



Training
QualificationsUK

Qualification Specification

TQUK Level 3 Certificate in AI Programming with Python (RQF)

Qualification Number: 610/0155/7

Version 5

Contents

Summary of changes	3
Introduction	4
Welcome to TQUK.....	4
Centre Recognition.....	4
Qualification Specifications.....	5
Use of TQUK Logo, Name and Qualifications.....	5
Introduction to the Qualification	6
Qualification Purpose	6
Entry Requirements.....	7
Progression.....	7
Structure	7
Guided Learning Hours.....	7
Directed study requirements	8
Total Qualification Time.....	8
Assessment	8
Centre Devised Assessment (CDA) Guidance	9
Course Delivery.....	9
Learner Registration.....	10
Tutor, Assessor and Internal Quality Assurer Requirements.....	10
External Quality Assurance	11
Useful Websites.....	11
Mandatory units	12
Introduction to Python	12
Understand libraries used for Python Programming	13
Introduction to version control using GitHub for Python	14
Linear Algebra Essentials for Deep Learning.....	15
Calculus Essentials for Deep Learning	16
Introduction to Deep Learning	17

Summary of changes

The following table provides a summary of the changes that have been made to the qualification specification since the publication of the previous version.

Version number	Summary of changes
Version 3	Rebranded
Version 4 – June 2024	<p>Page 16 – AC numbering corrected in assessment guidance</p> <p>Page 13 - New wording for AC 4.2</p> <p>Page 12 - Assessment guidance - built-in function's list should additions</p> <p>Page 13 - AC 1.3 "Miniconda" in place of "Anaconda"</p> <p>Page 14, assessment requirements, changes to wording</p> <p>Page 13 – 'magic keywords' changed to 'magic commands'</p> <p>Unit titles – 'neural networks' to become 'deep learning'</p> <p>Vocabulary – 'neural networks' to become 'deep learning'</p>
Version 5 – June 2024	<p>Page 12 – typo amended</p> <p>Page 16 – typo amended</p> <p>Page 17 – 3.1 wording change</p>

Introduction

Welcome to TQUK

Training Qualifications UK (TQUK) is an Awarding Organisation recognised by the Office of Qualifications and Examinations Regulation (Ofqual) in England and CCEA Regulation in Northern Ireland.

TQUK offers qualifications which are regulated by Ofqual and, in some cases, by CCEA Regulation. All regulated TQUK qualifications sit on the Regulated Qualifications Framework (RQF) and are listed on the [Register of Regulated Qualifications](#).

Our qualifications are designed to support and encourage learners to develop their knowledge and skills. This development may result in progression into employment or career development in the workplace. Our qualifications also allow learners to progress onto further qualifications. Please visit our [website](#) for news of our new and coming soon developments.

Centre Recognition

To offer a TQUK qualification, a centre must be recognised by TQUK.

The TQUK centre recognition process requires a centre to have in place a number of policies and procedures to protect the learners undertaking a TQUK qualification and the integrity of TQUK's qualifications. These policies and procedures will also support a recognised centre's quality systems and help support the centre to meet the qualification approval criteria.

Recognised centres must seek approval for each qualification they wish to offer.

The approval process requires centres to demonstrate that they have sufficient resources, including; suitably qualified and occupationally competent staff to deliver, assess and quality assure the qualification and access to appropriate support in the form of specialist resources. Qualification approval must be confirmed before any assessment of learners takes place.

Qualification Specifications

Each qualification TQUK offers is supported by a specification that includes all the information required by a centre to deliver the qualification. Information in the specification includes unit information, learning outcomes, and how the qualification is assessed.

The aim of the qualification specification is to guide a centre through the process of delivering the qualification.

Please read it alongside the TQUK Centre Handbook. Details of TQUK's procedures and policies can be found on our [website](#).

Qualification specifications can also be found on our [website](#). If you have any further questions, please contact TQUK.

Centres must ensure they are using the most recent version of the qualification specification for planning and delivery purposes.

Reproduction of this document

Centres may reproduce the qualification specification for internal use only but are not permitted to make any changes or manipulate the content in any form.

Centres must ensure they use the most up-to-date pdf version of the specification.

Use of TQUK Logo, Name and Qualifications

TQUK is a professional organisation and the use of its name and logo is restricted. TQUK's name may only be used by recognised centres to promote TQUK qualifications. Recognised centres may use the logo for promotional materials such as corporate/business letterheads, pages of the centre's website relating to TQUK qualifications, printed brochures, leaflets, or exhibition stands.

When using TQUK's logo, there must be no changes or amendments made to it, in terms of colour, size, border or shading. The logo must only be used in a way that easily identifies it as TQUK's logo. Any representation of TQUK's logo must be a true representation of the logo.

It is the responsibility of the centre to monitor the use and marketing of TQUK's logos and qualifications on their own materials as well as on those of any re-sellers or third parties they may use. TQUK must be made aware of centre relationships with re-sellers of TQUK qualifications. TQUK must be made aware of any additional websites where the centre intends to use TQUK's name and/or logo. If this information is changed, TQUK should be notified immediately. TQUK is required to monitor centres' websites and materials to ensure that learners are not being misled.

If a centre ceases to be/surrenders recognition as a TQUK centre, it must immediately discontinue the use of TQUK's logo, name, and qualifications from all websites and documents.

Introduction to the Qualification

The TQUK Level 3 Certificate in AI Programming with Python (RQF) is regulated by Ofqual.

The qualification was developed in association with Udacity.

A little bit about Udacity

Founded in 2010, Udacity is the only talent transformation platform in the world specialised exclusively in cultivating digital talent at scale and in a systematic way. Udacity works with global industry leaders to customize programs that turn learners into job-ready employees.

The company offers digital-only curriculum, expert mentor support and real-world project-based learning, to deliver job-ready skills in artificial intelligence, machine learning, data science, autonomous systems and cloud computing, among other disciplines.

Udacity consistently delivers successful talent transformation programmes at scale, through their unique talent transformation suite, world-class support and digital competency platform.

For more information, please visit www.udacity.com

Qualification Purpose

This qualification is designed to supercharge your skills and power the country's digital infrastructure forwards as it equips learners with knowledge and skills for Artificial Intelligence (AI) programming specifically with Python.

When indulging on this qualification, learners will cover key areas such as: basic python functions, writing scripts, libraries used within python, version control using GITHUB and deep learning which will entail linear algebra and calculus.

This qualification also aims to support and drive forward Government and Combined Authorities skill gap strategies for digital skills as this qualification encourages individuals to enter a growing sector.

The AI and python qualification holds a high status within the industry meaning that upon completion, learners will have entry into the programming sector and can path the way for the future of artificial intelligence and software technologies.

The qualification provides an alternative to the traditional academic University route. Innovation is at the heart of this qualification and is why it meets the need of any employers as they require qualifications and experience within programming.

While this qualification isn't your traditional University education, it's a new and innovative way of learning. The knowledge, skills and behaviours instilled in learners taking this qualification will give them the opportunity to spark the start of their career in the programming industry. Applying knowledge and skills to real life situations allows learners to adapt their behaviours and perform in a way that can be self-paced in a hands-on environment.

Entry Requirements

There are no specific entry requirements however learners should have a minimum of level two in literacy and numeracy or equivalent.

The recommended minimum age for this qualification is 16 years.

Progression

Successful learners can progress to other qualifications such as:

- Level 4 Diploma in Software Development
- Software Development technician Apprenticeship standard.
- Successful learners can apply for job roles such as:
 - Data and AI Consultant
 - AI Developer

Structure

Learners must achieve all credits from all mandatory units

Title	Unit ref.	Level	Guided learning hours	Credit value
Introduction to Python	J/650/0758	3	35	4
Understand libraries used for Python Programming	K/650/0759	3	37	4
Introduction to version control using GitHub for Python.	T/650/0761	4	42	6
Linear Algebra Essentials for Deep Learning	Y/650/0762	3	31	3
Calculus Essentials for Deep Learning	A/650/0763	3	20	2
Introduction to Deep Learning	D/650/0764	4	32	5

Guided Learning Hours

These hours are made up of all contact time, guidance or supervision of a learner by a lecturer, supervisor, tutor, trainer or other appropriate provider of education or training.

GLH for this qualification is 197 hours

Directed study requirements

Learners are expected to study and complete aspects of their assessment portfolio in their own time. This additional time is expected to be approximately 43 hours over the cycle of the programme.

Total Qualification Time

This is an estimate of the total length of time it is expected that a learner will typically take to achieve and demonstrate the level of attainment necessary for the award of the qualification i.e. to achieve all learning outcomes.

Total Qualification Time is comprised of GLH and an estimate of the number of hours a learner is likely to spend in preparation, study or any other learning including assessment which takes place as directed by, but not under the supervision of, a lecturer, supervisor or tutor. The credit value for a qualification, where given, is determined by TQT, as one credit corresponds to 10 hours of learning.

Total Qualification Time for this qualification is 240 hours.

Assessment

It is essential that all learners are assessed in English unless the qualification specification specifically states that another language may be accepted. This ruling also applies to all learner evidence presented for external quality assurance purposes.

The qualification is assessed by internally set and marked assessments subject to external quality assurance.

All learning outcomes which assess knowledge and understanding (usually beginning with 'understand' or 'know how to') may be assessed through, for example, internally set and marked written assignments, tasks, records of oral or written questions, work books or other portfolio evidence.

All learning outcomes which require demonstration of practical skills and confirmation of workplace competence (usually learning outcomes beginning with 'be able to'). Portfolio evidence must include observation of learner performance in real work situations. Details of specific requirements and where simulation is /is not permitted is included in the unit specifications.

Materials for internal assessment must be submitted to TQUK for approval prior to use and must be mapped to the relevant unit, learning outcome and assessment criteria.

All learning outcomes and assessment criteria must be met to achieve a pass - there is no grading.

Each unit within the qualification may have their own assessment requirements, assessment guidance and range.

- Assessment requirements are conditions of assessment that must be met by learners when undertaking their assessments to achieve the unit or meet a particular assessment criteria
- Assessment guidance are areas that could be covered by learners in their assessments to achieve the unit or particular assessment criteria but are not mandatory
- Range sets out the scope of what should be taught and may be assessed as part of a particular assessment criteria.

Centre Devised Assessment (CDA) Guidance

Centre-devised assessments play a vital role in the evaluation of a learner's progress as they are based on the qualification's learning objectives. They provide learners with the opportunity to evidence the knowledge, understanding, and skills gained while studying the qualification and support teaching staff in monitoring the learner's progress.

As this qualification is internally assessed, TQUK allows centres to produce their own assessments. When designing them, assessors must give consideration to the depth and breadth of knowledge allowed by each task.

TQUK has produced centre guidance on our suggested approaches to designing appropriate assessment tasks, and these may be accessed from our website www.tquk.org.

This includes templates to support the design of internal assessments and a checklist to ensure that the assessments are valid and fit for purpose.

To ensure the validity and fairness of our qualifications, centre-devised assessments form part of our quality assurance processes. More information about this and how to prepare for external quality assurance reviews can be found on our website.

Course Delivery

Pre-Course Information

All learners should be given appropriate pre-course information regarding any TQUK qualifications. The information should explain the qualification, the fee, the form of the assessment and any entry requirements or resources needed to undertake the qualification.

Initial Assessment

Centres should ensure that any learner registered on a TQUK qualification undertakes some form of initial assessment. The initial assessment should be used to inform a teacher/trainer of the level of the learner's current knowledge and/or skills and any additional specific support requirements the learner may need.

The initial assessment can be undertaken by a teacher/trainer in any form suitable for the qualification to be undertaken by the learner/s. It is the centre's responsibility to make available forms of initial assessment that are valid, applicable, and relevant to TQUK qualifications.

Teaching resources

All teaching materials and additional resources used to support the delivery of this qualification must be age-appropriate. Centres must ensure when developing or sourcing delivery materials that careful consideration is given to the safeguarding and wellbeing of their learners in line with the centre's policies and procedures.

Learner Registration

Once approved to offer a qualification, centres must follow TQUK's procedures for registering learners. Learner registration is at the discretion of the centre and in line with equality legislation and health and safety requirements.

Centres must register learners before any assessment can take place.

Tutor, Assessor and Internal Quality Assurer Requirements

All members of staff involved with the qualification (assessing or IQA) will need to be occupationally competent in the subject area being delivered. This could be evidenced by a combination of:

- A higher level qualification in the same subject area as the qualification approval request
- Experience of the delivery/assessment/IQA of the qualification requested
- Work experience in the subject area of the qualification.

Staff members will also be expected to have a working knowledge of the requirements of the qualification and a thorough knowledge and understanding of the role of tutors/assessors and internal quality assurance. They are also expected to undertake continuous professional development (CPD) to ensure they remain up to date with work practices and developments associated with the qualifications they assess or quality assure.

Tutor

Tutors or trainers who deliver a TQUK qualification must possess a teaching qualification appropriate for the level of qualification they deliver. This can include:

- Further and Adult Education Teacher's Certificate
- Cert Ed/PGCE/Bed/MEd
- PTLLS/CTLLS/DTLLS
- Level 3 Award/Level 4 Certificate/Level 5 Diploma in Education and Training.

Assessor

Staff who assess a TQUK qualification must possess an assessing qualification appropriate for the level of qualification they are delivering or be working towards a relevant qualification and have their assessment decisions countersigned by a qualified assessor. This can include:

- Level 3 Award in Assessing Competence in the Work Environment
- Level 3 Award in Assessing Vocationally Related Achievement
- Level 3 Award in Understanding the Principles and Practices of Assessment
- Level 3 Certificate in Assessing Vocational Achievement
- A1 or D32/D33.

Specific requirements for assessors may be indicated in the assessment strategy/principles identified in individual unit specifications.

Internal Quality Assurer

Centre staff who undertake the role of an Internal Quality Assurer (IQA) for TQUK qualifications must possess or be working towards a relevant qualification and have their quality assurance decisions countersigned by a qualified internal quality assurer. This could include:

- Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practice
- Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice
- V1 qualification (internal quality assurance of the assessment process)
- D34 qualification (internally verify NVQ assessments and processes).

It is best practice that those who quality assure qualifications also hold one of the assessing qualifications outlined above. IQAs must follow the principles set out in Learning and Development NOS 11 - Internally monitor and maintain the quality of assessment.

External Quality Assurance

External Quality Assurance will be undertaken by TQUK to ensure that centres are satisfying TQUK quality assurance compliance with the requirements associated with their TQUK recognised centre status and formal written agreement. This will consist of physical activities and remote reviews.

Useful Websites

- [Office of Qualifications and Examinations Regulation](#)
- [Register of Regulated Qualifications](#)

For further details regarding approval and funding eligibility please refer to the following websites:

- [Education & Skills Funding Agency for public funding information for 14+ learners in England](#)
- [Learning Aim Reference Service \(LARS\)](#)

Mandatory units

Title:		Introduction to Python	
Unit reference number:		J/650/0758	
Level:		3	
Credit value:		4	
Guided learning hours:		35	
Learning outcomes The learner will:		Assessment criteria The learner can:	
1.	Be able to use data types and operators in Python	1.1	Demonstrate the use of data types
		1.2	Demonstrate the use of data structures
2.	Be able to use control flow in Python	2.1	Implement decision-making in a code
		2.2	Demonstrate the use of built-in functions
		2.3	Demonstrate the use of loops
3.	Be able to use of functions in Python	3.1	Demonstrate the use of functions
4.	Be able to write Python Scripting	4.1	Write and run Python Scripts
		4.2	Describe types of errors and exceptions that may appear within a script
		4.3	Demonstrate the use of modules within the script
		4.4	Demonstrate the use of command line arguments
5.	Understand Object-Orientated Programming	5.1	Define terms associated with Object- Orientated programming
		5.2	Describe the benefits of Object- Orientated programming
		5.3	Explain the basic concepts of Object-Oriented Programming

Assessment requirements:

- 1.2- Learners must use operators within data structures.
- 2.3- Learners must repeat code with for and while loops.
- 3.1- Functions must cover a series of commands.
- 4.3- Modules must be used from
 - Python standard library.
 - Third-party libraries:
- 5.1- Learners must cover at least three terms.

Assessment guidance:

Built-in functions could include:

- Zip
- Enumerate
- Pip
- virtualenv

Terms could include:

- Class
- Object
- Attribute
- Method
- Encapsulation

Title:		Understand libraries used for Python Programming	
Unit reference number:		K/650/0759	
Level:		3	
Credit value:		4	
Guided learning hours:		37	
Learning outcomes The learner will:		Assessment criteria The learner can:	
1.	Understand Anaconda library for python programming	1.1	Describe what “Anaconda” is used for
		1.2	Outline the difference between “Anaconda” and “Miniconda”
		1.3	Describe how to install, remove and update packages once Miniconda is installed
		1.4	Explain how to manage environments in Anaconda
		1.5	Explain how to enter and deactivate an environment in Anaconda
2.	Understand Jupyter Notebooks library for python programming	2.1	Outline what a “Jupyter Notebook” is
		2.2	Describe code cells and markdown cells in Jupyter notebooks
		2.3	Outline the purpose of magic commands in Jupyter notebooks
		2.4	Give examples of formats to which Jupyter notebooks can be converted
3.	Understand the use of NumPy and ndarrays for python programming	3.1	Outline the use of “NumPy”
		3.2	Describe the benefits of using NumPy
		3.3	Explain how to create and save NumPy ndarrays
		3.4	Describe ways to manipulate ndarrays
4.	Understand Pandas library for python programming	4.1	Describe what “Pandas” is used for
		4.2	Describe the difference between Pandas data structures (Series and DataFrame) and NumPy ndarrays.
		4.3	Outline how to create, access, and delete elements in <ul style="list-style-type: none"> • Pandas series • Pandas data frames
5.	Understand Matplotlib and Seaborn	5.1	Outline the purpose of Matplotlib and Seaborn
		5.2	Describe features of Matplotlib and Seaborn
		5.3	Describe the features of a good visualisation

Assessment requirements:

1.4- Learners must cover:

- Entering an environment.
- Deactivate an environment.

3.2- Learners must cover at least two benefits.

Assessment guidance:

1.4 learners could cover:

- Creating an environment
- Saving and lading environments
- Sharing environments
- Removing an environments

3.2 benefits could be:

- Speed
- Multidimensional data structures
- Built in mathematical functions

3.3 learners could over built in functions within the explanation of creating ndarrays

Title:		Introduction to version control using GitHub for Python	
Unit reference number:		T/650/0761	
Level:		4	
Credit value:		6	
Guided learning hours:		42	
Learning outcomes The learner will:		Assessment criteria The learner can:	
1.	Understand Version Control	1.1	Outline why developers use version control
		1.2	Explain ways to use version control
2.	Be able to create GitHub Repository and use commits for version control	2.1	Create a GitHub repository
		2.2	Create a fork GitHub repository
		2.3	Demonstrate the use of commits for version control
		2.4	Demonstrate how to mark files as untracked in GitHub
3.	Be able to work with remotes effectively for version control using GitHub	3.1	Demonstrate how to verify a remote using GitHub
		3.2	Demonstrate how to clone remote repositories using GitHub
		3.3	Demonstrate how to push files to own remote repository using GitHub
		3.4	Describe the differences between fetch and pull
4.	Be able to tag, branch and merge for version control using GitHub	4.1	Demonstrate how to organise commits with tags and branches using GitHub
		4.2	Demonstrate how to check branches have changed in GitHub
		4.3	Demonstrate how to merge branches using GitHub
5.	Understand how to review a repositories history and undo changes	5.1	Describe how to review repositories commit history
		5.2	Explain the importance to review repositories commit history
		5.3	Explain ways to undo changes in GitHub
		5.4	Describe the difference between reverting and resetting changes
6	Understand the importance for staying in sync with a remote repository for version control	6.1	Outline how to stay in sync with the remote repository
		6.2	Explain the importance of staying in sync with a remote repository for version control
<p>Assessment requirements:</p> <p>2.2- Learners must use the GitHub web interface.</p> <p>2.3- Learners must:</p> <ul style="list-style-type: none"> • Use commit descriptive messages • Use commits to refactor • Push commits to a remote repository • Edit and delete commits • Undo or erase a commit <p>5.3- Learners must cover reverting unwanted changes.</p>			

Title:		Linear Algebra Essentials for Deep Learning	
Unit reference number:		Y/650/0762	
Level:		3	
Credit value:		3	
Guided learning hours:		31	
Learning outcomes The learner will:		Assessment criteria The learner can:	
1.	Understand the use of Vectors for deep learning	1.1	Outline what a 'vector' is
		1.2	Describe the purpose of vector transpose
		1.3	Outline how to calculate magnitude and direction
		1.4	Explain, with examples, the use of <ul style="list-style-type: none"> • Vector additions • Vector multiplication
		1.5	Describe how vectors support programming with Python
2.	Know how to use Linear Combinations for deep learning	2.1	Give examples of <ul style="list-style-type: none"> • Linear combination • Linear span
		2.2	Describe the use of linear dependency
3.	Understand Linear Transformation and Matrices for Numpy library	3.1	Outline what is meant by a 'matrix'
		3.2	Explain how to apply matrix arithmetic to perform <ul style="list-style-type: none"> • Matrix addition • Scalar multiplication of a matrix • Matrix multiplication
4.	Understand deep learning for Linear Algebra	4.1	Explain how the feedforward process uses linear algebra
<p><u>Assessment requirements:</u></p> <p>1.4- Learners must provide two or more examples within the explanation.</p> <p>2.1 Learners must provide two or more examples for each term.</p> <p><u>Assessment guidance:</u> None</p>			

Title:		Calculus Essentials for Deep Learning	
Unit reference number:		A/650/0763	
Level:		3	
Credit value:		2	
Guided learning hours:		20	
Learning outcomes The learner will:		Assessment criteria The learner can:	
1.	Understand deep learning	1.1	Explain what 'deep learning' is
		1.2	Outline how calculus supports deep learning
2.	Understand Derivatives	2.1	Explain what a Derivative is and its purpose
		2.2	Outline the need for derivatives in deep learning
<p><u>Assessment requirements:</u></p> <p>1.2- Learners must cover back propagation.</p> <p><u>Assessment guidance:</u> None</p> <p><u>Useful websites:</u> N/A</p>			

Title:		Introduction to Deep Learning	
Unit reference number:		D/650/0764	
Level:		4	
Credit value:		5	
Guided learning hours:		32	
Learning outcomes The learner will:		Assessment criteria The learner can:	
1.	Introduction to deep learning	1.1	Explain the difference between testing and validation datasets
		1.2	Describe the purpose of validation loss and accuracy
2.	Understand the importance of implementing gradient descent	2.1	Outline what gradient descent is
		2.2	Explain the importance of implementing gradient descent
		2.3	Describe the benefits of gradient descent
3.	Be able to train deep learning	3.1	Demonstrate ways to train the deep learning model
		3.2	Demonstrate the use of a validation set for hyperparameter tuning
		3.3	Demonstrate how to use deep learning for inference
4.	Be able to use deep learning with PyTorch	4.1	Demonstrate the use of pre-trained networks
		4.2	Create a training script that utilizes the GPU
		4.3	Demonstrate the use of image processing
		4.4	Demonstrate data normalisation
		4.5	Demonstrate data augmentation
		4.6	Demonstrate the use of data loading and data batching for <ul style="list-style-type: none"> • training • validation • testing
		4.7	Demonstrate how to save the model and load checkpoints
<p><u>Assessment requirements:</u></p> <p>3.3- Learners must cover</p> <ul style="list-style-type: none"> • Random scaling • Rotation • Mirroring • Cropping <p>4.2- The script must allow users to choose training models.</p> <p><u>Assessment guidance:</u> None.</p> <p><u>Useful websites:</u> N/A</p>			