

Degree Apprenticeship Information – Data Scientist (Integrated Degree)

ABOUT APPRENTICESHIPS AT NCH AT NORTHEASTERN

Apprenticeships are the skills programme of choice for 79,000 employers, and every year almost 750,000 employees are working towards achieving their apprenticeship. NCH at Northeastern (NCH) apprenticeships are part of this important skills training programme, designed with our employers to deliver measurable benefits for employers, employees and their organisations.

Through our apprenticeships, we help businesses to attract and grow their own talent and develop a diverse, motivated, skilled, qualified and professional workforce. Over 22,000 people started a degree apprenticeship during 2018/2019 in England, both new and existing staff from all ages. Higher and degree apprenticeships are the fastest growing area in the apprenticeship programme.

A degree apprenticeship delivered by NCH, a member of Northeastern University’s global network, combines structured off-the-job learning led by the university during the working week, alongside the hands-on learning that an apprentice gains during their day to day work supported by their line manager.

Eighty-nine percent of the country's Top 100 Apprenticeship Employers said that if they were starting out in their career now, they would opt for an Apprenticeship and over half (51%) said the average time for an apprentice to reach a management position in their firm was five years or less. Our programme design enables employees to become productive and skilled at work in the quickest time possible.

ABOUT THE DATA SCIENTIST APPRENTICESHIP FROM NCH AT NORTHEASTERN

The Data Scientist (Integrated Degree) Apprenticeship is supported by some of the UK’s biggest and best employers, apprentices have the opportunity to gain a Degree, incorporating maths, statistics, software engineering and communications, while working in the digital sector finding ways to improve an organisation’s processes.

We work with leading employers to develop our ‘Know-How Now’ pathway in each apprenticeship; scheduling courses and content to ensure every apprentice is quickly contributing to real work in their organisation. Here is what you need to know about the Apprenticeship programme in summary:

APPRENTICESHIP ESSENTIALS	THE DIGITAL SOLUTIONS APPRENTICESHIP	
<p>Duration: 36 months</p>	<p>Start Date Options: October January April</p>	<p>Mode of Training: Blended learning; a mixture of on-line and face-to-face delivery (70:30, respectively). Face-to-face is delivered as block release and/or at your location depending on cohort size.</p>
<p>Cost: Capped at £19,000 Maximum</p>	<p>Employer contribution (defined by your payroll size): Apprenticeship Levy – 100% from the apprenticeship levy. Co-Funding – employer contribution 5% (£950) government contribution 95%</p>	

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	<p>(£18,050).</p> <p>SME with <50 staff – 100% fully funded by government, providing the apprentice is 16-18 years old on the first day of their apprenticeship, or 19-24 years old and have an EHC plan or been in care of their local authority.</p> <p>LEVY Transfer from a Levy paying employer – 100% fully funded by the transfer.</p> <p>Please note that the cost of travel to/from, and/or accommodation, to 'residential/bootcamps' will need to be met by the employer and are not met by the cost of the apprenticeship (see Mode of Delivery below).</p>
Qualifications Achieved:	BSc (Hons) in Data Science
Entry Requirements:	<p>The apprentice will need to apply for a degree apprenticeship role within the hiring business, or already be in employment, with responsibilities aligned to the degree apprenticeship.</p> <p>Entry requirements are agreed and set, based on numerous factors including availability of additional on-the-job support, by both the employer and NCH. As such, entrance requirements may vary between apprenticeships.</p> <p>Typically, employers require:</p> <ul style="list-style-type: none"> • Three A levels (or equivalent at BBB or above) • At least Grade 4/C GCSE Maths, English and IT <p>Some applicants may not have traditional qualifications as listed above, and have prior learning and skills developed from the workplace, these will be considered on a case-by-case basis.</p> <p>Apprentices will also need to meet the government's eligibility criteria.</p>
Mode of Delivery:	<p>The apprentice will study with NCH for approximately 50 days a year – i.e. one day per week for 42 weeks each year, and a five-ten day 'residential/bootcamp' in any given year; for the duration of the three-year programme. Additionally, the apprentice and employer will commit to provider-guided work-based training activities. Apprentices will study 120 academic credits per year. Each course, typically 15 credits, is assessed by a range of activities aligned to industry norms, i.e. almost all assessments relate to workplace activities that are expected in a digital occupation. The content, and consequently the learning outcomes and methods of assessment vary between courses. Where possible, assessments are undertaken in the workplace.</p>

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WHO IS THIS APPRENTICESHIP FOR?

Our Data Scientist (Integrated Degree) Apprenticeship programme will provide the perfect route into a Data Scientist role.

Our apprenticeship is suitable for new starters, up-skilling and re-skilling existing employees and for those looking to retrain, restart careers or enter the world of work. We are actively working with partners to ensure that we are able to attract a wide variety of talent, including ex-service personnel, those not currently in work or education and career-changers as well as school leavers and undergraduates.

Our commitment to lifelong learning, pastoral support and to providing routes into digital careers for underrepresented groups provide an excellent opportunity for employers to build teams with a diversity of thought and experience – a critical factor in innovative thinking within teams.

KNOWLEDGE, SKILLS, EXPERIENCE ACHIEVED

Nearly every employer that takes on an apprentice (96%) reports benefits to their business and as part of an NCH apprenticeship every apprentice spends 80% of their time at/in work, learning from colleagues and achieving competency through their day-to-day activities. Every apprentice also must spend at least 20% of their typical working day over the life of their apprenticeship in off-the-job learning, acquiring the additional skills. This is their structured learning pathway through the apprenticeship. This 20% off-the-job learning time is set out in the Commitment Statement and is documented and tracked by NCH, the apprentice and their line manager. Keeping pace with the trajectory in the formal learning schedule is essential for a successful apprenticeship. Progress in knowledge and skills alongside the amount of time spent in off-the-job learning will be reviewed as part of each Tri-partite progress review meeting between the apprentice, the line manager and the university Apprenticeship Advisor (at 6-8-week intervals).

LEARNING APPROACH

Employers say qualified higher apprentices are the most employable people: 25% more employable than those with other qualifications. Nearly every employer that takes on an apprentice (96%) reports benefits to their business and we intend to maintain this through the design of our degree apprenticeship. Our programme built with an employer group, ensures that apprentices are productive at work as soon as possible, getting involved in activity at work to embed the knowledge, skills, experience and behaviours learned in the off-the-job elements of our apprenticeship.

We deliver our off-the-job learning for our apprenticeships in flexible, modular programmes based on each individual's prior knowledge, skills, and experience. We offer multiple start times throughout the year, learning through block sessions, online courses, assignments and project work. Our expertise is in modular, stackable learning. This flexible approach is part of our design and delivery DNA.

Our apprentices progress along a career path from day one, gaining professional skills, status and accreditation as they go. Degree apprenticeships allow employees to earn while they learn at the highest level and progress into higher skilled occupations.

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LEARNING OFF THE JOB

We deliver a modular, stackable apprenticeship experience, where we can take account of prior learning and build a learning programme that gets apprentices as productive as possible, as soon as possible. All of the off-the-job learning must be completed during a typical working week. This is a requirement of all apprenticeship learning and NCH must be able to demonstrate consistently that this is happening.

THE COURSES IN THIS APPRENTICESHIP PROGRAMME

COURSE	CONTENT
YEAR 1	
BUSINESS FUNDAMENTALS	This course will familiarise learners with the contemporary world of business. It introduces legal, political, ethical, and social citizenship foundations and theories that businesses and non-profit organisations are built upon. The course exposes learners to the various business disciplines and the role these disciplines play in an organisation. Several quantitative fundamentals, and tools, for ethical and socially responsible business decision making are described. The course integrates critical issues affecting the world of business from both a national and international perspective. Apprentices will have the opportunity to develop basic business literacy within an ethical context.
MATHEMATICAL STRUCTURES AND METHODS	This course introduces mathematical structures and methods that form the foundation of computer science. Learners will study structures such as sets, tuples, sequences, lists, trees, and graphs. Functions, relations, ordering, and equivalence relations and inductive and recursive definitions of structures and functions are explored. The course covers principles of proof, such as truth tables, inductive proof, basic logic, counting techniques and arguments needed to estimate the size of sets, the growth of functions, and the space-time complexity of algorithms.
INTENSIVE FOUNDATIONS OF COMPUTER SCIENCE AND PROGRAMMING I	This course introduces the fundamental ideas of computing and programming principles. The course discusses a systematic approach to word problems, including analytic reading, synthesis, goal setting, planning, plan execution, and testing. It presents several models of computing, beginning with functional program design. Learners will explore the Python programming language, its syntax, mathematical

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	functionality and suitability for data analysis applications.
DATA MANAGEMENT SYSTEMS	This course explores how a wide range of enterprises around the world use information and information technology to create better managed, more innovative, and successful organisations. Today’s business leaders must have ready access to timely, accurate, and relevant information to manage effectively in the global economy. Apprentices have the opportunity to apply their knowledge of data management systems using industry-standard cloud-based technology e.g. Using ServiceNow training.
DATABASE DESIGN AND MANAGEMENT I	This course covers the underlying principles and concepts behind relational databases. Learners will use the reporting language SQL to interrogate relational databases and design simple databases. SQL will be used for creating and accessing data tables, indexing, arithmetic operations, loops, arrays, multiple table processing, I/P operations, data-type conversions, and views. Apprentices will have the opportunity to apply their knowledge of relational databases using industry-standard cloud-based technology e.g. Using ServiceNow training.
INTENSIVE FOUNDATIONS OF COMPUTER SCIENCE AND PROGRAMMING II	This course covers more advanced topics in computing and programming principles. Learners will explore advanced Python programming and design principles. Learners will engage in an extensive programming task, which will result in the creation of a test suite. Learners will explore pair programming and public code review techniques, as found in industry today. Learners will have the opportunity to apply their knowledge of computer systems and programming using industry-standard cloud-based technology e.g. Using ServiceNow training.
CLOUD COMPUTING	This course offers an overview of practical aspects of distributed systems and cloud computing. Cloud computing and web services are an increasingly important tool for data scientists, allowing data storage, manipulation and analysis to occur on the cloud rather than on-premise systems. This course examines the key characteristics of cloud computing, cloud storage, cloud computing systems and online analytical processing. The topic of data warehousing is introduced and applications such as online analytical processing. Additionally, the course identifies and explores the risks and implications of cloud

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	<p>computing, including privacy, security and the protection of personal data. Learners will have the opportunity to apply their knowledge of cloud computing using industry standard cloud-based technology e.g. Using ServiceNow training.</p>
<p>DATA SCIENCE BOOTCAMP</p>	<p>This course is an intensive two-week, face-to-face residential/bootcamp and gives learners hands-on experience of a mini data science project. Learners will be required to complete preliminary reading and preparation before the two-week residential/bootcamp. Apprentices explore the data science workflow with practical and collaborative tasks. A wide variety of datasets will be used to mirror real-world settings. Learners engage in hands-on programming (python), database interrogation (sql) and exploratory data analytics and visualisation. Group discussion will include the context of data science, the data science community and the data protection and regulatory environment.</p>
<p>YEAR 2</p>	
<p>INFORMATION TECHNOLOGY PROJECT MANAGEMENT</p>	<p>This course covers the tools and techniques used to manage information technology (IT) projects. Topics include project planning, scheduling, and budgeting and project management tools (PERT/CPM/Gantt). It discusses all phases of IT projects from proposal evaluation through post implementation reviews and offers students an opportunity to plan and develop a project that provides a practical application of the topics covered in class. Apprentices will have the opportunity to apply their knowledge of IT project management using industry-standard cloud-based technology e.g. Using ServiceNow training.</p>
<p>DATABASE DESIGN AND MANAGEMENT II</p>	<p>This course studies the design of a database for use in a relational database management system (DBMS). The entity-relationship model and normalization are used in problems. Relational algebra and then the SQL (structured query language) are presented. Advanced topics include triggers, stored procedures, indexing, elementary query optimization, and fundamentals of concurrency and recovery. Students implement a database schema and short application programs on one or more commercial relational database management systems. Learners will have the opportunity to apply their knowledge of databases using industry-standard cloud-based</p>

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	technology e.g. Using ServiceNow training.
LINEAR ALGEBRA AND PROBABILITY FOR DATA SCIENCE	This course offers an introduction to the basics of statistics, probability, and linear algebra. It covers random variables, frequency distributions, measures of central tendency, measures of dispersion, moments of a distribution, discrete and continuous probability distributions, chain rule, Bayes' rule, correlation theory, basic sampling, matrix operations, trace of a matrix, norms, linear independence and ranks, inverse of a matrix, orthogonal matrices, range and null-space of a matrix, the determinant of a matrix, positive semidefinite matrices, eigenvalues, and eigenvectors.
DATA ANALYTICS	This course introduces the subject of data analytics. Learners will be taught how raw data is collected, stored, cleansed and interrogated in order to contribute to the needs of organisations. Four main areas of data analytics will be covered: descriptive, diagnostic, predictive and prescriptive. Learners will apply industry-standard software and Python packages commonly used for data analytics, encompassing basic graphical, numerical and statistical tools. Additionally, learners will have the opportunity to apply their knowledge of data analytics using industry-standard cloud-based technology e.g. Using ServiceNow training.
MACHINE LEARNING AND DATA MINING I	This course introduces the learner to three of the most well used machine learning techniques for data mining and predictive modelling: regression, decision trees, clustering and principal component analysis (PCA). Learners will explore the difference between supervised, unsupervised and machine learning, and study how to build and analyse robust predictive models using tools such as Python and R. It uses tools and libraries to analyse data sets, build predictive models, and evaluate the fit of the models. The course covers common learning algorithms, including dimensionality reduction, classification, principal-component analysis, k-NN, k-means clustering, gradient descent, regression, logistic regression, regularization, multiclass data and algorithms, boosting, and decision trees. This course will also examine data bias and accurate model building: assessing the appropriateness of training and test sets, evaluation and deployment.
MACHINE LEARNING AND DATA MINING II	This course continues with supervised and unsupervised predictive modelling, data mining, machine-learning concepts and feature

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	<p>engineering. It also covers mathematical and computational aspects of learning algorithms, including kernels, time-series data, collaborative filtering, support vector machines, neural networks, Bayesian learning and Monte Carlo methods, multiple regression, and optimization. It uses mathematical proofs and empirical analysis to assess validity and performance of algorithms. Apprentices study additional computational aspects of probability, statistics, and linear algebra that support algorithms, and apply concepts to common problem domains, including spam filtering.</p>
DATA VISUALISATION	<p>This course introduces the use of design, interaction, and visualisation techniques and strategies to support the effective presentation and manipulation of business information. The course is based on principles from art, design, psychology, and information science. It offers learners opportunities to learn how to successfully choose appropriate methods of representing various kinds of business data to support analysis, decision making, and communication to organizational stakeholders. Learners will have the opportunity to apply their knowledge of data visualisation using industry-standard cloud-based technology e.g. Using ServiceNow training.</p>
DATA SYNTHESIS	<p>This course is an intensive two-week, face-to-face residential/bootcamp, which covers how data is brought together from different sources (text, audio, images etc) to enrich data science analysis. The course focuses on two aspects: parsing images using Computer Vision and parsing language using Natural Language Processing (NLP). Learners will gain hands-on experience in using Computer Vision and NLP and will explore how to extract information from a variety of formats to inform data analysis.</p>
YEAR 3	
ADVANCES IN DATA SCIENCE	<p>This course will explore cutting-edge advances in data science, such as artificial intelligence, deep learning, advanced computer vision and natural language processing, and meta-analysis. Learners will explore the topics through real-world case studies.</p>
BIG DATA	<p>This course explores the challenges associated with interrogating, storing and analysing big (typically unstructured) data. Apprentices will conceptually explore how to build large-scale information storage</p>

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	structures using distributed storage facilities and data warehouses. The challenges of data quality assurance, storage reliability, and working with very large data volumes will be examined in detail. Learners will study how to model big data and use analytic services provided by host institutions. This course uses nosql to interrogate unstructured data sets and tools such as candela and chart studio to visualise analytics for big data
SOFTWARE ENGINEERING	This course covers the foundations of software engineering, including software development life cycle models (e.g., waterfall, spiral, agile), requirements analysis, user-centred design, software design principles and patterns, testing (functional testing, structural testing, testing strategies), code refactoring and debugging, software architecture and design, and integration and deployment.
IMPLEMENTING DATA SCIENCE	This course offers apprentices an opportunity to learn how to approach data analysis problems in a systematic manner and to learn how to design data analysis pipelines, as well as how to implement them at scale in the context of real-world problems. Data science is at the intersection of statistics, machine learning, and software development. Data analysis problems are solved in a series of datacentric steps: data acquisition, data cleaning, data transformation, data modelling, and data visualization.
EPA PREPARATION - GATEWAY	
DATA SCIENCE SYNOPTIC PROJECT AND END POINT ASSESSMENT	This course is a data science project, conceived and executed by the apprentice in their place of work. The project will demonstrate a high-level of technical and analytical skill, aligned to achieving organisational goals and enabling effective institutional change. The project may focus on any element of the data science workflow and will culminate with a dissertation. The dissertation will combine technical research with organisational needs and project management and will enable the learner to deepen his or her understanding of a particular area of data science. Project assessment includes a compulsory knowledge test and professional discussion (<i>viva voce</i> examination) at the end of the process, as per the end point assessment for apprenticeships (see EPA for Data Scientist [Integrated Degree] apprenticeship, for more details).

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THE ADDED VALUE OF NCH AT NORTHEASTERN SUPPORT

We provide KPI-driven wrap-around support for learning on and off-the-job, working with line managers and mentors to guide learners from entry level knowledge to demonstrating full competence in their role.

SUPPORT FROM DAY 1

NCH provides a comprehensive induction, including readiness for work training, for the apprentice, and line manager training. Tri-partite reviews take place every 6-8-weeks to maintain progress and ensure a successful outcome.

TEACHING AND TRAINING FROM INDUSTRY EXPERTS

Backed by our parent institution Northeastern University in Boston (Mass., USA) our apprenticeship has been designed with industry experts, world-class research-active academics, and world leaders in experiential and on-line learning.

PROGRESS REVIEWS, FEEDBACK AND ACTION PLANNING

Monthly feedback to the employer, frequent progress review sessions with the Academic team, and 6-8-weekly Tri-partite review sessions, provide comprehensive progress monitoring, and allows NCH to collate the evidence that an apprentice's skills are increasing.

Apprentices are prepared for end point assessment (EPA) throughout the apprenticeship, undertaking activities at work and with NCH that will demonstrate skills and provide opportunities to gain experience of the EPA.

WHERE TO GO FOR MORE INFORMATION

EMPLOYERS - CONTACT EMMA KELLY AT emma.kelly@NCHLondon.ac.uk OR CALL ON 0204 5040184

EMPLOYEES - EMAIL US AT apprenticeships@NCHLondon.ac.uk

GENERAL INFORMATION - <https://www.nchlondon.ac.uk/study/apprenticeships/>

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FIND OUR MORE ABOUT THE DATA SCIENTIST (INTEGRATED DEGREE) APPRENTICESHIP

If you would like to read more about the knowledge, skills and experience that you will gain from this apprenticeship and how these are assessed click on the following links:

Read about the
Apprenticeship
Standard

HERE

<https://www.instituteforapprenticeships.org/apprenticeship-standards/data-scientist-integrated-degree/>

Read about the End-

point Assessment

HERE

https://www.instituteforapprenticeships.org/media/1973/st0585_data-scientist-integrated-degree_l6_ap-for-publication_230718.pdf