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Date:

**CSX4277: Software Defined Networks**

**L-T-P-Cr: 3-0-0-3**

**Pre-requisites:** Undergraduate Computer Networks course.

**Objectives/Overview:**

- Introduce software-defined networking, including the background, the development, and the challenges.
- Hands-on experience with SDN using a popular simulator, Mininet.

**Course Outcomes:**

At the end of the course, a student should be able to:

| S.No | Course Outcome                                                             | Mapping to POs |
|------|----------------------------------------------------------------------------|----------------|
| 1    | Understand the basic architecture of SDN and its working                   | PO1, PO3       |
| 2    | Differentiate the SDN and its functioning compared to legacy network       | PO1, PO3       |
| 3    | Identify Challenges in SDN                                                 | PO1, PO2, PO3  |
| 4    | Identify Challenges that can be solved using SDN                           | PO1, PO2, PO3  |
| 5    | Develop solutions to Data Center traffic engineering challenges using SDN. | PO1, PO2, PO5  |

**UNIT I:**

**Lectures: 8**

**History and Evolution of SDN:** Separation of Control Plane and Data Plane, IETF Forces, Active Networking.

**Control and Data Plane Separation:** Concepts, Advantages and Disadvantages, the OpenFlow protocol.

**UNIT II:**

**Lectures: 8**

**Network Virtualization:** Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples.

**Control Plane:** Overview, Existing SDN Controllers including Floodlight and OpenDaylight projects.

**UNIT III:**

**Lectures: 10**

**Customization of Control Plane:** Switching and Firewall Implementation using SDN Concepts.

**Data Plane:** Software-based and Hardware-based; Programmable Network Hardware.

**UNIT IV:**

**Lectures: 8**

**Programming SDNs:** Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs.

# **Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.**

## **UNIT V:**

**Lectures: 8**

**Data Center Networks:** Packet, Optical and Wireless Architectures, Network Topologies.

**Use Cases of SDNs:** Data Centres, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering

## **Text/Reference Books:**

1. SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies, By Thomas D. Nadeau, Ken Gray Publisher: O'Reilly Media, August 2013, ISBN: 978-1-4493-4230-2, ISBN 10:1-4493-4230-2.
2. OpenFlow standards, <http://www.openflow.org>, 2015.