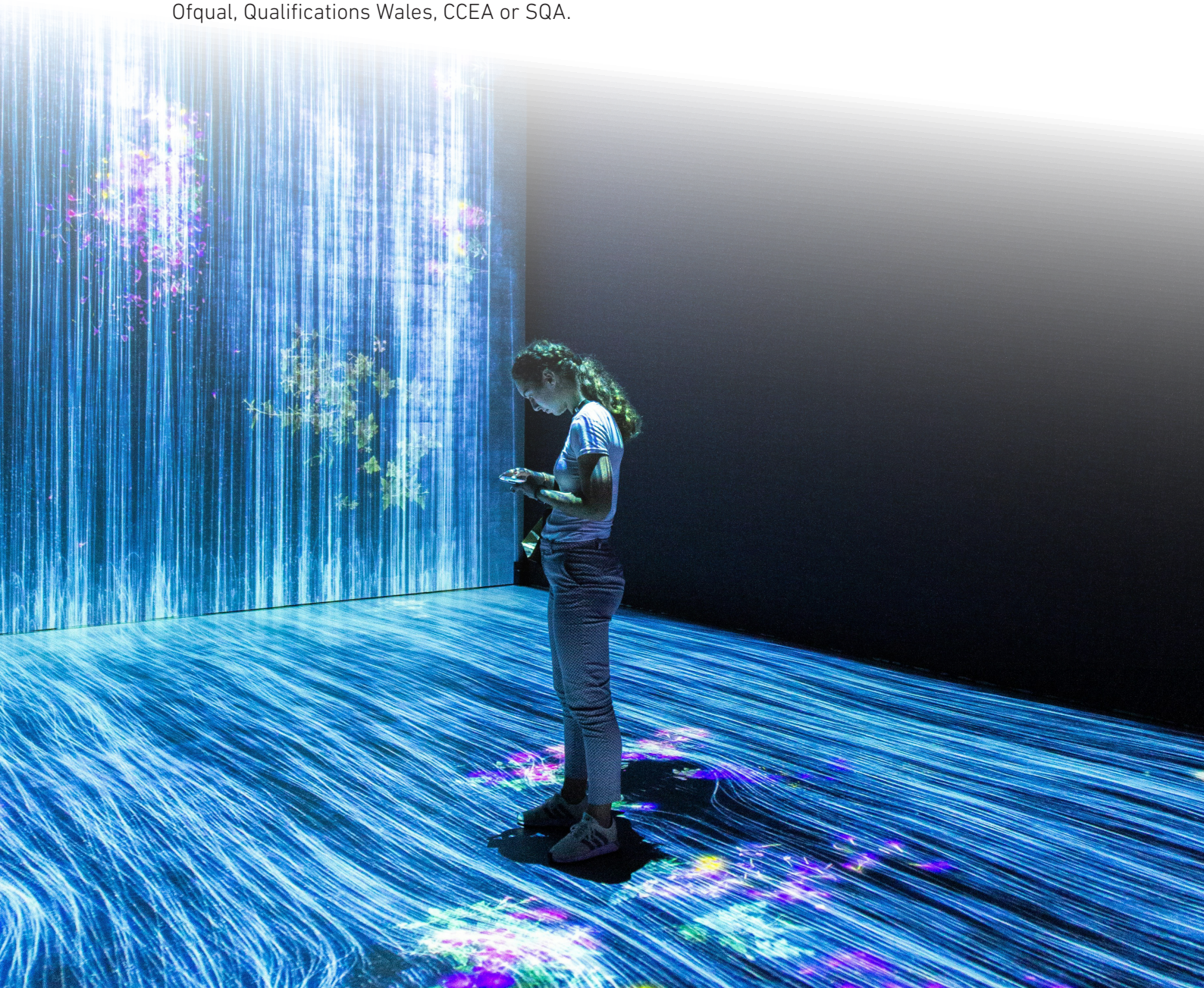
The Chartered Institute for IT

BCS ESSENTIALS CERTIFICATE IN ARTIFICIAL INTELLIGENCE V2.0

This professional certificate is not regulated by the following United Kingdom Regulators - Ofqual, Qualifications Wales, CCEA or SQA.



CONTENTS

INTRODUCTION AND OVERVIEW

INTRODUCTION

Artificial intelligence (AI) has boomed in popularity and use in recent years and is now widely used. It's transforming industry and the future of technology by enabling systems to learn and mimic human intelligence.

The BCS Essentials Certificate in Artificial Intelligence provides an introduction into key AI terminology and tools and what they mean for society.

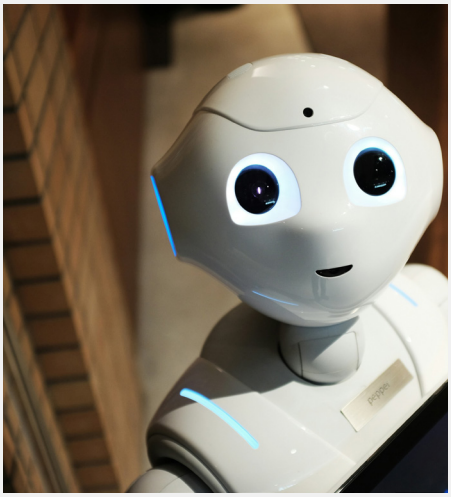
The syllabus covers the following aspects of AI: its history, ethical and sustainable AI challenges, key AI enablers like data, and the future of AI-human interaction in the workplace.

This certification offers a broad yet straightforward first step into navigating the constantly evolving AI landscape.

LEARNING OUTCOMES

Upon completion of the certificate, candidates will recognise:

- Key terminology in AI.
- Key legal, ethical and regulatory considerations in AI.
- The use of AI in an organisation.
- The potential future impact of AI on society and business.



QUALIFICATION SUITABILITY AND OVERVIEW

The BCS Essentials Certificate in Artifical intelligence is suitable for individuals with an interest in exploring the basic functions and abilities of AI, and how these could impact an organisation.

Roles with a particular interest may be; developers, project managers, product managers, chief information officers, chief finance officers, change practitioners, business consultants and leaders of people.

There are no specific entry requirements for this exam, although candidates with no prior knowledge of AI subject areas are recommended to spend more time on independent study.

Candidates can study for this award by attending a training course provided by a BCS accredited training provider or through self-study.

TOTAL QUALIFICATION TIME	GUIDED LEARNING HOURS	INDEPENDENT LEARNING	ASSESSMENT TIME
30	6 hours	23+ hours	30 minutes

TRAINER CRITERIA

It is recommended that to deliver this award effectively, trainers should:

- Hold the BCS Essentials Certificate in Artifical Intelligence.
- Have 3 years experience of work or study in a related subject.
- Have teaching or training experience.

SFIA LEVELS

This award provides candidates with the level of knowledge highlighted within the table, enabling them to develop the skills to operate successfully at the levels of responsibility indicated.

LEVEL	LEVELS OF KNOWLEDGE	LEVELS OF SKILLS AND RESPONSIBILITY (SFIA)
K7		Set strategy, inspire and mobilise
K6	Evaluate	Initiate and influence
K5	Synthesise	Ensure and advise
K4	Analyse	Enable
K3	Apply	Apply
K2	Understand	**Assist**
K1	**Remember**	**Follow**

SFIA***PLUS***

This syllabus has been linked to the SFIA knowledge, skills and work activities required at level 2 for an individual working in the following subject areas.

KSCA5

The ability to harvest, clean, curate, manage, process and manipulate data in a variety of formats.

KSCA8

Knowledge and understanding of the development of intelligent agents, able to mimic cognitive functions, react to stimuli, and improve automatically through experience and the use of data.

KSD21

Methods and techniques for the assessment and management of business risk including safety-related risk.

Click HERE for further information regarding the SFIA Levels.

SYLLABUS

SYLLABUS

1. AN INTRODUCTION TO AI AND HISTORICAL DEVELOPMENT 15% K1

1.1 State the definitons of key artificial intelligence terms.

Indicative content

a. Human intelligence - "The mental quality that consists of the abilities to learn from experience, adapt to new situations, understand and handle abstract concepts, and use knowledge to manipulate one's environment."
b. Artifical intelligence - "Intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals."
c. Machine learning - "The study of computer algorithms that allow computer programs to automatically improve through experience".
d. Scientific method - "An empirical method for acquiring knowledge that has characterised the development of science."

Guidance

To build their understanding of AI, it is essential for candidates to recognise the definitions of the key artificial intelligence terms listed.

1.2 Identify key milestones in the development of artifical intelligence.

Indicative content

a. Asilomar principles.
b. Dartmouth conference of 1956.
c. AI winters.
d. Big data and the internet of things (IoT).
e. Large language models (LLMs).

Guidance

Candidates will be able to identify these key milestones in the evolution of AI.

Asilomar principles are a set of guidelines for responsible AI development. The Dartmouth conference which took place in 1956, is considered to be the starting point of AI as a field of practice. Candidates should understand the concept of AI winters, from 1974-1980 and from 1987-1993, through to the rise of big data and the development of generative AI.

Big data refers to the access to enormous amounts of data from a wide variety of sources, including social media, sensors, and other connected devices. Candidates should understand the widespread use of large language models in 2022, which made AI a matter of public interest like never before.

1.3 Identify different types of AI.

Indicative content

a. Narrow / weak AI.

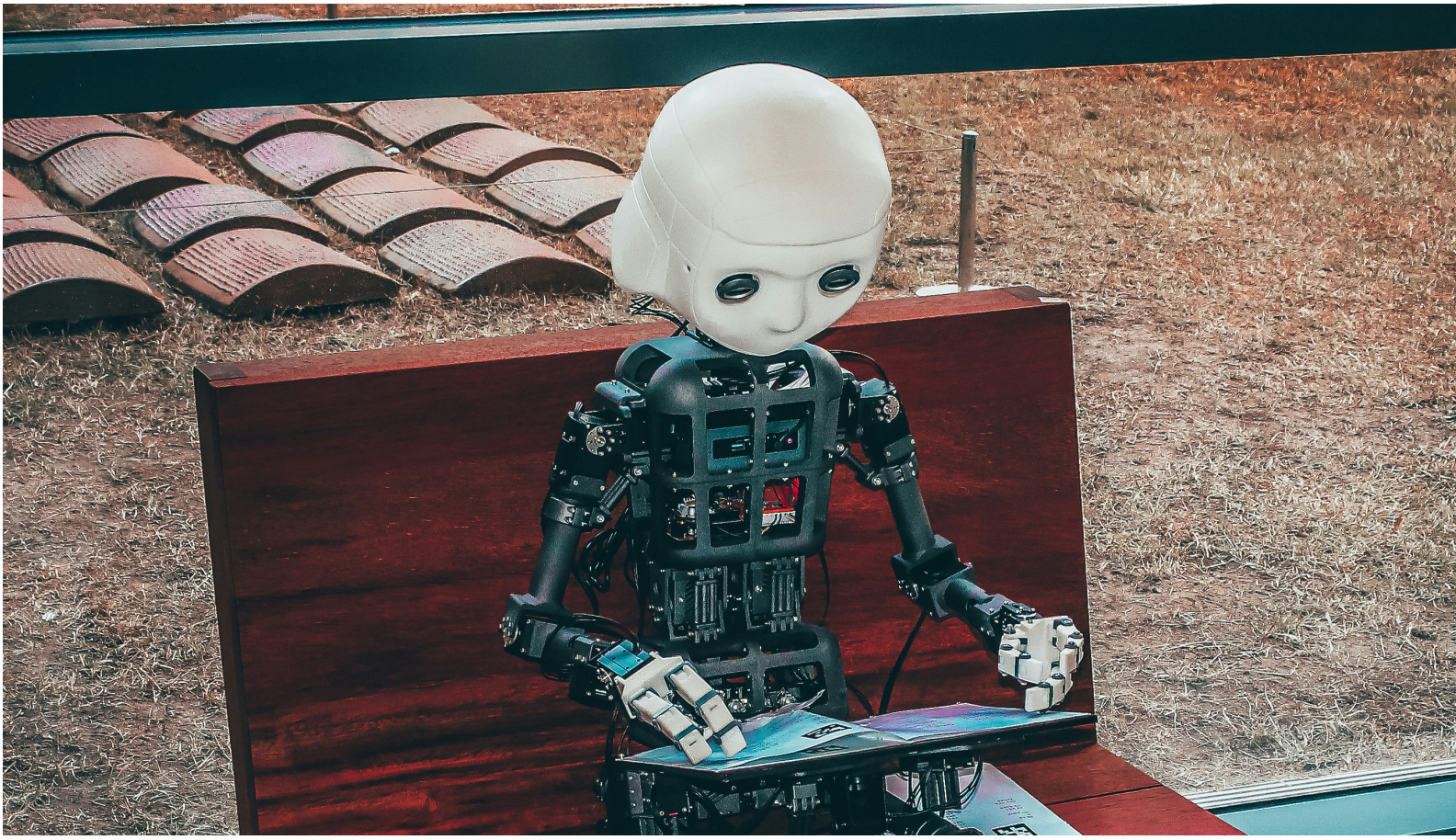
b. General / strong AI.

Guidance

Candidates will be able to identify examples of narrow AI (Weak AI) and general AI (Strong AI).

Narrow AI (ANI) also known as weak AI, is task-specific and operates within well-defined domains. Examples include: image recognition, speech recognition, language translation and virtual assistants.

General AI (AGI) also known as strong AI aims to replicate human intelligence. It is the hypothetical intelligence of a machine that has the capacity to understand or learn any intellectual task that a human being can understand or learn.



SYLLABUS

2. ETHICAL AND LEGAL CONSIDERATIONS 15% K2

2.1 Identify the role of ethics in AI.

Indicative content

a. What is ethics?
b. Differences between ethics and law.

Guidance

AI offers huge opportunities, however there are also commonly held ethical concerns about its increasingly widespread use.

Ethics relate to the moral principles that govern a person's behaviour or the conducting of an activity.

Candidates will be able to state the general definition of ethics and recognise the differences between ethics and law.

2.2 State key ethical concerns in AI.

Indicative content

a. Ethical concerns of AI;
   - Potential for bias, unfairness and discrimination.
   - Data privacy and protections.
   - Impact on employment and the economy.

Guidance

Candidates will be able to state and identify common ethical concerns in the use of AI, such as the potential for bias in training data leading to biased output, data protection and privacy concerns, and the long-term impact on jobs.

2.3 Identify guiding principles in the use of ethical AI.

Indicative content

a. UK AI Principles and other relevant legislation.
   - Safety, security and robustness.
   - Transparency and explainability.
   - Fairness.
   - Accountability and governance.
   - Contestability and redress.

b. AI governance models including ISO42001.

Guidance

Candidates will be able to identify the key principles and models as listed.

SYLLABUS

3. ENABLERS OF ARTIFICAL INTELLIGENCE
15% K1/K2

3.1 List common examples of AI.

Indicative content

a. Human compatible.
b. Internet of things.
c. Generative AI tools.

Guidance

There are countless examples of AI in everyday life, and candidates should be able to list examples of those outlined.

3.2 Identify robotics in AI.

Indicative content

a. Definition of robotics. "a machine that can carry out a complex series of tasks automatically, either with or without intelligence."
b. Intelligent or non-intelligent.
c. Types of robots:
    - Industrial.
    - Personal.
    - Autonomous.
    - Nanobots.
    - Humanoids.
d. Robotic process automation (RPA).

Guidance

Candidates should be able to state the definition of robots as outlined.

They should know that RPA refers to a machine that can carry out a complex series of tasks automatically, either with or without intelligence, usually with a goal of improving processes.

Various types of robots exist, and candidates should be familiar with each of these.

3.3 Describe machine learning.

Indicative content

a. Machine learning - "The field of machine learning is concerned with the question of how to construct computer programs that automatically improve with experience." Tom Mitchell
b. Deep learning - a multi-layered neural network.

Guidance

Candidates should understand that machine learning is a subset of AI and that deep learning is a type of machine learning.

AI itself is not a new concept; machine learning is another step in the evolution of AI. Machine learning is used within data science and is the application of algorithms to derive insight from data and big data.

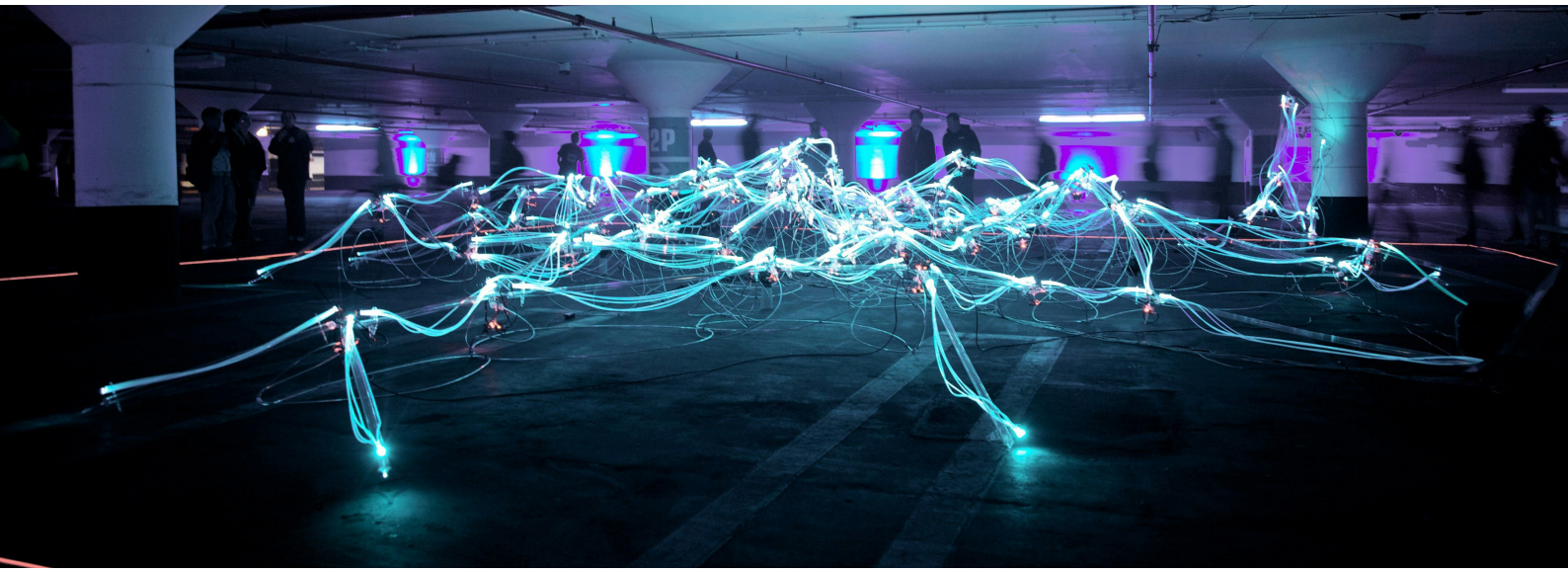
3.4 Identify common machine learning concepts.

Indicative content

a. Prediction.
b. Object recognition.
c. Classification.
d. Clustering.
e. Recommendations.

Guidance

Machine learning can be used in several contexts to complete different types of tasks. Candidates should be encouraged to explore different examples and applications of machine learning.



SYLLABUS

4. FINDING AND USING DATA IN ARTIFICIAL INTELLIGENCE 20% K1

4.1 State key data terms.

Indicative content

a. Big data - "extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations." (Dialogic.com)
b. Data visualisation - "the representation of data through use of common graphics, such as charts, plots, infographics and even animations." (IBM)
c. Structured data is data files organised sequentially or organised serially in a tabular format.
d. Semi-structured data is data that does not follow the tabular structure of a relational database, but does have some defining or organisational properties which allow it to be analysed.
e. Unstructured data is data that does not follow any pre-defined order or structure.

Guidance

Candidates should be able to identify the key terminologies listed and recognise them in context.

4.2 Identify the characteristics of data quality.

Indicative content

a. 5 data quality characteristics:
   - Accuracy - is it correct?
   - Completeness - is it all there?
   - Uniqueness - is it free from duplication?
   - Consistency - is it free from conflict?
   - Timeliness - is it current and available?

Guidance

Candidates should be able to list the 5 characteristics of good quality data and the importance of each. Good quality data, which demonstrates all five of these characteristics, provides accurate information about its subject, and in turn, this helps to inform good decision making and reliable business intelligence.

4.3 State the risks associated with handling data in AI.

Indicative content

a. Bias.
b. Misinformation.
c. Processing restrictions.
d. Legal restrictions.

Guidance

Throughout the data lifecycle, there are various risks to consider, including how data is legally gathered and stored, to ensuring it is processed in line with its intended use, and is free from bias or misinformation.

Candidates should be aware of these risks and recognise examples of them in context.

4.4 Identify data visualisation techniques and tools.

Indicative content

a. Written.
b. Verbal.
c. Pictorial.
d. Sounds.
e. Dashboards and infographics.
f. Virtual and augmented reality.

Guidance

Data visualisation is required to format data in a manner which is meaningful and digestible to the intended audience. Good data visualisation means that data can be consumed, analysed, summarised, and used easily, which supports decision making.

4.5 State key generative AI terms.

Indicative content

a. Generative AI - "Refers to deep-learning models that can generate high-quality text, images, and other content based on the data they were trained on." (IBM)
b. Large language models (LLMs) "Deep learning algorithms that can recognise, summarise, translate, predict, and generate content using very large datasets." (IBM)

Guidance

Candidates should be able to state the definitions of generative AI and large language model and identify them in use.

4.6 Identify the use of data in the Machine Learning process.

Indicative content

a. Stages of the Machine Learning process:
- Analyse the problem.
- Data Selection.
- Data Pre-processing.
- Data Visualisation.
- Select a Machine Learning model (algorithm).
  - › Train the model.
  - › Test the model.
  - › Repeat (Learning from experience to improve results).
- Review.

Guidance

The Machine Learning process allows us to define the solution based on the problem that has been identified through the process of data selection, pre-processing, visualisation and testing of data with specific algorithms.

SYLLABUS

5. USING AI IN YOUR ORGANISATION
20% K2

5.1 Identify opportunities for AI in your organisation.

Indicative content

a. Opportunities for automation.
b. Repetitive tasks.
c. Content creation – generative AI.

Guidance

Candidates should be able to identify simple opportunities for AI in an organisation, such as an opportunity to automate a process, or minimise the human input into a repetitive task.

5.2 Identify project management approaches.

Indicative content

a. Agile.
b. Waterfall.
c. Hybrid.

Guidance

Candidates should be able to identify the key characteristics of these project management approaches and their suitability for a given project.

5.3 Identify governance activities associated with implementing AI.

Indicative content

a. Compliance.
b. Risk management.
c. Lifecycle governance.

Guidance

The three areas that governance must address are: compliance to satisfy regulations; risk management to proactively detect and mitigate risk; and lifecycle governance to manage, monitor and govern AI models.

(10 things governments should know about responsible AI, IBM 2024)

SYLLABUS

6. FUTURE PLANNING AND IMPACT - HUMAN PLUS MACHINE 15% K1/2

6.1 Describe the roles and career opportunities presented by AI.

Indicative content

a. AI specific roles including: machine learning engineer, data scientist, AI research scientist, computer vision engineer, natural language processing (NLP) engineer, robotics engineer, AI ethics specialist, AI anthropologist.
b. Opportunities for existing roles.
   - Additional training and knowledge.
   - Improved efficiency.
   - Automation.

Guidance

AI is a rapidly evolving field, and new roles emerge regularly.

Candidates will be able to describe the various career opportunities evolving in this field – they will not be assessed on the names or duties of specific job roles.

6.2 Identify AI uses in the real world.

Indicative content

a. Marketing.
b. Healthcare.
c. Finance.
d. Transportation.
e. Education.
f. Manufacturing.
g. Entertainment.
h. IT.

Guidance

AI tools and services are now part of the real world.

Candidates will be able to describe practical examples of AI applications in different sectors.

6.3 Identify AI's impact on society.

Indicative content

a. Benefits of AI.
b. Challenges of AI.
c. Potential problems with AI.
d. Societal impact.
e. Environmental impact – sustainability, climate change and environmental issues.
f. Economic impact – Job losses, retraining for new AI roles.

Guidance

AI is evolving rapidly. This rapid technological advancement comes with benefits and challenges at societal level. Candidates should be able to identify these benefits and challenges and their impact on society.

Benefits include: reducing human error through task automation, processing and analysing vast amounts of data for informed decisions (AI algorithms) and AI-powered tools in assistance in in medical diagnosis.

Challenges include ethical concerns about algorithm bias and privacy, job loss, lack of creativity and empathy, security risks from hacking, socio-economic inequality, market volatility because of AI-driven trading algorithms and AI systems rapid self-improvement.

6.4 Describe the future of AI.

Indicative content

a. Human and machine working together – augmented roles.
b. Near and long-term developments in AI e.g. Increased business automation, chatbots and digital assistants.
c. Ethical AI.

Guidance

The future of AI will continue to be shaped by technological advancements e.g. increase in data availability, better algorithms, higher computing power.

Candidates should be able to Identify examples of potential future advancement and direction of AI.

EXAMINATION FORMAT

This award is assessed by completing an invigilated online exam that candidates will only be able to access at the date and time they are registered to attend.

Adjustments and/or additional time can be requested in line with the BCS reasonable adjustments policy for candidates with a disability or other special considerations, including English as a second language.

TYPE

20 MULTIPLE CHOICE QUESTIONS

DURATION

30 MINUTES

SUPERVISED

YES

THIS AWARD WILL BE SUPERVISED

OPEN BOOK

NO

(NO MATERIALS CAN BE TAKEN INTO THE EXAMINATION ROOM)

PASSMARK

(65%)

13/20

DELIVERY

ONLINE FORMAT ONLY

QUESTION WEIGHTING

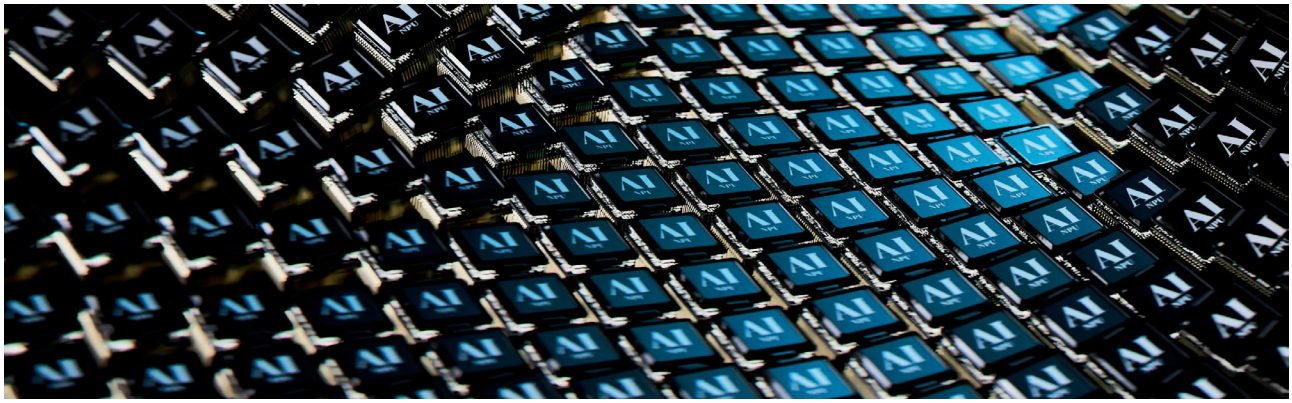
Each primary subject heading in this syllabus is assigned a percentage weighting. The purpose of this is:

- Guidance on the proportion of content allocated to each topic area of an accredited course.
- Guidance on the proportion of questions in the exam.

Syllabus Area		
1	Introduction to AI and historical development	15%
2	Ethical and legal considerations	15%
3	Enablers of AI	15%
4	Finding and using data in AI	20%
5	Using AI in your organisation	20%
6	Future planning and impact - human plus machine	15%

Question Type

All questions are single mark, multiple choice.



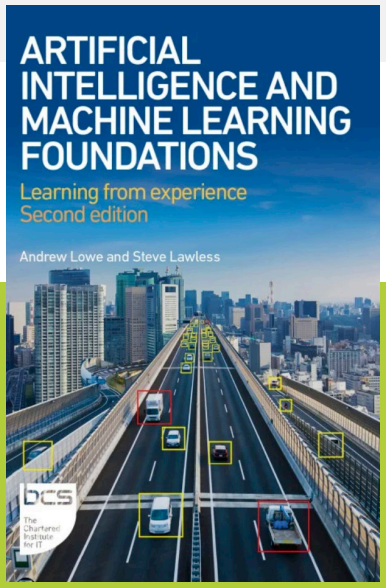
RECOMMENDED READING

The following titles are suggested reading for anyone undertaking this award.
Candidates should be encouraged to explore other available sources.

TITLE: Artificial Intelligence Foundations: Learning from experience
AUTHOR: Andrew Lowe and Steve Lawless
PUBLISHER: BCS
PUBLICATION DATE: *February 2021*
ISBN: *9781780175287*

Note - second edition due for publication October 2024.

TITLE: Getting Started with ChatGPT and AI Chatbots: An introduction to generative AI tools
AUTHOR: Mark Pesce
PUBLISHER: BCS
PUBLICATION DATE: *December 2023*
ISBN: *9781780176413*



USING BCS BOOKS

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DOCUMENT CHANGE HISTORY

Any changes made to the syllabus shall be clearly documented with a change history log. This shall include the latest version number, date of the amendment and changes made. The purpose is to identify quickly what changes have been made.

VERSION 2.0	CHANGES MADE
1.0 January 2025	All learning objectives and topics changed to reflect latest industry developments. Updated reading list. Amended information relating to AI winters in LO1.2 Corrected page numbering.
1.1 March 2025	Very minor updates made to 1.2, 3.1 and 4.4 to correct wording/fomatting

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