FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2020-21

Programme: Bachelor of Engineering (Computer Engineering)

Semester: VIII

Course Code: 102047807

Course Title: Introduction to Software Defined Networking

Course Group: Professional Elective Course - V

Course Objectives: Objective of this course is to make students aware about the differences between traditional networks and software defined network and to understand how this emerging technology is changing the way communication networks are managed and maintained. This course explains the skills to do advance networking research and to learn how software programs can be used to perform varying and complex networking tasks.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	40/14	60/21	20/07	30/10	150/52

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to SDN Background and Motivation:** Evolving network requirements-The SDN Approach: Requirements, SDN Architecture, Characteristics of Software-Defined Networking, SDN and NFV-Related Standards: Standards-Developing Organizations, Industry Consortia, Open Development Initiatives.	4
2	**SDN Data Plane and OpenFlow:** SDN data plane: Data plane Functions, Data plane protocols, Openflow logical network. Device: Flow table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table- OpenFlow Protocol.	8
3	**The Control Plane:** SDN Control Plane Architecture: Control Plane Functions, Southbound Interface, Northbound Interface, Routing, ITU-T Model- Open Day light-REST- Cooperation and Coordination among Controllers.	8

4	**SDN Application Plane:** SDN Application Plane Architecture: Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, Frenetic- Traffic Engineering Measurement and Monitoring – Security- Data Center Networking- Mobility and Wireless Networks.	8
5	**Network Function Virtualization:** Background and Motivation for NFV- Virtual Machines- NFV Concepts: Simple Example of the Use of NFV, NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements-NFV Reference Architecture: NFV Management and Orchestration.	8
6	**SDN Use Cases:** Data Centers, Internet Exchange Points, Wide-Area Backbone Networks, Home Networks.	4
	Total	40

List of Practicals / Tutorials:

1	Introduction to MININET tool with installation.
2	Introduction to MININET Command line interface.
3	To implement default topology using MININET and test connectivity.
4	Introduction and Installation of OpenDayLight Controller.
5	To implement communication between hosts using OpenDayLight Controller.
6	To view OpenFlow Communication using Wireshark.
7	To implement manual configuration of switch using dpctl command.
8	To implement different forwarding rules to switch in the controller.
9	Introduction and installation of ONOS Controller.
10	To implement routing in MININET.
11	To implement routing in ONOS.
12	To implement routing within SDN Network.

Reference Books:

1	Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2	Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, O'Reilly Media, 2013.
3	Siamak Azodolmolky, Software Defined Networking with Open Flow, Packet Publishing, 2013.
4	William Stallings, "Foundations of Modern Networking", Pearson Ltd., 2016.

Supplementary learning Material:

1	Coursera – Software Defined Networking –University of Chicago.

Pedagogy:
- Direct classroom teaching
- Audio Visual presentations/demonstrations

- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	25%	15%	20%	---	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.No.	Course Outcome Statements	%weightage
CO-1	To explain key benefits of SDN by the separation of data and control planes.	**16**
CO-2	To interpret the SDN data plane devices and OpenFlow Protocols.	**24**
CO-3	To implement the operation of SDN control plane with different controllers.	**24**
CO-4	To apply techniques that enable applications to control the underlying network using SDN.	**20**
CO-5	To describe Network Functions Virtualization components and their roles in SDN.	**16**

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	June-2020
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025