Title	Network Systems
Long Title	Network Systems
Credits	**5**
NFQ Level	**6**
Module Author	**Eoin O'Regan**

Module Description:

This module introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, transport, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced. This module also offers an introduction to the architecture and operation of routers, routing protocols and the principles of routing.

Learning Outcomes

On successful completion of this module the learner will be able to:

LO1 Describe the Open System Interconnection (OSI) reference model and the communication process between different layers.
LO2 Discuss Ethernet LAN technologies.
LO3 Analyze the operations and features of the network layer protocols and services.
LO4 Apply IP subnetting by calculating subnet masks and addresses to fulfill given requirements.
LO5 Configure & troubleshoot routing protocols on industry standard routers.
LO6 Identify the characteristics of distance vector routing protocols.

Indicative Content

Network models
Layered approach, OSI, network protocols.
Application Layer
Application layer protocols, applications and services supporting communications.
Transport Layer
Roles of the transport layer, communicating with low overhead (UDP), communicating with reliability (TCP), reassembling, managing data loss.
Network Layer & Routing
Roles of the network layer; dividing devices into groups; communications between networks.
Internet Protocol v4
Internet Protocol v4, Addresses for different purposes, overview of IPv6, subnetting, network layer testing.
Data Link Layer
Data link layer, Media Access Control, addressing and framing.
Physical Layer
Physical layer, signalling, media.
Ethernet
Ethernet media, layers – MAC technology, MAC addressing, Address Resolution Protocol (ARP), shared versus dedicated Ethernet.
IP Subnetting
Routing based on IP address; calculating IPv4 subnet masks; VLSM; designing an IPv4 addressing scheme; IPv6 address assignment
Routing and Packet Forwarding
Router configuration, routing table, path determination and switching functions.
Dynamic Routing
Classifying dynamic routing protocols, metrics, administrative distances.
Distance Vector Routing Protocol
Network discovery, routing table maintenance, routing loops, routing table structure, routing table lookup process, classful routing behaviour, classless routing behaviour, equal cost load balancing.
RIPv1
RIPv1 configuration, verification and troubleshooting, automatic summarisation, default route and RIPv1.
IPv6 and RIPng
IPv6 addressing; RIPng configuration, verification and troubleshooting.

Course Work

Assessment Type	*Assessment Description*	*Outcome Addressed*	*% of Total*	*Assessment Date*
Written Report	Weekly lab reports summarising & analysing the work carried out in assigned networking labs.	1, 2, 3, 4, 5, 6	30.0	Every Week
Practical/Skills Evaluation	A skills based assignment that requires the design & implementation of a network infrastructure.	4, 5, 6	40.0	Week 12
Written Report	A research report assessing the students knowledge of network communications, switching or routing.	1, 2, 3, 6	30.0	Sem End
No End of Module Formal Examination				

Assessment Breakdown	%
Coursework	100

Re-Assessment Requirement

Coursework Only

This module is reassessed solely on the basis of re-submitted coursework. There is no repeat written examination.

Workload – Full Time

Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Leaner Workload*
Lecture	Lecture underpinning learning outcomes.	2.0	Every Week	2.00
Lab	Lab supporting content delivered in class.	2.0	Every Week	2.00
Independent & Directed Learning (Non-contact)	Directed study to support labs/lectures/tutorials.	3.0	Every Week	3.00
		Total Hours		7.00
		Total Weekly Learner Workload		7.00
		Total Weekly Contact Hours		4.00

Workload – Part Time

Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Leaner Workload*
Lecture	Lecture underpinning learning outcomes.	2.0	Every Week	2.00
Lab	Lab supporting content delivered in class.	2.0	Every Week	2.00
Independent & Directed Learning (Non-contact)	Directed study to support labs/lectures/tutorials.	3.0	Every Week	3.00
		Total Hours		7.00
		Total Weekly Learner Workload		7.00
		Total Weekly Contact Hours		4.00

Recommended Book Resources

- **Cisco Networking Academy 2016 2006, *Introduction to Networks v6 Companion Guide*, 1st Ed. Ed., Cisco Press [ISBN: 9781587133602]**
- **Jim Kurose and Keith Ross 2013, *Computer Networking: A Top-Down Approach*, 6th Ed. Ed., Pearson [ISBN: 9780132856201]**

Supplementary Book Resources

- **Al Anderson and Ryan Benedetti 2009, *Head First Networking*, O' Reilly Media [ISBN: 9780596521554]**

This module does not have any article/paper resources

Other Resources

- **Online Curriculum: *All course material is available on-line for registered students***

  http://cisco.netacad.net
- **NetLab: *Virtual Environment***

  http://netlab.cit.ie