

Next Generation IP and Network Technologies

(Elective)

Level : M. Sc.
 Program : MScISE/MScSKE

Year :
 Part :

Teaching Schedule					Examination Schedule						Total	Remarks
Course Code Subject Title	L	T	P	Total	Theory			Practical				
					Assessment Marks*	Final		Assessment Marks*	Final			
						Duration Hrs.	Marks		Duration Hrs.	Marks		
Elective	3	1		4	40	3	60	-	-	-	100	*Continuous Assessment

Credits: 4

Course Objective:

Fundamental issues in network protocol design and implementation, historical development of the Internet; Internet routing protocols (unicast, multicast and unidirectional); algorithmic issues related to the Internet; measurement and performance; next generation Internet (IPv6, QoS), SDN and IoT.

1 The Global Internet Technology

3Hrs

- 1.1 Historical Development
- 1.2 IP Address Allocation
- 1.3 Domain Name Services
- 1.4 Web/Proxy Concepts

2 Internet and Routing Protocols

12hrs

- 2.1 Next Generation Internet (IPv6)
 - 2.1.1 History of IPv6
 - 2.1.2 IPv6 Header Format
 - 2.1.3 Feature of IPv6
 - 2.1.4 IPv6 Addressing (Unicast, Anycast & Multicast)
 - 2.1.5 ICMPv4/v6
- 2.2 Security and Quality of Service
 - 2.2.1 Security Problems with IPv4
 - 2.2.2 Types of Threats
 - 2.2.3 Security Techniques
 - 2.2.4 IPSEC Framework
 - 2.2.5 QoS in IPv6 Protocols
- 2.3 Routing Protocols
 - 2.3.1 RIPng
 - 2.3.2 OSPF

2.3.3 PIM-SM & DVMRP

- 3 IPv6 Deployment** **8Hrs**
- 3.1 Challenges and Risks
 - 3.2 Compatibility Issues
 - 3.3 IPv6 & DNS
 - 3.4 IPv6 enabled Servers
 - 3.5 IPv6 network migration strategies
- 4 SDN & NFV** **12Hrs**
- 4.1 SDN and NFV overview
 - 4.2 SDN Protocol Standards (OpenFlow)
 - 4.3 SDN APIs (North, South, East and West bound)
 - 4.4 Data and Control Plane overview (NOX, POX, Beacon...)
 - 4.5 SDN in the Telecom Domain
 - 4.6 Legacy Network Migration to SDN
 - 4.7 SDN Programming (P4, Frenetic)
 - 4.8 SDN testing and verification tools (mininet, geni..)
 - 4.9 OpenVSwitch
 - 4.10 Research Trends in SDN and NFV
- 5 Internet of Things (IoT)** **12Hrs**
- 5.1 Definition, Overview, Applications, Potential & Challenges
 - 5.2 IoT visoin, paradigm
 - 5.3 Smart objects
 - 5.4 IoT Technologies: RFID, WSN
 - 5.5 Interoperability for IPv6 and IoT
 - 5.6 Multi-hop wireless Ad-hoc network routing protocols: performance comparison
 - 5.7 Vehicular Ad-hoc Network: Survey
 - 5.8 6LoWPAN overview
 - 5.9 Research Trends in IoT: Future evolutions of current technologies.

Laboratory Works:

IPv6 routing on GNS3 or Packet Tracer

SDN: Mininet, research on GENI, Controller Programming : Java/Python

IoT: wireless protocol test

Network Socket Programming

References Books:

1. *J. F. Kurose and K. W. Ross: Computer Networking - A Top-Down Approach Featuring the Internet*, Addison-Wesley, 2000.
2. *Silvia Hagen: IPv6 Essentials*, O'reilly
3. *Thomas D. Nadeau, Ken Gray, An Authoritative Review of Network Programmability Technologies: SDN*. O'Reilley Media, 3013, ISBN: 978-1-4493-4230-2
4. *e-BOOK: executive Guide to SDN*
5. *Cuno Pfister, Getting Started with IoT-1st Edition*, O'Reilley Media, ISBN: 978-1-4493-9357-1