strategies in enterprise and transport networks.
CO6 Analyze real-world SDN case studies and propose solutions for network challenges.

IV. COURSE SYLLABUS:

MODULE–I: INTRODUCTION TO SOFTWARE DEFINED NETWORKING (9)

Introduction, SDN Implementation, SDN Design, Separation of the Control and Data Planes, Edge-Oriented Networking, SDN Operation, Service Providers and SDN.

MODULE–II: SDN IMPLEMENTATION (9)

Introduction, SDN Implementation, SDN Design, Separation of the Control and Data Planes, Edge-Oriented Networking, SDN Operation, Service Providers and SDN.

MODULE-III: OPENFLOW (9)

Introduction, Overview of the OpenFlow Switch Specification, OpenFlow Ports, OpenFlow Packet-Processing Pipeline, OpenFlow Channel, Message Handling, OpenFlow Channel Connections, Controller Modes, Auxiliary Connection Use for Performance and Reliability.

Flow Table Synchronization, Bundle Messages, OpenFlow Configuration-and-Management Protocol, Remote Configuration and The OpenFlow Conformance Testing Program.

MODULE-IV: SOFTWARE-DEFINED NETWORKING AND NETWORK PROGRAMMABILITY (10)

SDN Controllers, Network Programmability, The Management Interface, The Application-Network Divide Modern Programmatic Interfaces, Virtualization and Data Plane I/O, Services Engineered Path, Service Locations and Chaining.

MODULE-V: SDN EVOLUTION (9)

Introduction, SDN and Enterprise Networks, SDN and Transport Networks, SDN and Optical Transport Networks, Increasing WAN Utilization with SDN, SDN Scalability Issues, Controller Designs for Scalability, Potential SDN Scalability Issues, Network Types, SDN Management, Load Adaptation, Google and SDN, Google's G-Scale Network, Google's G-Scale Network Hardware, Google SDN Deployment, Implementation Challenges.

V. TEXT BOOKS:

1. Patricia A. Morreale and James M. Anderson, "Software Defined Networking: Design and Deployment", CRC press 1st Edition.
2. Thomas D. Nadeau and Ken Gray," SDN: Software Defined Networks", O'Reilly Media, 1st Edition.

VI. REFERENCE BOOKS:

1. Siamak Azodolmolky," Software Defined Networking with OpenFlow", Packt Publishing, 2nd Edition, October 2017.
2. Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, 2014.

VII. ELECTRONICS RESOURCES:

1. https://www.geeksforgeeks.org/introduction-to-software-defined-networking-sdn
2. https://opennetworking.org
3. https://developer.cisco.com/learning/topics/sdn

VIII. MATERIALS ONLINE:

1. Course Outline Description
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)