


ADVANCED COMPUTER NETWORKS

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PRE-REQUISITES : Computer Networks and Computer Architecture Courses are Prerequisites

INTENDED AUDIENCE : Final year undergraduate students and postgraduate (masters + PhD) students of computer science and engineering

INDUSTRY SUPPORT : CISCO, Juniper Networks, Sasken, Hewlett-Packard, Wipro, Broadcom

COURSE OUTLINE :

This is an advanced course on Computer Networks covering four main contemporary topics namely how high performance networks are designed covering algorithms and implementations, data center networking, information centric networking and network softwarization: software defined networking, network virtualization and programmable networks. This course assumes a basic knowledge of computer networks and working proficiency with Unix/Linux Operating Systems. It has practical component with programming assignments giving hands on to the students.

ABOUT INSTRUCTOR :

Prof. Neminath Hubballi received the Ph.D. degree from the Department of Computer Science and Engineering, IIT Guwahati, India. He is currently an Associate Professor in the Discipline of Computer Science, IIT Indore, India. Prior to the current role, he was with corporate research and development centers of Samsung, Infosys Lab. He has also worked with Hewlett-Packard. He has several publications in the areas of security. His areas of interests include networks and system security. He has served as a TPC member and the chair of several conferences. He is a regular reviewer of many security journals and conferences.

Prof. Sameer G Kulkarni is an Assistant Professor in Computer Sciences at Indian Institute of Technology, Gandhinagar. He received a Ph.D. degree in Computer Science from University of Göttingen, Germany in July 2018 and worked as a postdoctoral researcher at the University of California, Riverside. He received his M.S. degree in Computer Engineering from the University of Southern California, in 2010, and B.E. degree in Computer Science and Engineering from National Institute of Engineering, Mysore, in 2004. He is the recipient of the IEEE TCSC Best PhD Dissertation Award 2019. His research interests include Software Defined Networking, Network Function Virtualization, Edge Cloud Platforms, Distributed systems, and Disaster Management.

COURSE PLAN :

Week 1: High Performance Switching and Routing: Introduction, performance considerations, IP address lookup
Week 2: Algorithms for IP address lookup and optimization, hardware implementation of address lookup
Week 3: Packet Classification: Need for packet classification and methods for packet classification.
Week 4: Differentiated Service, Quality of Service, Traffic Polishing, Traffic Shaping
Week 5: Network Softwarization - Introduction
Week 6: Software Defined Networking (SDN) - Deep Dive (Northbound and Southbound interface) , Working with Mininet + Lab Exercises with Mininet
Week 7: Network Function Virtualization (NFV) - Architecture and Concepts
Week 8: Programmable Networks - Introduction to P4, SmartNICS and P4 switches. + Lab Exercise with Mininet and BMV2 switches.
Week 9: Data Center Networking (DCN) - Introduction
Week 10: DCN - Deep Dive (Network topologies, Container Network Interfaces)
Week 11: Content Distribution on the Internet, Architectures for Information Centric Networking
Week 12: Content Naming, Routing and Caching, Security in Named Data Networking