Pearson Higher Nationals in

Computing

SCHEME OF WORK

UNIT 1: Programming

For use with the Higher National Certificate and
Higher National Diploma in Computing

First teaching from September 2017

Issue 1

Please note that Schemes of Work are for guidance and support only.

They can be customised and amended according to localised needs and requirements.
All schemes of work can be adapted to suit specific establishment time frames in line with GLH delivery.

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Programme Title:	Higher Nationals in Computing	**Level:**	4
Unit Title:	Programming	**Tutor:**	
Unit Number:	1	**Academic Year:**	

Learning Outcomes (LO)	Assessment 1	Assessment 2	Assessment 3	Assessment 4
Define basic algorithms to carry out an operation and outline the process of programming an application.	☐	☐	☐	☐
Explain the characteristics of procedural, object-orientated and event-driven programming, conduct an analysis of a suitable Integrated Development Environment (IDE).	☐	☐	☐	☐
Implement basic algorithms in code using an IDE.	☐	☐	☐	☐
Determine the debugging process and explain the importance of a coding standard.	☐	☐	☐	☐

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Sessions	Learning Outcome(s)	Session Activities

Session 1	LO1
	Topic:
	Introduction to the unit's content and the unit assessment
		An introduction to algorithms; what is an algorithm? Defining an algorithm; purpose and structure and the outline of a program.
		
		Sample activities:
		• Present a series of problems and the steps to solve them via brute force and then with an algorithm, such as searching through records.
		• An overview – programming is:
		  ○ the analysis of the scenario/problem
		  ○ defining a specification
		  ○ identifying input, process and output testing/debugging.

Session 2	LO1
	Topic: Examining algorithms
		A look at the most common algorithms and their application.
		
		Sample activities:
		• Examine a range of algorithms for various purposes including:
		  ○ sorting algorithms
		  ○ encryption/decryption.
		• Analysing efficiency: their performance against brute force.
		• Cost of running time, acknowledging hardware performance as a factor.

Session 3	LO1 & 2 Topic: Implementation of algorithms	A look at the code implementation of common algorithms. Sample activities: • Examination of the structure of a program: input, process and output. • Identifying methods, variables, constants, scope, relating to an algorithm implementation. Assignment 1 set.

Sessions	Learning Outcome(s)	Session Activities
Session 4	LO1 & 2 Topic: Assignment workshop	Addressing issues and concerns with the assignment. Sample activities: • An overview of assessment requirements. Question and answer session regarding assignment.
Session 5	LO2 Topic: Introduction to the procedural programming paradigm	Analysing the characteristics of procedural programming. Sample activities: • Identify what procedural programming is. • Overview of the process of procedural development. • Recognise the characteristics. An examination of a program implementation.
Session 6	LO2 Topic: Introduction to the object-orientated programming paradigm	Identification of the characteristics of object-orientated programming (OOP). Sample activities: • Identify what OOP is. • Building on the procedural programming paradigm. • Definition of an object.
Session 7	LO2 Topic: Identifying characteristics of object-orientated programming	Analysing the characteristics of object-orientated programming. Sample activities: • Class definition and its make up. • Class and object association.
Session 8	LO2 Topic: Object-orientated programming paradigm implementation	Analysing practical implementation of object-orientated programming. Sample activities: • An examination of an implementation of a program. • Identifying object class relationship. • Overview of the process of OOP development.
Session 9	LO2 Topic: Introduction to the event driven programming paradigm	Identification of the characteristics of event driven programming. Sample activities: • Identify what event driven programming is. • Building on the previous programming paradigms.

Sessions	Learning Outcome(s)	Session Activities
Session 10	LO2 Topic: Identifying characteristics of event driven programming	Analysing the characteristics of event driven programming. Sample activities: • Examination of what makes an event driven program. • Typical events encountered; timers, input etc. • Event listeners, triggers.
Session 11	LO2 Topic: A summary of the programming paradigms	A look at the relationships between the programming paradigms. Sample activities: • Discuss the relationship between the programming paradigms, how they complement each other. • Review a range of applications that would be best suited for developing in each/or multiple programming paradigms.
Session 12	LO2 & 3 Topic: What is an IDE?	A look at the various components of an IDE, the editor, file manager and compiler. Sample activities: • Setup and installation of an IDE. • User configuration of an IDE (fonts, shortcuts, etc.).
Session 13	LO2 & 3 Topic: The IDE continued	A look at the debugger, performance analyser, version control. Sample activities: • Examine a typical IDE project structure; source code and binaries, file structure layout. • Build a test application (Hello World!) to utilise the components of an IDE. • Assignment 2 set.
Session 14	LO3 Topic: Assignment workshop	Addressing issues and concerns with assignment. Sample activities: • An overview of assessment requirements • Question and answer session regarding assignment.
Session 15	LO3 Topic: Implementing algorithms (part 1)	An overview of the implementation process. Sample activities: • Setup of a project with version control. • Use the IDE to develop an application.

Sessions	Learning Outcome(s)	Session Activities
Session 16	LO3 Topic: Implementing algorithms (part 2)	The implementation process continued, assignment workshop. Sample activities: • Work on the assignment. • Use of best practice.
Session 17	LO3 Topic: Application development	Implement an application using algorithms for a specified purpose, assignment workshop. Sample activities: • Continue development of application. • Use of best practice.
Session 18	LO4 Topic: Evaluating the debugging process	Internal testing and debugging an application using the IDE. Sample activities: • Use the features in the IDE to test and debug. • Identify features of the IDE that help with documentation and maintain a coding standard.
Session 19	LO3 & 4 Topic: Application development	Working to the specification. Sample activities: • Adapting development of application according testing process.
Session 20	LO3 & 4 Topic: Assignment review workshop	Final submission of reports with code projects. Sample activities: • Conduct a review of the work to be submitted.

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SCHEME OF WORK

UNIT 2: Networking

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SCHEME OF WORK

Programme Title:	Higher Nationals in Computing	**Level:**	4
Unit Title:	Networking	**Tutor:**	
Unit Number:	2	**Academic Year:**	

Learning Outcomes (LO)	Assessment 1	Assessment 2	Assessment 3	Assessment 4
Examine networking principles and their protocols.	☐	☐	☐	☐
Explain networking devices and operations.	☐	☐	☐	☐
Design efficient networked systems.	☐	☐	☐	☐
Implement and diagnose networked systems.	☐	☐	☐	☐

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Sessions	Learning Outcome(s)	Session Activities
Session 1	LO1 Topic: Role of networks	Introduction to the unit contents, assessment types, the significance of networking in communication technologies. Sample activities: • Discuss the benefits and constraints of different network types and standards. • Investigate the purpose, resource implications, communications, working practice, commercial opportunity, information sharing and collaboration.
Session 2	LO1 Topic: System types	Analyse system types looking at real world scenario and networking types. Sample activities: • Discuss and study different system types. • Study the system types of peer based, client-server, cloud, cluster, centralised, virtualised.
Session 3	LO1 Topic: Networking topology	Understand networking topology and explore the size of a required network. Sample activities: • Investigate logical topology (e.g. Ethernet, Token Ring). • Investigate physical topology (e.g. star, ring, bus, mesh, tree, ring). • Explain the impact of network topology, communication and bandwidth requirements.
Session 4	LO1 Topic: Networking standards	Overview of OSI networking standards and explore the functionalities of different layers. Sample activities: • Explore and analyse conceptual models (e.g. OSI model, TCP/IP model), standards (e.g. IEEE 802.x). • Gain knowledge on 7-layer OSI reference model.

Sessions	Learning Outcome(s)	Session Activities
Session 5	LO2 Topic: Networking devices	Understand networking devices, their functionalities and selection decisions for network design. Sample activities: • Investigate networking devices and equipment. • Explore through servers; hub, routers; switches; multilayer switch, firewall, HIDS, repeaters; bridges; wireless devices; access point (wireless/wired), content filter, load balancer, modem, packet shaper, VPN concentrator. • Discuss and explore the operating principles of networking devices and server types.
Session 6	LO2 Topic: Networking software	Networking software requirements, interfacing with hardware and design requirements. Sample activities: • Explore through client software, server software, client operating system, server operating system, firewall. • Investigate hardware (e.g. network card, cabling), permissions, system bus, local-system architecture (e.g. memory, processor, I/O devices).
Session 7	LO2 Topic: Workstation, server selection	Server selection related to cost, performance and network size. Sample activities: • Develop a case study as a role play for a small organisation. • Discuss cost, purpose, operating system requirement. • Explore a range of server types and select server types and networking equipment required. • Justify the selection of a server regarding cost and performance optimisation.
Session 8	LO1 & 2 Topic: Review and preparation for assessment tutorial	Overview of learning covered in the first half of the unit, prepare report for assessment, formal written assignment covering LO1 and LO2. Sample activities: • Review requirements for assessment. • Consider the assessment requirements, review progress, plan for completion of assessment.

Sessions	Learning Outcome(s)	Session Activities
Session 9	LO3 Topic: User requirements	The significance of user requirements for quality system development. Sample activities: • Discuss quality expectations and the concept of system growth. • Produce a test plan for the selected case study. • Test and evaluate the design to meet the requirements. • Discuss and analyse user feedback requirements for continuous system improvement.
Session 10	LO3 Topic: Bandwidth	Understand bandwidth requirements and impact on network load. Sample activities: • Investigate bandwidth requirements, cost constraints and throughput. • Group work: Plan and design an observation form to investigate network load to investigate average and peak load. • Record average load and anticipated peak load with access to different networking labs if possible.
Session 11	LO3 & 2 Topic: Networking system communication	Plan and design a network system with a developed case study and analyse if it is fit for purpose. Sample activities: • Design a networked system to meet a given specification for the case study selected. • Investigate: Suited to devices, suited to users, supportive of lifestyle desires, supportive of commercial requirements. • Justify the security requirements and quality of service needs.
Session 12	LO3 Topic: Networking services and application	Understand IP addressing and domain name servers. Sample activities: • DHCP, static versus dynamic IP addressing, reservations, scopes, leases, options (DNS servers, suffixes), IP helper, DHCP relay, DNS records, Dynamic DNS. • Install and configure network services and applications.

Sessions	Learning Outcome(s)	Session Activities
Session 13	LO3 Topic: Scalable	Understand system scalability of enhancements and options for improvement. Sample activities: • Investigate what functionalities would allow a system to support device growth, support the addition of communication devices. • Discuss how to cope with bandwidth use and trend changes, protocol utilisation, addressing.
Session 14	LO3 Topic: Selection of components	Analytic factors for selection of networking components and their impacts. Sample activities: • Investigate supporting infrastructure needs. • Analyse supporting connectivity requirements.
Session 15	LO4 Topic: Networking devices	Understand installation of communication devices, allocation of addresses, local client configuration, server configuration and server installation. Sample activities: • Implement a networked system related to the design prepared in the LO1 and LO2 assessment.
Session 16	LO4 Topic: Verification of configuration and connectivity	Overview of connectivity verification methods. Sample activities: • Installation of internet work communication medium. • Conduct verification with (e.g. Ping, extended Ping, traceroute, telnet, SSH). • Record and evaluate Ping results as successful/unsuccessful.
Session 17	LO4 Topic: maintenance schedule	Plan and manage a maintenance schedule. Sample activities: • List steps for backup and restore depending on the network and operating systems you are using and upgrades. • Discuss the significance of upgrades and security requirements.

Sessions	Learning Outcome(s)	Session Activities
Session 18	LO4 Topic: Diagnose and resolve layer 1 problems	Document and analyse test outcomes against expected results. Sample activities: • Discuss the test techniques for framing, CRC, Runts and Giants. • Investigate dropped packets, late collisions and Input/Output errors.
Session 19	LO4 Topic: Systems monitoring	Plan systems monitoring and future enhancement directions. Sample activities: • Recommend potential enhancements for the networked system. • Utilisation, bandwidth needs, monitoring user productivity.
Session 20	LO3 & 4 Topic: Review and preparation for assessment tutorial	Overview of learning covered in the second half of the unit and collate the information (e.g. observation records, test results, design specification for assessment). Sample activities: • Review requirements for collating output and test results. • Consider the assessment requirements, review progress in gathering examples and plan for completion of the assessment.