B. E. Computer Engineering
(Course 2012)
(**w.e.f. June 2016**)
410452D Elective-IV (Open Elective)

Fundamentals of Software Defined Networks

Teaching Scheme

Lectures: 3 Hrs/Week

Examination Scheme

In Semester Assessment: 30

End Semester Assessment:70

Course Objectives

- To develop knowledge in networking fundamentals
- To gain conceptual understanding of Software Defined Networks (SDN)
- To study industrial deployment use-cases of SDN

Course Outcomes

- To develop conceptual design of SDN solutions
- To apply network virtualisation for industry standard solutions
- To solve industry case-studies based on SDN

Unit	Content	Hours
I	**Introduction to Networking:** OSI layers; TCP/IP Protocol Suite; Distance vector and link state routing algorithms, Network protocols (ARP, BGP, OSPF, RIP, ICMP) and network topologies.	6
II	**Introduction to SDN:** Overview; History and evolution of SDN; Architecture of SDN; SDN Flavours; Scalability (Data Centres, Service provider networks, ISP Automation); Reliability (QoS, and Service Availability); Consistency (Configuration management, and Access Control Violations); Opportunities and Challenges;	6
III	**Control and Data Plane Separation:** Introduction to OpenFlow; History and evolution; Control and data plane separation; virtual networking; Use-cases (Network Access Control, Virtual Customer Edge, Datacenter Optimization);	6
IV	**Network Virtualisation:** Abstraction of Physical Network (constrained forwarding model, distributed state, detailed configuration); components of a virtual network (Virtual Switch, Bridge, Host-virtual adapter, NAT device, DHCP server, Network adapter); Network as a Service (NaaS)	8
V	**Applications of SDN:** Network management; Resource utilization; Network service chaining; Bandwidth calendaring and Network programmability.	6
VI	**SDN Design and Development:** Mininet; Applications; Network Virtual Machines; SDN Controller (POX, Floodlight, OpenDayLight; Applicability of OpenFlow protocols in SDN Controllers	8

Text Books

S. No	Title
1	Ying-Dar Lin, Ren-Hung Hwang, and Fred Baker, "Computer Networks: An Open Source Approach", McGraw-Hill Science/Engineering/Math, 2011.
2	Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, 2014.

Reference Books

S. No	Title
1	Siamak Azodolmolky, "Software Defined Networking with OpenFlow", Packt Publishing, 2013
2	Kingston Smiler, "OpenFlow® Cookbook", Packt Publishing, 2015
3	Doug Marschke, Jeff Doyle, Pete Moyer, "Software Defined Networking (SDN): Anatomy of OpenFlow® Volume I". Lulu Publishing Services, 2015

410454 Computer Laboratory-IV
410452D Elective-IV (Open Elective) Lab

Software toolset
- Linux Environment (Ubuntu 14.04 or greater)
- Python
- Practical assignments from Group A, B & C are mandatory

Group A
1. Implementation of network topologies (bus, ring, star, tree, mesh)
2. Implementation of a IP Router

Group B
3. Network traffic monitoring using Wireshark
4. Implementation of Network Address Translation (NAT) and OSPF v2 Protocols

Group C
5. Implement a POX controller to process incoming network packets
6. Implementation of a network policy for packet filtering