



Awarding  
Great British  
Qualifications

# SHORT COURSE IN DATA SCIENCE:

## An Introduction



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Qualification Unit Specification  
**2020/21**

## Modification History

Version	Revision Description
V1.0	For release

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# 1. About NCC Education

NCC Education is a UK-based awarding body, active in the UK and internationally. Originally part of the National Computing Centre, NCC Education started offering IT qualifications in 1976 and from 1997 developed its Higher Education portfolio to include Business qualifications, IT qualifications for school children and a range of Foundation qualifications.

With Centres in over forty countries, four international offices and academic managers worldwide, NCC Education strives to employ the latest technologies for learning, assessment and support. NCC Education is regulated and quality assured by Ofqual (the Office of Qualifications and Examinations Regulation, see [www.ofqual.gov.uk](http://www.ofqual.gov.uk)) in England and Northern Ireland.

## Overview and Objectives

**Short Course in Data Science: An Introduction** will provide learners with an understanding of how to think in a data-analytics way, conduct investigations on business activity, rigorously analyse data and communicate results. Students will learn how to present summarised findings to allow key stakeholders to make effective decisions.

The course is aimed at people with little to no experience in data science.

## Hardware and Software Requirements

Hardware: Learners need access to computers with Internet access.

Software: Learners must have access to Python IDE/Java/Java IDE, spreadsheet software and access to SQL Fiddle.

# Short Course in Data Science: An Introduction

<b>Title:</b>	Short Course in Data Science: An Introduction
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<b>Guided Learning Hours</b>	80 hours
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<b>Learning Outcomes; The Learner will:</b>	<b>Objectives; The Learner can:</b>
1. Understand computer instructions and datatypes	1.1 Storing and Executing Computer Instructions 1.2 Representing and Manipulating Different Types of Data
2. Know how to manage a digital project	2.1 Collecting and Analysing Data 2.2 Presenting Data Digitally
3. Understand how to solve problems with algorithms	3.1 Understanding, Designing and Developing Algorithms 3.2 Decision Making in Algorithms 3.3 Problem Solving in Algorithms
4. Be able to structure, manipulate and represent data	4.1 Explain what a data structure is 4.2 Use different data types 4.3 Make use of appropriate data structures in code 4.4 Explain the benefits of a modular computer program
5. Developing and Testing Programme Code	5.1 Write code which includes iteration 5.2 Write code which includes selection 5.3 Write a sequential computer program 5.4 Describe the processes through which high level code is converted so that it can be processed by the CPU 5.5 Create a test plan 5.6 Carry out testing on program code
6. Be able to create a database using SQL	6.1 Understand the purpose of databases 6.2 Create a database using SQL 6.3 Create and execute sort/filter commands
7. Use summary and inferential statistics to inform business decisions	7.1 Calculate and interpret standard scores 7.2 Use index numbers when reviewing data 7.3 Compare and contrast sampling methods and techniques 7.4 Use confidence intervals to indicate the reliability of estimates 7.5 Apply significance testing to business hypotheses
8. Understanding Data visualisation	8.1 Explain the key points of effective communication 8.2 Communicate information using data visualisation 8.3 Use visualisation to explore data
9. Understand Machine Learning Models	9.1 Machine Learning Steps 9.2 Phases of building a Machine Learning Model 9.3 Types of algorithms used in Machine Learning

## Syllabus

Topic No	Title	Content
1	Computer Instructions and Data	<ul style="list-style-type: none"> <li>• How the CPU in a computer works</li> <li>• How instructions are stored and executed within a computer system</li> <li>• How text and numbers are represented through basic character encoding</li> <li>• How images are represented and manipulated</li> </ul> <p><b>Learning Outcome: 1</b></p>
2	Collecting and Analysing Data	<ul style="list-style-type: none"> <li>• Qualitative and Quantitative Data</li> <li>• Primary and Secondary Data</li> <li>• How to collect Quantitative Data?</li> <li>• Data analysis and representing data</li> </ul> <p><b>Learning Outcome: 2</b></p>
3	Understand how to solve problems with Algorithms -1	<ul style="list-style-type: none"> <li>• An introduction to algorithms</li> <li>• Sequence of an algorithm</li> <li>• Algorithms with Selection</li> <li>• Algorithm with Loops</li> <li>• Sorting algorithms: Bubble Sort and Selection Sort</li> </ul> <p><b>Learning Outcomes: 3</b></p>
4	Understand how to solve problems with Algorithms - 2	<ul style="list-style-type: none"> <li>• Introduction to searching algorithms</li> <li>• Linear Search and how it works</li> <li>• Binary Search and how it works</li> <li>• Linear Search VS Binary Search</li> <li>• Abstraction</li> <li>• Decomposition</li> <li>• Relationship between abstraction and decomposition</li> <li>• How to compare algorithms</li> </ul> <p><b>Learning Outcome: 3</b></p>

5	Structure, Manipulate and Represent Data	<ul style="list-style-type: none"> <li>• What is modular programming?</li> <li>• Benefits of modular programming</li> <li>• Introduction to Python</li> <li>• Data type, variable, constant and reserved words in Python</li> <li>• Arithmetic operators in computing</li> <li>• Logical operators</li> <li>• Data structure and array in Python</li> </ul> <p><b>Learning Outcome: 4</b></p>
6	Developing and Testing Program Code	<ul style="list-style-type: none"> <li>• Function vs Methods</li> <li>• Array and List Declaration</li> <li>• Code Visualiser</li> <li>• Functional testing</li> <li>• Operational testing</li> <li>• Logical testing</li> <li>• Test Plan</li> </ul> <p><b>Learning Outcome: 4 &amp; 5</b></p>
7	Developing a Simple Database using SQL	<ul style="list-style-type: none"> <li>• Basic concepts of SQL</li> <li>• Data-types in SQL</li> <li>• Creating tables</li> <li>• More of the select statement</li> <li>• Fixing errors and optimisation</li> </ul> <p><b>Learning Outcome: 6</b></p>
8	Data Retrieval with SQL	<ul style="list-style-type: none"> <li>• Referential integrity in relational databases</li> <li>• Types of joins</li> <li>• Retrieving data using joins</li> <li>• Retrieving data using sub-queries</li> </ul> <p><b>Learning Outcome: 6</b></p>

9	Inferential Statistics - 1	<ul style="list-style-type: none"> <li>• Probability and percentage points (percentiles) of the normal distribution</li> <li>• Population parameters, sample statistics and the distribution of sample means</li> <li>• The central limit theorem and large sample confidence intervals</li> <li>• Exact confidence intervals using the t-distribution</li> <li>• An introduction to hypothesis testing</li> </ul> <p><b>Learning Outcome: 7</b></p>
10	Inferential Statistics – 2	<ul style="list-style-type: none"> <li>• The three views of hypothesis testing are introduced</li> <li>• One and two sample t-tests are given</li> <li>• Error types and power are explained</li> <li>• Goodness of fit test is shown</li> <li>• Sampling frames are introduced</li> </ul> <p><b>Learning Outcome: 7</b></p>
11	Data Visualisation	<ul style="list-style-type: none"> <li>• What is Data Visualisation?</li> <li>• Role of Visualisation</li> <li>• Common Display Types</li> <li>• Visualisation Technique</li> <li>• Visualisation Pipeline</li> </ul> <p><b>Learning Outcome: 8</b></p>
12	Data Science Project Lifecycle	<ul style="list-style-type: none"> <li>• OSEMN framework</li> <li>• Introduction to Machine Learning</li> <li>• Machine Learning steps</li> <li>• Machine Learning Models</li> </ul> <p><b>Learning Outcome: 9</b></p>