# Pre-Tech Apprenticeship Programme

*Providing skills sampling in Network Engineer, Software Development, Security, Project Management & Employability Skills in preparation for successful progression and participation on a Tech Apprenticeship.*



## *Programme Descriptor*

# 1.   INTRODUCTION

Apprenticeships are an exciting and proven way for employers to develop talent for their company and industry.  They pave the way to exciting and rewarding careers, with learning grounded in the practical experience of undertaking a real job.  Apprentices earn while they learn and build valuable work-ready skills in a chosen occupation.

Helping more people discover and develop their talents through training is at the heart of the national apprenticeship system. This Pre-Tech Apprenticeship programme is aimed at candidates who wish to pursue a Tech Apprenticeship but are unsure of which programme to choose or who may not currently satisfy the eligibility criteria.

There are currently three Tech Apprenticeships available namely **i) Network Engineer Apprenticeship ii) Software Developer Apprenticeship and iii) Cybersecurity.**

I)   **ICT Associate Professional Network Engineer Apprenticeship:** A network specialist designs, installs, maintains and supports communication networks within and between organisations. They understand network topologies, cloud services, network administration and monitoring tools and are able to give technical advice and guidance. Typical job titles for people with this skillset include: Network Engineer, Network Technician, Network Specialist, Systems Engineer, Network Administrator or Network Support.

II)   **ICT Associate Professional Software Developer:** A software developer, also known as a computer programmer, builds and tests high-quality code across front-end, logic and database layers. Developers typically work as part of a larger team, in which they have responsibility for some of the straightforward elements of the overall project. Software products, applications and services are widely used across many sectors and potentially, all sectors in a modern economy. Most ICT Associate Professional Software Developers will work in the ICT sector industries that research, develop, design, sell, install and maintain software products and services. However, a large number will work in other sectors which use, develop and apply software solutions to support their activity. Typical job roles include those of Web Developer, Application Developer, Mobile App Developer, Games Developer and Software Developer.

III)   **Cybersecurity Professionals:** are charged with keeping data safe. In a digital society where everything is connected, it is critical that apprentices understand how networks are created, the flow of data and how it can be kept secure.  Protecting data requires a knowledge of the threat landscape, tools and technologies to protect an organization, security architecture, managing identity, risk management and cryptography practices and implementation. All specialists in this occupation work to achieve required security outcomes in a legal and regulatory context in all parts of the economy. They develop and apply practical knowledge of information security to deliver solutions that fulfil organisational requirements. They understand network topologies, cloud services, network administration and monitoring tools. They are able to give technical advice and guidance. Typical job titles for people with this skillset include: Cloud Security Specialist, Penetration Tester, IT Security Engineer, Risk Analyst, Security Sales Engineer, Cybersecurity Specialist, Information / Cybersecurity Analyst, Associate Cybersecurity Support Engineer, Information Security Assurance & Threat Analyst, Forensics & Incident Response Analyst, Security Engineer, Information Security/Governance Officer, Security Administrator, Information Security Officer.

The Tech Apprenticeships are two-year programmes designed for those who have recently completed second level education or mature learners who are seeking to retrain. It is a dual-education programme involving both college-based and workplace learning. The college-based

learning is state-funded, and Apprentices receive a salary from their employer while on the programme. The programmes provide learners with the theoretical and practical skills required to secure and retain employment in tech related sectors as computer networking specialists or as software developers.

## 2. A Pre-Tech Apprenticeship Programme Option:

This course developed by FIT and with the Support of Salesforce is aimed at assisting candidates wishing to pursue a Tech Apprenticeship programme to determine their level of interest and suitability and to decide whether the Network Engineer Software Developer or Cybersecurity is their preferred Apprenticeship option by which to pursue a career in the tech sector. The programme is a composite of City & Guilds (C&G) modules, practical assignments combined with professional development, project management and employability skills. The C&G modules are constituent elements of technical qualifications that are comparable to level 5 major awards placed on the National Framework of Qualifications. Successful completion of each module will provide participants with greater insight of what is required to successfully complete a Tech Apprenticeship, inform them whether Network Engineer, Software Developer or Cybersecurity is their career of choice and finally prepare them to successfully complete an interview with a sponsoring tech employer. Sucessful completion of this Pre-Tech Apprenticeship Propgramme will fullfil the eligibilty criteria necessary to progress to a Tech Apprenticeship.

### 2.1 Modules & Certification

| # | Qualification | Module Level | Awarded by |
|---|---|---|---|
| | **Pre Tech Apprenticeship Programme in ICT Systems & Principles** *(incl. modules from C&G 7540-12/13)* | | |
| | | | |
| | **General Components:** | | |
| 1. | Creative Problem Solving (C&G Unit 388) | 5 | C&G |
| 2. | Personal & Professional Development | Overview | N/A |
| | | | |
| | **Networking Components:** | | |
| 3. | Introduction to Networks (C&G Unit 645) | 5 | C&G |
| 4. | Maintaining ICT Equipment and Systems (C&G Unit 328) | 5 | C&G |
| | | | |
| | **Software Development Components:** | | |
| 5. | Software Development Fundamentals (C&G Unit 620) | 4 | C&G |
| 6. | Software Testing (C&G Unit 043) | 5 | C&G |
| 7. | Principles of ICT Systems & Data Security (C&G Unit 011) | Overview | N/A |
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| | **Workplace Readiness:** | | |
| 8. | Preparation for Work / Employability Skills | FIT | N/A |
| 9. | Career Guidance & Assessment | FIT | N/A |
| 10. | Appreciation of Project Management | Overview | N/A |

## 3. Entry Requirements:

**Minimum entry requirements are as follows.**
Applicants:
- Must have a Junior Cert or equivalent.

**Skills and Attributes.**

Applicants:

- Must be numerate and literate, with good learning skills.
- Demonstrate interest in technology and customer service.
- Be motivated and enthusiastic.
- Possess good communication skills, pleasant personality, be determined to succeed and good interpersonal skills.
- Be a team player, adaptable and flexible.

## 4.    Course Duration

**20 Weeks**

## 5.    Pre-Tech Apprenticeship - Syllabus

| # | Qualification | Module Level | Awarded by | Assessment |
|---|---|---|---|---|
| | **Pre Tech Apprenticeship in ICT Systems & Principles** *(incl. modules from    C&G 7540-12/13)* | | | |
| | | | | |
| | **General Components:** | | | |
| 1. | **Creative Problem Solving (C&G Unit 388)** | *5* | *C&G* | *Assignment* |
| | **Aim: The aim of this unit is to enable learners to understand the process of analysing a problem and providing a solution. Learners will develop the skills to write a problem statement, generate, select and evaluate possible solutions and plan for successful implementation** | | | |
| | **Learning outcome 1 The learner will:** 1. Be able to identify and analyse a problem **Assessment criteria.  The learner can:** 1.1 Select and use a technique to obtain information on a problem 1.2 Provide solution criteria 1.3 Create a problem statement 1.4 Create an impact statement using time, cost, personnel issues 1.5 Select and use analysis techniques to look at causes and potential solutions to problems 1.6 Compare the main features and risks of each possible solution 1.7 Use tools like BOSCARD to make clear what is required<br><br>**Learning outcome2. The learner will:** 2. Be able to plan, monitor and evaluate an implementation/a problem solution **Assessment criteria. The learner can:** 2.1 Identify the steps to solve the problem using their preferred solution 2.2 Use diagrammatic representations or charts to plan the solution implementation 2.3 Present the solution to a line manager or experienced person 2.4 Collect data around the problem 2.5 Analyse data collected using established methodologies | | | |

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| | | 2.6 Monitor and evaluate progress as the implementation progresses<br>2.7 Plan tasks in a chronological and logical order<br>2.8 Justify the solution to the decision maker<br>2.9 Log results in a systematic and consistent manner<br><br>**Learning outcome 3 The learner will:**<br>3. Review their approach to problem solving and the proposed problem solution<br>**Assessment criteria. The learner can:**<br>3.1 Check if the problem has been solved by gathering and comparing data to benchmarked data<br>3.2 Assess whether the solution met the original criteria for the problem to be deemed solved<br>3.3 Create a logical and easily understood document / presentation showing the results and the degree of success in solving the problem<br>3.4 Create a summary of lessons learned to apply to the next problem<br>3.5 Create a summary of lessons learned for the solution, concerning the approach used in the problem solving process<br>3.6 Run a review session | | | |
| 2. | | **Personal & Professional Development** | *Overview* | *N/A* | *N/A* |
| | | Aim: The purpose of this unit is to provide learners with an understanding of the different methods and resources available to them to help them plan for their personal and professional development. They will learn how to identify factors that may affect targets or goals, prioritise actions and how feedback from others can be utilised to aid their development and career progression. They will be able to develop a plan which can either be used during progress of a course of study or as a tool for their future/current career path. | | | |
| | | **Learning outcome 1. The learner will:**<br>1. Understand how to plan for personal and professional development<br>**Assessment criteria. The learner can:**<br>1.1 Describe the benefits of personal and professional development<br>1.2 Identify development opportunities for career and personal progression<br>1.3 Analyse development opportunities that may support career and personal progression<br><br>**Range.**<br>**Personal benefits:**<br>Update skills, gain new skills, increase motivation, confidence<br>**Professional benefits:**<br>Career progression, meeting organisation goals, how role fits into organisation<br>Check if the problem has been solved by gathering and comparing data to benchmarked data<br>3.3 Create a logical and easily understood document / presentation showing the results and the degree of success in solving the problem | | | |

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| | 3.4 Create a summary of lessons learned to apply to the next problem<br>3.5 Create a summary of lessons learned for the solution, concerning the approach used in the problem solving process<br>3.6 Run a review session | | | |
| | **Networking Components:** | | | |
| **3.** | **Introduction to Networks (C&G Unit 645)** | *5* | *C&G* | *Portfolio* |
| | **This unit introduces learners to the architecture, structure, functions, components, and models of the Internet and other computer networks. It covers the principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations. Successful completion of the unit would enable learners to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.**<br>**This unit includes content from Cisco CCNA Routing and Switching curriculum. In particular, the content is relevant to the Introduction to Networks course.** | | | |
| | **Learning outcome 1. The learner will:**<br>1. Understand networking within business.<br>**Assessment criteria. The learner can:**<br>1.1 explain how multiple networks are used in everyday life<br>1.2 explain how rules are used to facilitate communication<br>1.3 explain trends in networking that will affect the use of networks<br>1.4 describe how a host computer builds a message and sends it to a destination.<br><br>**Learning outcome 2. The learner will:**<br>2. Understand how standardisation supports interoperable end-to-end communications.<br>**Assessment criteria. The learner can:**<br>2.1 explain the topologies used in a network<br>2.2 explain the devices used in a network<br>2.3 explain the characteristics of a network that supports communications<br>2.4 explain the role of protocols in facilitating interoperability in network communications<br>2.5 explain the role of standards organisations in facilitating interoperability in network communications.<br><br>**Learning outcome 3. The learner will:**<br>3. Understand the process by which devices access resources using the TCP/IP suite.<br>**Assessment criteria. The learner can:**<br>3.1 explain how devices on a Local Area Network (LAN) access resources<br>3.2 explain how the physical layer supports communication across data networks (protocols and services)<br>3.3 explain the role of the data link layer in supporting communication across data networks (protocols and services)<br>3.4 compare media access control techniques with logical topologies used in networks<br>3.5 explain the role of the Address Resolution Protocol (ARP) in supporting network connectivity | | | |

3.6 explain the operation of Ethernet at the network access layer of TCP/IP within a LAN
3.7 explain how the network layer supports communication across data networks
3.8 explain how the transport layer supports communication across data networks
3.9 compare the operations of transport layer protocols in supporting end-to-end communication
3.10 explain the operation of the application layer in providing support to end-user applications
3.11 describe the features of the application layer
3.12 describe the operation of the application layer
3.13 describe the use of the application layer.

**Range:**
**network layer** (protocols and services)
**transport layer** (protocols and services)
**application layer** (protocols and services)

**Learning outcome 4. The learner will:**
4. Be able to design an IP addressing scheme to provide network connectivity.
**Assessment criteria. The learner can:**
4.1 explain the use of IPv4 addresses to provide connectivity
4.2 calculate IPv4 addresses to enable end-to-end connectivity
4.3 design an IP addressing scheme to provide connectivity to end users
4.4 explain the use of IPv6 addresses to provide connectivity
4.5 explain design considerations for implementing IPv6.

**Range**
 **IPv4 addresses** (network, host, broadcast)

**Learning outcome 5. The learner will:**
5. Be able to implement network connectivity between devices.
**Assessment criteria. The learner can:**
5.1 connect network devices with media
5.2 configure IP address parameters on devices to provide end-to-end connectivity
5.3 explain how a network of directly connected segments is configured
5.4 explain how a network of directly connected segments is verified
5.5 configure wireless on an integrated router
5.6 use testing utilities to test network connectivity.

**Learning outcome 6. The learner will:**
6. Be able to configure network access.
Assessment criteria
The learner can:
6.1 determine the devices required to route traffic
6.2 explain how routers enable end-to-end connectivity
6.3 configure a router
6.4 explain how switches in enable end-to-end connectivity
6.5 implement LAN switching to enable end-to-end connectivity
6.6 use show commands to establish a relative performance

baseline for the network.

**Learning outcome 7. The learner will:**
7. Be able to configure initial Inter Network Operating System (IOS) device settings.
Assessment criteria
The learner can:
7.1 explain features of IOS software
7.2 explain functions of IOS software
7.3 configure initial setting on a network using IOS software
7.4 configure connectivity devices with device hardening features to enhance security
7.5 manage IOS configuration files to ensure device operation.

| 4. | **Maintaining ICT Equipment and Systems (C&G Unit 328)** | *5* | *C&G* | *Assignment* |
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|    | **Aim: This unit will enable the candidate to maintain ICT networks and multi-user systems.** | | | |
|    | **Learning outcome 1. The learner will:**<br>1. Identify types of system maintenance<br>**Assessment criteria. The learner can:**<br>1.1 prepare a system maintenance plan for peer to peer and client server<br>1.2 identify types of system maintenance<br>1.3 describe the properties of different types of maintenance<br>1.4 describe the key activities in each type of maintenance and their benefits<br>1.5 describe types of remote maintenance<br>1.6 describe the importance of negotiating system priorities and availability with customers.<br><br>**Learning outcome 2. The learner will:**<br>2. Collect information on technical problems with ICT systems<br>**Assessment criteria. The learner can:**<br>2.1 obtain information to resolve technical problems with ICT systems<br>2.2 select and justify the test to be undertaken for a given problem, ensuring the tests are applied correctly<br>2.3 create and maintain operational records<br>2.4 describe the information needed to resolve technical problems with ICT systems<br>2.5 identify the most common types of technical problems that could occur in ICT systems<br>2.6 identify the most common routine maintenance procedures.<br><br>**Learning outcome 3. The learner will:**<br>3. Evaluate technical problems and implement solutions<br>**Assessment criteria. The learner can:**<br>3.1 apply preventative maintenance using the recommended procedures, materials and parts<br>3.2 maintain different types of hardware<br>3.3 maintain function of hardware by applying software fixes<br>3.4 check the equipment to confirm that the preventative maintenance procedures have been carried out successfully<br>3.5 produce a report of problems encountered while carrying out preventative maintenance | | | |

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| | | 3.6 maintain preventative maintenance records. | | | |
| | **Software Development Components:** | | | | |
| 5. | **Software Development Fundamentals (C&G Unit 620)** | *4* | *C&G* | *Assignment* |
| | **Aim: This unit has been designed to help a learner build an understanding of these topics: Core Programming, Object-Oriented Programming, General Software Development, Web Applications, Desktop Applications, and Databases.** **Learners are expected to be able to demonstrate this understanding, so that on successful completion of this unit they will be able to:** | | | | |

**Aim: This unit has been designed to help a learner build an understanding of these topics: Core Programming, Object-Oriented Programming, General Software Development, Web Applications, Desktop Applications, and Databases.**
**Learners are expected to be able to demonstrate this understanding, so that on successful completion of this unit they will be able to:**
- **understand core programming**
- **understand object-oriented programming**
- **understand general software development**
- **understand web applications**
- **understand desktop applications**
- **understand databases**

**This unit is linked to the Microsoft Official Academic Course (MOAC) and Exam for the Microsoft Technical Associate (MTA) Software Development Fundamentals.**

**Learning outcome 1. The learner will:**
1. Know the fundamentals of core programming.
**Assessment criteria. The learner can:**
1.1 describe how information is stored in computer memory
1.2 describe memory size requirements for data storage types
1.3 describe computer decision structures
1.4 identify methods for handling repetition
1.5 describe how errors are handled.

**Range:**
**decision structures** (IF, multiple, decision tables, evaluating expressions, flowcharts)
**methods for handling repetition (**For loops, While loops, Do. While loops, recursion)

**Learning outcome 2. The learner will:**
2. Know what is involved in object orientated programming.
**Assessment criteria. The learner can:**
2.1 describe the fundamentals of classes
2.2 describe how to create a class
2.3 describe how to use classes in code
2.4 describe the concepts of object-oriented programming (inheritance, polymorphism, encapsulation).

**Range**
**fundamentals of classes** (properties, methods, events, constructors)

**Learning outcome 3. The learner will:**
3. Know requirements for software development.
**Assessment criteria. The learner can:**
3.1 describe phases of application lifecycle management
3.2 interpret application specifications
3.3 identify algorithms (arrays, stacks, queues, linked lists,

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| | sorting)<br>3.4 describe performance implications of data structures<br>3.5 select a data structure to meet requirements.<br><br>**Learning outcome 4. The learner will**:<br>4. Know requirements for web application development.<br>**Assessment criteria. The learner can:**<br>4.1 identify functions of web technologies<br>4.2 describe web application development<br>4.3 describe how to host webpages<br>4.4 describe how to access web services from client applications<br>4.5 describe the implementation of Web services (SOAP, Web Service Definition Language (WSDL)).<br><br>**Range**<br>**web technologies** (HTML, CSS, JavaScript)<br>**web application development** (page life cycle, event model, state management, client-side vs server-side programming)<br>**host webpages** (virtual directories, Web server)<br><br>**Learning outcome 5. The learner will:**<br>5. Know the requirements to create desktop applications.<br>**Assessment criteria. The learner can:**<br>5.1 describe how to create desktop applications (SDI, MDI, UI design, visual inheritance)<br>5.2 describe console based applications<br>5.3 describe windows based system services.<br><br>**Range**<br>**console based applications** (capabilities, characteristics)<br>**windows based system services** (capabilities, characteristics<br><br>**Learning outcome 6. The learner will:**<br>6. Know how to store and use data.<br>**Assessment criteria. The learner can:**<br>6.1 describe relational database management systems<br>6.2 describe database query methods<br>6.3 describe methods to connect to data stores.<br><br>**Range**<br>**relational database management systems** (capabilities, characteristics, design, ERDs, normalisation)<br>**query methods** (SQL, creating and accessing stored procedures)<br>**data stores** (flat file, XML, in-memory object)<br><br>**Learning outcome 7. The learner will:**<br>7. Be able to create applications and store data.<br>**Assessment criteria. The learner can:**<br>7.1 create a program<br>7.2 create an object oriented program<br>7.3 create a web based application<br>7.4 create a desktop based application<br>7.5 create a database. | | | |
| **6.** | **Software Testing (C&G Unit 043)** | 5 | C&G | Assignment |

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| | **Aim: This unit introduces the basics of testing strategies and techniques and their application.** | | | |
| | **Learning outcome 1. The learner will:**<br>1. Understanding testing strategies and techniques<br>Assessment criteria<br>The learner can:<br>1.1 Explain the purpose and scope of unit, integration and system testing of software<br>1.2 Describe the stages of system testing including alpha, beta, and acceptance testing<br>1.3 Describe how automation can be applied to software testing<br>1.4 Describe and differentiate functional (black box) and structural (white box) testing.<br><br>**Learning outcome 2. The learner will:**<br>2. Manage a test process for a software solution<br>Assessment criteria<br>The learner can:<br>2.1 Develop a test plan including:<br>   • test specification (including functional and structural techniques)<br>   • test cases<br>   • test data and expected results<br>   • resources and scheduling<br>   • recording and checking of results<br>   • evaluation<br>2.2 Implement a test plan<br>2.3 Produce a test report. | | | |
| 7. | **Principles of ICT Systems & Data Security (Unit 011)** | Overview | N/A | Assignment |
| | **Aim: This unit will introduce the principles required to understand data security; this is becoming ever important within industry.** | | | |
| | **Learning outcome 1. The learner will:**<br>1. Know the common types of threat to ICT systems and data<br>**Assessment criteria. The learner can:**<br>1.1 Identify common types of physical threats to ICT systems and data (hardware damage, loss and theft)<br>1.2 Identify common types of electronic threats to ICT systems and data (e.g. denial of service, data theft or damage, unauthorised use)<br>1.3 List the security vulnerabilities associated with remote access technologies (including wireless)<br>Range<br>1.1 Hardware threat should be investigated using real world scenario where possible<br>1.3 Should be investigated using simulation where possible<br>Learning outcome<br>**Learning outcome 2. The learner will:**<br>2. Know how to protect ICT systems<br><br>**Assessment criteria. The learner can:**<br>2.1 Identify methods of providing physical access control and security for ICT systems (locks, biometric controls, CCTV, shielding, fire detection and control) | | | |

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| | 2.2 State methods of providing electronic access control and security for ICT systems (firewalls, virtual networks, secure connection/transfer protocols, secure wireless connection)<br>2.3 Identify common types of malicious code:<br>• Virus<br>• Trojan<br>• Logic Bomb<br>• Worm<br>• Spyware<br>2.4 Identify the characteristics of strong passwords<br>Learning outcome<br><br>**Learning outcome 3. The learner will:**<br>3. Be aware of the applications of cryptography to ICT systems and data<br>**Assessment criteria. The learner can:**<br>3.1 State how cryptography can be applied to ICT system and data security<br>3.2 State how Public Key Infrastructure (PKI) operates<br>Range<br>3.1 Should be demonstrated if possible or referenced to real world scenarios | | | |
| | **Workplace Readiness:** | | | |
| 8. | **Preparation for Work / Employability Skills** | *FIT* | *N/A* | *N/A* |
| 9. | **Career Guidance & Assessment** | *FIT* | *N/A* | *N/A* |
| 10. | **Appreciation of Project Management** | *Overview* | *N/A* | *N/A* |
| | **Underpinning knowledge. The learner will understand the following concepts in project management:**<br><br>• **Initiating** – The process of outlining your project and obtaining proper approval to begin.<br>• **Planning** – The process of developing your project management plan to reach your project goals.<br>• **Executing –** The process of completing work as defined in your project management plan.<br>• **Monitoring and Controlling** – The process of reviewing and tracking the progress of predetermined work while accounting for unplanned changes.<br>• **Closing** – The process of completing the project work and receiving approval from the stakeholder. | | | |