



MCAST

Malta College of Arts, Science & Technology

MQF Level 6

IT6-A1-19

**MCAST Bachelor of Science (Honours) in Computer
Systems and Networks**

Course Specification

Course Description

This course is intended for students who would like to pursue a career in the ever changing world of computer systems and networks. In this course, students will be exposed to enterprise network technologies, data centre operations, service provider networks, information security, virtualisation and cloud computing technologies. Due importance will also be given to emerging technologies which students will find being implemented when they start working in industry. A hands on approach is adopted throughout this course.

Programme Learning Outcomes

At the end of the programme the learner will be able to:

1. Understand key technologies and protocols used in enterprise systems and networks.
2. Design enterprise computer systems and networks according to a given specification
3. Implement enterprise computer systems and networks according to a given specification
4. Evaluate current and emerging network technologies

Entry Requirements

MCAST Advanced Diploma in IT
(recommended streams: “Computer Systems and Networks” and “End User Support”)
or
MCAST Advanced Diploma in Electronics (Computer Engineering)
or
2 A-Level passes and 2 I-Level passes
Compulsory A-Level: Computing.
Compulsory A-Level or I-Level: one subject from Pure Mathematics, Applied Mathematics and Physics

Current Approved Programme Structure

Unit Title	ECTS
Database Administration 1	6
Networking Concepts	6
Computer Platforms	6
Security Fundamentals	6
Database Administration 2	6
Server Administration	12
LAN Switching	6
Advanced Scripting	6
Virtualisation	6
WAN	6
Network Security & Penetration Testing	6
Advanced Routing	6
Ethical Hacking	6
Maths for Computer Networks	6
Wireless Networks	6
Computer Forensics	6
Project	6
Multimedia Networks	6
Software Defined Networks	6
Linux Server Administration	6
Wide Area Networks II	6
Cloud Infrastructures	6
IT Project	6
Content Management Systems	6
English	6
Entrepreneurship	6
Critical Thinking	6
Dissertation	12
Total ECVET/ECTS	180

Database Administration 1

Unit level (MQF): 5

Credits: 6

Unit Description

A database is a collection of information stored in a structured way for convenient access by applications or data-processing systems. Databases play a key role in most organizations today. In fact every organization, in some way shape or form, uses a database. Companies within the retail sector, the medical sector and the Government sector are all popular users of large-scale databases. Because databases often hold business critical data belonging to the organization, its employees or customers, they can grow into complex, mission critical systems. For them to perform well on a consistent basis they must be managed and maintained properly using a database management system (DBMS).

With this in mind, the role of a database administrator - the person responsible for the performance, integrity and security of the database and its related infrastructure - becomes a critical piece of the puzzle. The database administrator, or DBA, supports the wider areas of the business by managing and maintaining the database system, handling capacity planning, disaster recovery planning and ensuring availability and reliability. The DBA can also be responsible for the retrieval of data from the database using the Structured Query Language (SQL).

Individuals studying this unit will learn the skills required to implement, manage and support a variety of database management systems (DBMS). This unit is built on the notion that, while databases are essentially practical things, their successful creation and implementation depends on understanding the important theoretical concepts that define them.

Learners will build and draw upon technical, analytical, and problem solving skills in all areas of database administration. Through theory and practice, students will learn

about the fundamental concepts, tools and techniques required to perform the role of a database administrator.

Learning Outcomes

On completion of this unit the student will be able to

1. *Plan and install a DBMS solution.*
2. *Configure and manage a DBMS solution.*
3. *Plan and implement data import, export, and migration.*
4. *Managing DBMS security and permissions.*

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Networking Concepts

Unit level (MQF): 5

Credits: 6

Unit Description

Computer networks are vital in different areas of our lives. This aim of this unit is to reinforce the basic concepts that enable data communication over computer networks. Students will be introduced to the theoretical foundations of data transmission along with an in-depth coverage and application of the OSI & TCP/IP models.

Practical exercises will be presented to provide a practical perspective to the theory presented. A number of core networking protocols will be discussed and analysed using a protocol analyser. Students will also be introduced to copper and fibre structured cabling design, installation, testing and certification. Emerging technologies such as IPv6 are also an essential part of this unit.

The unit shall assist the learner in preparing himself/herself for professional/vendor certifications.

Learning Outcomes

On completion of this unit the student will be able to

1. *Show understanding of the basic concepts behind data transmission technology.*
2. *Understand and apply networking models and protocols.*
3. *Show understanding of the operation of various network components.*
4. *Design, configure, test and troubleshoot a network.*

Computer Platforms

Unit level (MQF): 5

Credits: 6

Unit Description

This course introduces the foundations of data representations, combinational logic design using HDL and computer systems.

This module provides an understanding of computer number representations and basic arithmetic algorithms. These are further developed to cover the design of arithmetic unit and combination logic design using a HDL. Computer architecture together with memory management and I/O systems are also covered within this module.

Learning Outcomes

On completion of this unit the student will be able to

1. *Manipulate and explain the use of number and logic systems in a computer.*
2. *Design a combinational logic circuit.*
3. *Simulate a combinational logic circuit.*
4. *Understand and design the basic computer architecture.*

Security Fundamentals

Unit level (MQF): 5

Credits: 6

Unit Description

This unit is designed to introduce candidates to the issues involved in designing and constructing secure computer networks. An organisation must consider security to protect its network from damage and information theft.

Security is an essential part of an IT system. As security attacks become more sophisticated, the level of skill required to perform the simplest of attacks is decreasing. Several tools which enable users with basic security skills to launch attacks are become widely available.

This course will focus on network security concerns related to hardware, software, network and physical access. Industry standard best practises will also be explored.

Knowledge of threats and attacks is important in order to appreciate the potential consequences to an organization and implement defence mechanisms.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Demonstrate network security, compliance and operational security.*
- 2. Identify and describe threats and vulnerabilities.*
- 3. Implement basic application, data and host security.*
- 4. Identify suitable methods of cryptography.*

Database Administration 2

Unit level (MQF): 5

Credits: 6

Unit Description

A database is a collection of information stored in a structured way for convenient access by applications or data-processing systems. Databases play a key role in most organizations today. In fact, every organization, in some way shape or form, uses a database. Companies within the retail sector, the medical sector and the Government sector are all popular users of large-scale databases. Because databases often hold business critical data belonging to the organization, its employees or customers, they can grow into complex, mission critical systems. For them to perform well on a consistent basis they must be managed and maintained properly using a database management system (DBMS).

With this in mind, the role of a database administrator - the person responsible for the performance, integrity and security of the database and its related infrastructure - becomes a critical piece of the puzzle. The database administrator, or DBA, supports the wider areas of the business by managing and maintaining the database system, handling capacity planning, disaster recovery planning and ensuring availability and reliability. The DBA can also be responsible for the retrieval of data from the database using the Structured Query Language (SQL).

This unit is a continuation of Database Administration I; it builds on the knowledge and skills obtained from the previous unit. In this unit, the learner will learn skills required to ensure availability and reliability of data. This is obtained by understanding and implementing different fault tolerance solutions, continuously monitor and manage a DBMS whilst making necessary adjustments, analyse and improve DBMS performance, and plan and deploy backup strategies.

Learning Outcomes

On completion of this unit the student will be able to

1. *Understand and implement a database design.*
2. *Retrieve data and improve database performance.*
3. *Plan and deploy mirroring and replication solutions.*
4. *Plan and implement a clustering solution.*

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Server Administration

Unit level (MQF): 5

Credits: 12

Unit Description

According to Info Tech Research Group, the job of a server administrator is to, “Install, administer, and optimize company servers and related components to achieve high performance of the various business applications supported by tuning the servers as necessary. This includes ensuring the availability of client/server applications, configuring all new implementations, and developing processes and procedures for ongoing management of the server environment. Where applicable, the Server Administrator will assist in overseeing the physical security, integrity, and safety of the data centre/server farm.”

The purpose of this unit is to address skillset requirement by providing learners with the basic knowledge and understanding of the server operating systems and the services and features offered by them, and to enable learners to acquire the practical skills required to configure and maintain these devices.

The unit delivers the knowledge and skills required to deploy, configure and maintain a contemporary server operating system. In addition to studying the theoretical aspects of network server operating systems such as designing a network directory infrastructure the unit involves a significant element of hands-on lab-oriented activities using industry standard software.

Learning Outcomes

On completion of this unit the student will be able to

1. *Plan and implement infrastructure services.*
2. *Plan and deploy application services.*
3. *Plan and implement server and network security.*
4. *Manage and monitor servers.*

LAN Switching

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to provide learners with the basic knowledge and understanding of the switching technologies underlying contemporary LAN network infrastructures and to enable them to acquire practical skills in the configuration and maintenance of these devices.

Computer Networking technologies have grown in complexity to meet the need of modern Business solutions. This unit presents learners with the business drivers for and the underlying technologies to support integrated voice and data capabilities in a secure network environment.

In addition to studying the theoretical aspects of protocols, the unit involves a significant element of hands-on lab-oriented activities and simulation package exercises using industry standard equipment.

The course can be delivered through a 'blended learning approach' where tutor led teaching is combined with media rich online learning resources.

Learning Outcomes

On completion of this unit the student will be able to

1. *Describe Ethernet technology and Switching concepts.*
2. *Show proficiency in switch configuration and troubleshooting.*
3. *Understand concepts of and implement VLANs.*
4. *Understand switching technologies providing redundancy and availability.*

Advanced Scripting

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to enable the learner to complete system administration tasks. The unit begins with enabling the learner to perform system administration tasks using shell commands and progresses to advance levels of system administration tasks that require alternative scripting languages.

The learner will become familiar with shell commands and the limitations of shell commands. The unit will introduce the learner to complex scenarios which require programming logic, such as, sequence, selection and repetition.

The unit will challenge the learner to analyze a given system administration scenario and provide a solution. The solution must cover each criteria within the learning outcomes.

It is expected that the unit is a holistic piece of academic work.

Learning Outcomes

On completion of this unit the student will be able to

1. *Understand Different Scripting Languages.*
2. *Perform System Administration Tasks using Shell Commands.*
3. *Configure and Implement Shell Scripts.*
4. *Understand and Use Advanced Shell Commands.*

Virtualisation

Unit level (MQF): 5

Credits: 6

Unit Description

Nowadays virtualisation plays a key role in the IT industry. Companies are no longer dedicating physical servers for every system that is deployed. There are different models that an organisation may use to take the advantage of virtualisation within their day to day operations.

Through this course, learners will be exposed to the planning, installation and management of virtualised environments. The importance of monitoring, backups and redundancy will also be stressed.

A significant number of practical exercises will be carried out and learners will be able to put every aspect of the theory covered into practise. This unit is not tied to any particular virtualisation solution vendor and therefore can be adapted according to the need of the institution.

The assessment process will focus significantly on being able to apply the content covered in class to a practical business scenario with specific requirements and constraints.

Learning Outcomes

On completion of this unit the student will be able to

- 1. Assess the use of various technologies used in the implementation of virtualised environments.*
- 2. Implement a virtualisation solution for a given scenario.*
- 3. Monitor and troubleshoot a virtualised environment.*
- 4. Implement high availability in a virtualised environment.*

WAN

Unit level (MQF): 5

Credits: 6

Unit Description

Wide Area Networks (WANs) are service provider owned networks that enable organisations to communicate across large geographical distances. These technologies also enable end users to connect to the largest available network - the Internet.

Throughout this study unit, the learners will develop practical understanding of WAN technologies and the services delivered across the WAN infrastructure, enabling them to plan, design and implement WAN infrastructure solutions. Special focus on the technologies implemented by the local service providers will be made.

Site visits, external talks and practical labs are an essential part of this unit's delivery.

Learning Outcomes

On completion of this unit the student will be able to

1. *Apply core telecommunication concepts to WANs.*
2. *Explain the operation of different WAN technologies.*
3. *Design and Implement WAN technologies.*
4. *Monitor and troubleshoot WAN technologies.*

Network Security & Penetration Testing

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to educate the student on methods used to secure networks and IT systems. The unit will offer the student theoretical and practical sessions on techniques to be applied to networks and systems to determine their vulnerabilities, their threats and their risks and to provide secure solutions to mitigate the identified risks. The unit will focus on:

1. The use of network hardware systems such as CISCO products.
2. The use of system software, mainly Windows and Linux.
3. Technical methods to identify vulnerabilities on network hardware systems.
4. Technical methods to identify vulnerabilities on systems software.
5. Other methods (such as tapping into the physical infrastructure) to gather information and get access to systems.
6. Configure network hardware systems in a secure manner.
7. Configure and install systems software in a secure manner.

The students will be conducting network attacks and implementing counter measures within a controlled environment which will be setup by the students themselves.

The unit outline is as follows:

1. Explanation on the purpose of penetration testing including the meaning of risk, vulnerability and threat.
2. A brief explanation on the authorization boundaries when conducting a penetration test.
3. Explanation of a pen-test environment and how this environment is set up.
4. Explanation of the hacking methodology and how it is conducted.
5. Use of pen test applications such as Wire shark and Metasploit.
6. Use of vulnerability mitigating software such as WSUS.
7. Use of network simulation software such as GNS3 and CISCO packet tracer.

Students will be assessed on all of the above. It is important to note that hands on experience is crucial for this unit since students will grasp more security knowledge through facing real case scenarios .

The specific objective of this unit, is that the learner undertakes a logical / correct sequence of how penetration testing is performed and how to secure your network from malicious attacks.

Learning Outcomes

On completion of this unit the student will be able to

1. *Demonstrate penetration testing techniques.*
2. *Demonstrate the required skills to secure operating systems.*
3. *Demonstrate the required skills to secure networks.*

Advanced Routing

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to provide learners with the basic knowledge and understanding of the routing technologies underlying contemporary network infrastructures and to enable them to acquire practical skills in the configuration and maintenance of these devices.

The unit delivers the knowledge and skills required to cover material related to the curriculum of Cisco Certified Network Associate (CCNA) Routing and Switching semester 2 and semester 3 courses.

In addition to studying the theoretical aspects of contemporary routing protocols such as OSPFv3 and EIGRP for IPv6 the unit involves a significant element of hands-on lab-oriented activities and simulation package exercises using industry standard equipment.

The unit gives learners an introduction to basic routing concepts such as the classification and characteristics of well-established advanced distance vector (EIGRP) and link state protocols (OSPF). In addition the structure of the routing table and the lookup process are explained.

Topics such as NAT/PAT are introduced together with the related address conservation methods of private IP addressing and VLSM. The requirement for securing access to a network segment and filtering traffic is explained together with hands on experience of implementing ACL's.

The unit also introduces contemporary IPv6 IGRP protocols.

Learning Outcomes

On completion of this unit the student will be able to

1. *Understand basic routing concepts.*
2. *Implement and configure EIGRP as a dynamic routing protocol.*

3. *Implement and configure OSPF as a dynamic routing protocol.*
4. *Securing dynamic routing protocols and application of Access Control Lists.*
5. *Implement and configure Network Address Translation (NAT) and Dynamic Host Configuration Protocol (DHCP).*

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Ethical Hacking

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to understand who an Ethical Hacker is and what is involved to be one. The course will start off with an introduction in ethical hacking, covering various topics such as essential hacking terminologies, different hacker classes and most importantly the methodology of hacking. It will then go into reconnaissance where a student will learn how to gather information of a person, system or company using different methods. Vulnerabilities in systems are an ongoing issue and students will learn how to test systems for such issues.

Part of duties of an ethical hacker is that of writing reports, hence the student will learn how to write such documents.

Learners will be assessed on all of the above and they will also understand the true meaning of ethical hacking. This involves having the student appreciate the skill set required to be one and the repercussions of using this knowledge in an unethical manner.

The specific objective of this unit, is that the learner undertakes a logical / correct sequence of how hacking is done in order for him to appreciate system security and what is involved to counteract such attacks.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the methodology of hacking.*
2. *Evaluate information gathering through the use of footprinting and reconnaissance.*
3. *Point out different ways to test for vulnerabilities.*
4. *Perform system vulnerability exploit attacks.*
5. *Compute security assessment reports.*

Maths for Computer Networks

Unit level (MQF): 5

Credits: 6

Unit Description

This unit provides a framework for students to develop their mathematical skills in solving problems related to Computer Networks. Students will develop in-depth knowledge of terms that are frequently used and this will equip them with the right mathematical knowledge and skills needed for success on the job.

The unit focuses on the successful achievement of engineering-based core competences and key skills such as understanding the mathematical relation in signal degradation and regeneration, polynomial applications to error detection and correction, applying Shannon's Law amongst others. Students will evaluate and apply different techniques/laws to various real life scenarios and provide the most cost effective solution to the given problem. Moreover students will be able to present results using appropriate tools and finally communicate the conclusions effectively.

On successful completion of the unit students will be able to evaluate, reflect and re-examine their computer network design following a mathematical thinking process. This will help them to further their future studies and potentially improve their work employability prospects.

Learning Outcomes

On completion of this unit the student will be able to

1. *Apply algebraic concepts to engineering equations.*
2. *Understand core mathematical skills for network engineers.*
3. *Understand signal processing applications.*
4. *Apply statistical techniques to analyse data.*

Wireless Networks

Unit level (MQF): 5

Credits: 6

Unit Description

This course introduces students to the modern technology involved with commercial wireless networks.

In industry today the flexibility of wireless technologies is essential. This course will enhance the students' knowledge, skills and confidence to design, configure, implement and support wireless Local Area networks in a Small to Medium sized Business.

The course will introduce the characteristics of a wireless Local Area Network and introduce various technologies developed to enhance wireless communications.

Knowledge and implementation of security features is essential for an efficient and effective wireless networks

Learning Outcomes

On completion of this unit the student will be able to

1. *Describe the characteristics of wireless LANs.*
2. *Describe wireless radio technology concepts.*
3. *Configure a small wireless network.*
4. *Implement wireless network security.*

Computer Forensics

Unit level (MQF): 5

Credits: 6

Unit Description

Computer forensics involves the collection, analysis and presentation of electronic evidence from volatile and non-volatile data sources (e.g. PCs, laptops, GPSs, mobile phones, hard drives, RAM). The main scope of a computer forensic investigation is to identify the root cause of an event or to help prove or disprove that a particular individual was involved in a crime. The necessity to identify the what, when, how and who of an incident and follow the correct procedures to ensure the findings are admissible as evidence in a court of law is crucial.

While popular TV programmes such as ‘CSI’ have brought computer forensics to the forefront of public awareness in recent times, digital investigations have long been necessary and crucial functions for both law enforcement and commercial organizations. In fact, there are few areas of crime or dispute where computer forensics cannot be applied. Law enforcement agencies were amongst the earliest adopters of computer forensics and have used it to solve crimes such as murder, pedophilia and drug trafficking. Commercial organisations have also started to use computer forensics to their benefit in a variety of cases such as post cyber-attack investigations, intellectual property theft, employment disputes, fraud investigations, inappropriate email and internet use, as well as regulatory compliance.

Individuals studying this unit will learn the skills required to conduct investigations on a variety of digital devices in adherence to industry recognized guidelines and frameworks. Learners will build and draw upon technical, analytical and evaluation skills in all areas of digital forensic investigation. Through theory and practice, students will learn about the tools and techniques as well as the legal, ethical and professional issues surrounding computer forensic investigations.

This unit provides a solid foundation for anyone wishing to learn the fundamentals of computer forensics. It prepares students for what to expect in the real world and gives them the knowledge needed to assist with or conduct computer forensic investigations on their own.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the principles of computer forensic analysis and discuss where and how these principles should be applied.*
2. *Identify areas within digital devices that may hold data of evidentiary value and how that data should be recovered.*
3. *Use computer forensic tools to conduct a digital investigation.*
4. *Describe the legal and procedural issues and the documentary and evidentiary standards expected in presenting investigative findings in a court of law.*
5. *Present computer forensic investigative findings to technical and non-technical audiences.*

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Project

Unit level (MQF): 5

Credits : 6

Unit Description

The rise and evolution of network technology and the internet has made significant changes and improvements to the world around us. Individuals, businesses and countries have benefited greatly through global dissemination of information, growth of electronic commerce, and business innovation through collaboration.

Recent technology trends and the rapid and significant developments in mobility and cloud computing have all played a major role in promoting and enhancing growth in global economies. Whilst this growth and the benefits derived from it have been welcomed they have compounded to a growing shortage of highly skilled employees with the necessary skillsets to work within the industry.

The primary aim of the MCAST Higher Diploma in Network Design and Implementation is to provide participants with a comprehensive range of knowledge and practical skills in designing, building and maintaining computer network infrastructures.

The structure of the award and the inclusion of units particularly in the areas of Virtualisation, cloud computing, network security and intrusion prevention will ensure the award is well placed to address the growing demand for the aforementioned skillsets.

The purpose of this unit is to allow students to demonstrate the practical and technical skills they have acquired whilst studying on the diploma.

The unit should help students to consolidate their learning of network design, implementation and maintenance and should help students considering a career in IT with a particular emphasis on networks gain successful employment or progression to studies at a higher level.

Students should be encouraged to choose a project in an area of their own specific interest derived from the course. The chosen project should however allow the students to demonstrate their competence in the field of network design and should reflect the other units they have learnt on the course namely, installation and configuration of computer platforms, management of databases and Content

Management Systems, Virtualisation/Cloud computing and Wider Area Networks, and network security.

Learning Outcomes

On completion of this unit the student will be able to

1. *Analyse a networking project assignment brief and develop a solution to meet a given specification.*
2. *Plan and organize a technical solution that meets the given specification.*
3. *Implement the chosen solution in phases through to project completion.*
4. *Reflect and evaluate the success of the implemented solution against the given specification.*

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Multimedia Networks

Unit level (MQF): 6

Credits: 6

Unit Description

Today's networks have changed significantly from those of the past. Whereas, traditionally, computer networks only dealt with simple data, today's networks are being used in a converged way to transport data, voice and video.

The requirements of multimedia applications are significantly different from other applications. Traditional parameters that were allowed in traditional networks such as latency and delay are significantly less tolerated in multimedia networks.

The aim of this unit is to provide learners with a thorough understanding of how multimedia content is prepared for transmission over a computer network. Learners will also be exposed to the technical challenges pertaining to the implementation of IP PBX and video streaming services. Implementation strategies for enterprise and service providers shall be considered.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain how multimedia content is prepared for transmission over a computer network.*
2. *Examine protocols used in multimedia networks.*
3. *Assess the impact of quality of service implementation in multimedia networks.*
4. *Plan and deploy multimedia services over a network.*

Software Defined Networks

Unit level (MQF): 6

Credits: 6

Unit Description

Software has enabled the customisation of devices that previously had a fixed configuration set at manufacturing stage. Through software, the operation of a device can evolve during its use to cater for the operational requirements.

The Open Networking Foundation (ONF) defines a Software-Defined Network (SDN) as “*the physical separation of the network control plane from the forwarding plane, and where a control plane controls several devices*”. This enables an organisation’s network architecture to be more responsive to its needs by having direct programmatic control over the operation of the network.

This unit delves into the detail of OpenFlow – the core SDN protocol. Learners shall be exposed to the technical details of this protocol along with the interaction between network devices and the controller.

The focus of this unit is on the practical aspects of SDN. For this reason, various real-world case studies shall be explored. Practical exercises using virtual environments and controllers are core elements.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the fundamentals of software-defined networks.*
2. *Describe the operation of the OpenFlow protocol.*
3. *Implement a software-defined network.*
4. *Analyse a software-defined network implementation.*

Linux Server Administration

Unit level (MQF): 6

Credits: 6

Unit Description

The purpose of this unit is to cover the skills required in order to perform system administration tasks on a Linux Server. The unit assumes that students are already familiar with basic Linux Server administration tasks such as creating files and folders, manipulating and editing files, changing file permissions, creating users and groups and managing processes using a Linux shell such as sh or bash.

This unit covers the deployment, configuration and management of the most widely used services that a student will encounter in a Linux Server environment. The unit is based on the exam objectives set by the Linux Professional Institute for the certifications of LPIC-1, LPIC-2 and LPIC-3. It is up to the lecturer to decide which Linux Server distribution to use to cover the learning outcomes of this unit. Typical Linux distributions used in industry include Ubuntu Server, Red Hat Enterprise, SUSE Linux Server or CentOS.

The unit will start by covering the basic tasks of installing and managing a Linux Server and will then move to more advanced features such as web services and network directory infrastructures. Most of the theoretical aspects of the services covered in this unit have already been covered at Level 5 and the unit is designed so as to have a significant element of hands-on lab-oriented activities.

Learning Outcomes

On completion of this unit the student will be able to

1. *Plan and deploy a Linux Server.*
2. *Deploy, manage and monitor essential system services.*
3. *Implement server security and network security services.*
4. *Monitor and integrate Linux Servers in a mixed server environment.*

Wide Area Networks II

Unit level (MQF): 6

Credits: 6

Unit Description

The purpose of this unit is to provide learners with an in-depth knowledge and understanding of WAN technologies, by being exposed to underlying principles and best practices typically implemented in real-life setups.

This unit is a continuation from the previous unit “WAN”, where students should have already attained a level of understanding on the fundamentals of WAN technologies typically implemented by Internet Service Providers.

The first part of this unit will be specifically focused on layer 2 and layer 3 protocols with relevance to the OSI model, implemented in WAN setups. Some of the protocols which shall be covered are: PPP, HDLC and Frame Relay for layer2, BGP and Layer 3 MPLS for Layer 3.

Moreover, learners will also start to familiarise themselves with common WAN best practices, which are currently being applied in the IT industry; particularly DUAL WAN setups, VPNs, Firewalls and Intrusion Prevention Systems.

After having covered these deliverables, the last part of the unit will be specifically focused on the monitoring aspect, which is in-line to what organisations typically implement to give them detailed analysis of how their WAN link is being utilized.

In order to fulfil these deliverables, learners are expected to familiarise themselves with actual physical equipment and specific software to offer a simulated testing environment for adequate hands-on experience.

Learning Outcomes

On completion of this unit the student will be able to

1. *Understand and apply in practice, layer 2 and layer 3 protocols typically implemented in WANs.*
2. *Implement and configure Dual WAN Setups.*
3. *Implement and configure Virtual Private Networks (VPNs).*
4. *Implement security best practices by adhering to firewalling techniques and Intrusion Prevention Systems.*
5. *Monitor WAN traffic utilization via network monitoring tools.*

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Cloud Infrastructures

Unit level (MQF): 6

Credits: 6

Unit Description

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

–The NIST Definition of Cloud Computing,
National Institute of Standards and Technology

More and more organisations are deciding to deploy services to a cloud service rather than hosting themselves due to the flexibility and benefits provided. The aim of this unit is to introduce learners to the enterprise features provided by cloud service providers such as AWS, Azure and Google.

Since this unit is targeted to learners studying computer systems and networks, its focus will be on the infrastructure side of cloud computing. Hence learners will be exploring various hardware and software elements that are important to support the computing requirements of a cloud based computing approach. Furthermore This includes deployment of virtual machine instances, network configuration, high-availability and security.

Special focus on cost considerations will be made. This is extremely important in view of the complex pricing structures used by cloud service providers. Deployment of cloud based services using a private cloud shall also be considered. This includes technical analysis of the underlying infrastructure required to deploy such services.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the concepts of cloud computing.*
2. *Use compute and storage services in the cloud.*
3. *Apply the appropriate measures to secure services deployed in the cloud.*
4. *Design and implement advanced cloud services.*

IT Project

Unit level (MQF): 6

Credits: 6

Unit Description

In this unit, students will be studying the research methods which may be applied to the results and discussions section in their thesis. They will be guided in the development of conclusions and inferring patterns from their results, and will learn how best to interpret and explain data gathered as part of their research. This module is intended to help students working on their final year projects and the practical assessments will be based in part on their project work.

Learning Outcomes

On completion of this unit the student will be able to

1. *Define research scope.*
2. *Identify the correct approach for a given research problem.*
3. *Explain different research methodologies.*
4. *Present information and conclusions effectively.*

Content Management Systems

Unit level (MQF): 6

Credits: 6

Unit Description

When learning how to program students typically write short programs all by themselves. This contrasts with the reality of most workplaces which require employees to work in teams on larger projects. A content management system supports a number of users working in an environment that promotes synergies for people to achieve their goals. Enterprise-level software is more complex and typically requires a future-proof architecture that keeps maintainability and extendibility manageable.

The unit starts by exploring the anatomy of a Content Management system; a system that has stood the test of time. Furthermore it considers how its design maintains the delicate balance between simplifying extendibility and keeping conflicts and bugs in check.

Next, learners can explore how this architecture can be extended through the creation of themes, plugins, and REST API applications.

Themes allow the programmer to modify the look and feel of the software. While it focuses on design, other development considerations such as responsiveness, and support for different layouts come into play.

Plugins, on the other hand, allow the developer to extend the functionality of the application via self-contained modules that can easily be activated or deactivated by a website administrator.

Finally REST API application development allows one to write and integrate external applications that can have their own independent architecture and that can be written using an entirely different programming language. Although the unit is software intensive, it also covers administration topics such as authentication and authorization, configuration, and module management.

Learning Outcomes

On completion of this unit the student will be able to

1. *Identify the features and functionality of an extendible content management system.*
2. *Activate and customise a versatile and responsive theme that supports multiple layouts.*
3. *Install and set up several plugins including ones that incorporate settings and short-codes.*
4. *Integrate an external application capable of communicating with the content management system through a REST API.*

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