TECH07048
Network Routing & Switching

Full Title	Network Routing & Switching		
Status	Uploaded to Banner	Start Term	2020
NFQ Level	07	ECTS Credits	05
Module Code	TECH07048	Duration	Semester - (13 Weeks)
Grading Mode	Numeric	Department	Business, Humanities and Tech
Module Author	Seamus Dowling		
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Module Description

This module aims to introduce the learner to modern computer networking concepts and technologies. The learner should understand current IP addressing schemes and be familiar with designing, installing and troubleshooting local area networks (LAN) and wide area networks (WAN).

Learning Outcomes
On completion of this module the learner will/should be able to:

1.	Understand and implement IPv4, IPv6, variable length subnet mask (VLSM) and subnetting.
2.	Differentiate between Static and Dynamic routing protocols and concepts.
3.	Configure and maintain networks using LAN and WAN devices.
4.	Troubleshoot LAN and WAN communication problems.
5.	Understand and implement routing protocol and concepts.
6.	Demonstrate ability to plan and design congestion free networks.

Indicative Syllabus

IP addressing (10%)

- IPv4 Class A, B and C networks
- Intro to IPv6 IP addressing
- Classful and Classless addressing
- Fixed size subnetting
- Variable Length Subnet Mask (VLSM)
- Network ID, Broadcasts and Subnet Masks

Static and Dynamic Routing (10%)

- Introduction to *Static Routing* and *Dynamic Routing* concepts
- Distance Vector, Link State routing and metrics
- Create and implement static and default routes and gateways
- Designing networks with fast convergence

Build and configure LANs and WANs (20%)

- Designing networks for internal and external communication for an organisation
- Configure LAN and WAN devices
- Configure router with static and/or dynamic routing
- Implement network strategies for fast convergence
- Configure LAN and WAN devices for secure access

Troubleshooting (20%)

- Layer 1, 2 and 3 errors
- Top-down, bottom-up and divide-and-conquer methods
- Ping, Traceroute responses

- LAN and WAN troubleshooting commands

Routing (20%)

- RIP
- EIGRP
- OSPF
- BGP

Switching (20%)

- Switch Configuration
- Spanning Tree
- Trunking
- VTP

Practical Programme

- Design and implement VLSM addressing schemes
- Correct wiring schemes and management
- Remote access to LAN and WAN devices
- Basic LAN/WAN device configuration - Hostname, MOTD, security
- Implement Static and Dynamic Routing
- Troubleshoot LAN and WAN communication problems

Teaching and Learning Strategy

Live (and recorded) webinars will be posted as links and will be continuously referred to during module. Short individual webinars during first week stepping through:

- the virtual online learning environment, Moodle, Skype etc
- assessment content and submission
- software tools used such as Packet Tracer and GNS3

For both *face-to-face* and *online/blended delivery,* the following information will be posted on moodle: tasks, expected deliverable, deadlines, assessment materials and other sources to complete assessment.

Social presence is encouraged in the classroom for socially distanced face-to-face and facilitated for online/blended delivery. Classroom group work and lab challenges creates an environment that promotes appropriately distanced social interaction. Online and blended delivery requires more facilitation. This will involve an initial get-to-know-you webinar. Forum discussions will ensure that all students share a little about themselves. Students in the same geographic area will be encouraged to collaborate. This overlaps with other both the cognitive and teaching presences. Period webinars will be scheduled with specific 'agenda' points to be discussed. Students will need to prepare for these webinar by completing e-tivities in advance, and discuss their findings during the webinar. Students will be encouraged to use their own social networking groups whereby they can get instant notifications of comments and can contribute to discussions

Cognitive presence will be 'assessed' and monitored for socially distanced face-to face and online/blended delivery. This should be an iterative process whereby students will demonstrate their growing knowledge of Incident Detection and Response concepts. Constant feedback and participation by the lecturer (on social platforms, classroom and VLE) and feedback on their performance of past assessment items, will be provided

Teaching presence is relevant for socially distanced face-to face and online/blended delivery. This should engage and challenge the student. They should want to pursue the next task and apply what they have learned. Lab practical tasks will assess elements of all modules. Intermittent quizzes and reflective activities will also be posted although these will not contribute to assessment marks.

Assessment Strategy

Information concerning the nature and timing of continuous assessment will be reviewed and agreed with learners and external examiners at the beginning of the academic year. Marking criteria, deadlines and expectations will also be provided to the learner in advance. Constructive feedback will be provided in a timely manner and in an appropriate format.

A series of **Lab Practical** tests which are intended *primarily* to assess learner's ability to build and configure LANs and WANs using routers and switches. These assessments will be *summative* (assessment 2 and 4 - in class) and *formative* (assessments 1 and 3 - submitted online, learonline.gmit.ie).

A **Final Practical** consisting of a two-hour long practical covering all of the topics delivered during the course. This assessment is *summative*.

Repeat Assessment Strategies

All assessment will be carried out in line with the programme, campus and institute assessment strategies and in line with the Code of Practice No. 3 Student Assessments: Marks and Standards.

Students can resubmit Assessments (LAN/WAN Configurations, Written Reports) on Moodle, where eligible.

Decisions on nature of assessment will be linked to the need to achieve particular learning outcomes. Individuals may be interviewed or asked to present their work in a formal context to validate authenticity and ownership of work.

Indicative Coursework and Continuous Assessment:		100 %		
Form	*Title*	*Percent*	*Week (Indicative)*	*Learning Outcomes*
Assessment	Design a Class C VLSM strategy for LAN/WAN environment	20 %	Week 4	1,6
In class exam	Configure LAN and WAN devices schematic with Static and Dynamic Routing	20 %	Week 7	2,3,4,5
Assessment	Configure, troubleshoot and secure LAN and WAN devices using routing and switching concepts	30 %	Week 10	1,3,6
In class exam	Final practical assessing ability to design, configure and troubleshoot a secure LAN/WAN environment	30 %	Week 13	1,2,3,4,5,6

Full Time Delivery Mode Average Weekly Workload:			3.00 Hours		
Type	*Description*	*Location*	*Hours*	*Frequency*	*Weekly Avg*
Lecture	Lectures	Computer Laboratory	2	Weekly	2.00
Practical	Network labs	Computer Laboratory	1	Weekly	1.00

Online Learning Delivery Mode Average Weekly Workload:			3.00 Hours		
Type	*Description*	*Location*	*Hours*	*Frequency*	*Weekly Avg*
Online Learning	Online Lectures and Labs	Online	3	Weekly	3.00

Blended Delivery Mode Average Weekly Workload:			3.00 Hours		
Type	*Description*	*Location*	*Hours*	*Frequency*	*Weekly Avg*
Online Learning	Online lecture	Not Specified	1	Weekly	1.00
Online Learning	Online Tutorial	Not Specified	1	Weekly	1.00
Practical	Lab Practical	Computer Laboratory	4	Monthly	1.00

Required Reading Book List
Wendell, S., (2017). *CCNA Routing and Switching ICND2 200-105.* ISBN 1587205815 ISBN-13 9781587205811
Nastase, R., (2018). *Computer Networking.* Computer Networking. ISBN 179210734X ISBN-13 9781792107344

Literary Resources

Cisco Press

- Networking Academy Program: CCNA 1 and 2 companion guide
- ISBN-10: 1587131501

V. Anand/K. Chakrabarty

- Cisco IP routing protocols troubleshooting techniques
- Ebrary resource

A. Tanenbaum

- Computer Networks, 5th Edition, Pearson 2011
- ISBN : 9780132553179

Journal Resources

Online Resources

Cisco Network Academy: https://www.netacad.com/

CCIE WAN concepts and sample labs (Creative Commons): http://www.ccie18473.net/

Other Resources

Packet Tracer

Wireshark

SolarWinds

Additional Information

Moodle: learnonline.gmit.ie

Office 365

Programme Membership

GA_KNCSC_B07 202000 Bachelor of Science in Network Cybersecurity