

# **BCS FOUNDATION CERTIFICATE IN THE ETHICAL BUILD OF AI**

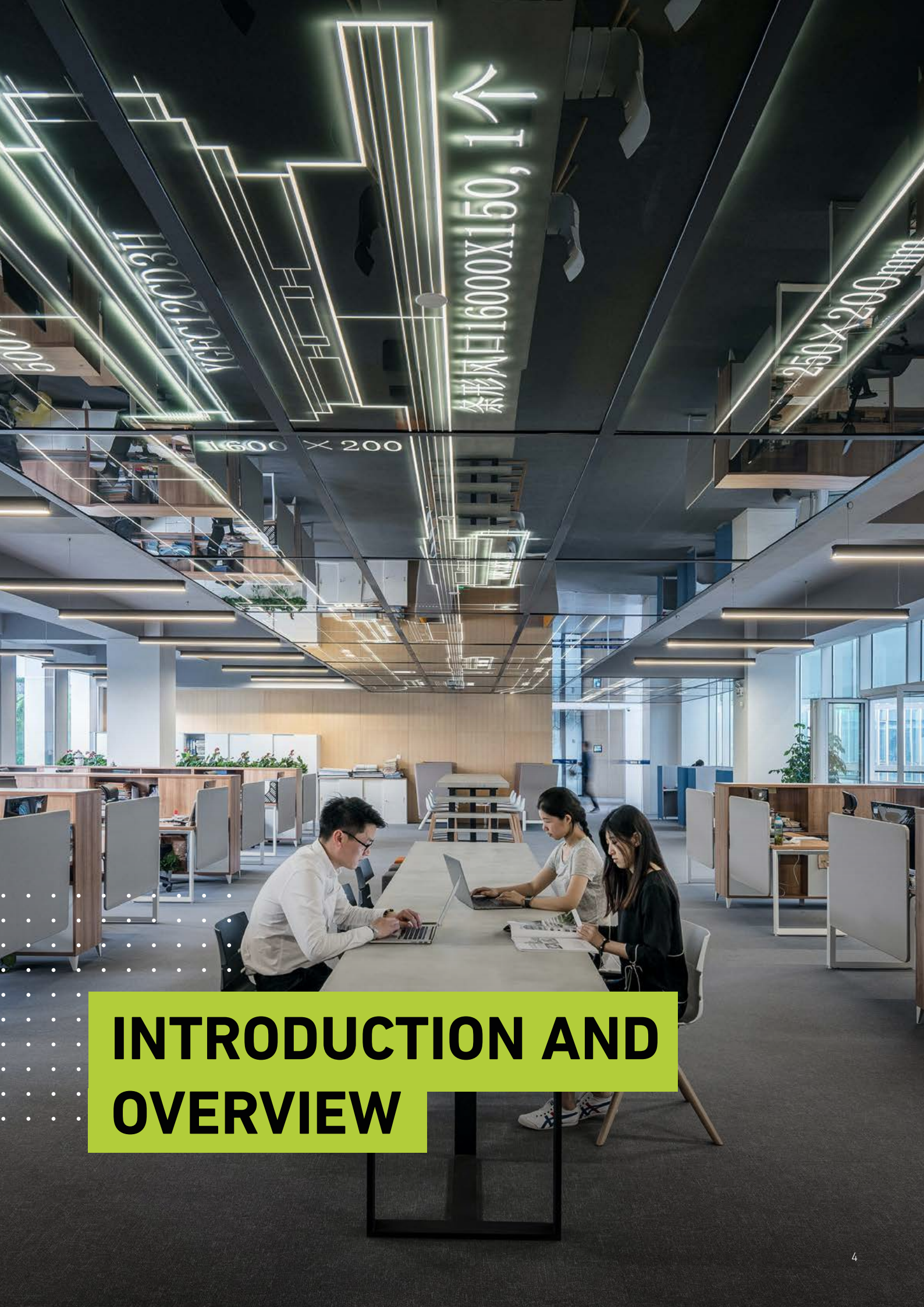
SYLLABUS



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# INTRODUCTION AND OVERVIEW

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# INTRODUCTION

The transformative power of Artificial Intelligence offers a wealth of opportunity. From healthcare to finance to manufacturing and industry, AI's ability to analyse vast datasets, derive highly accurate insights and automate complex tasks has helped to drive both organisational and societal change. Furthermore, its future potential to help mankind innovate and overcome difficult global challenges appears vast and unparalleled.

Yet, despite its promise, serious concerns about the ethical implications of AI persist. There are legitimate worries about the potential for biased and unfair decision-making, a lack of

transparency and accountability in the outputs of AI systems, and the difficulty in maintaining security and confidentiality of personal data used in AI. For many, these concerns far outweigh the potential benefits.

This interactive learning programme takes you on a journey through the ethical considerations required to help ensure that AI systems are carefully designed, trained, tested and monitored so that the well-being and rights of individuals, and society as a whole, are always placed at the forefront of decision-making.

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## LEARNING OUTCOMES

By completing this CPD course and assessment activities, learners will develop a practical understanding of, and skills relating to:

- The need for ethical and regulatory standards in AI.
- The use of different AI systems and their impact on the business and society.
- The lawful and ethical collection and use of data.
- The data, infrastructure and environmental considerations of AI systems.
- The ethical considerations in developing, testing and running AI.



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# QUALIFICATION SUITABILITY AND OVERVIEW

The Foundation Certificate in the Ethical Build of AI consists of five self-study online learning modules. Upon completion of the modules, there is the opportunity to take an exam to assess content knowledge and earn certification.

This professional learning programme is relevant to anyone wanting to further their understanding of the ethical considerations of designing, training, testing and monitoring AI systems, and requires no prior learning.

There are no formal prerequisites or entry requirements to be able to undertake the exam, but candidates should have a good standard of English comprehension.

This is a foundation level certificate that will:

- develop an understanding of ethical behaviour and how this may be threatened.
- explore why both ethics and regulation are required in managing AI risk.
- enable learners to explain both the benefits and ethical concerns of AI.
- develop an understanding of governance and security considerations when using data in AI systems.
- enable learners to explain the key processes and areas of scrutiny when training, testing and running AI systems.

TOTAL QUALIFICATION TIME	SELF-STUDY HOURS	MOCK ASSESSMENT TIME	FINAL ASSESSMENT TIME
9.5 hours	7.5 hours	1 hour	1 hour

# SFIA LEVELS

This certificate 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)
<b>K7</b>		Set strategy, inspire and mobilise
<b>K6</b>	Evaluate	Initiate and influence
<b>K5</b>	Synthesise	Ensure and advise
<b>K4</b>	Analyse	Enable
<b>K3</b>	<b>Apply</b>	<b>Apply</b>
<b>K2</b>	<b>Understand</b>	<b>Assist</b>
<b>K1</b>	<b>Remember</b>	<b>Follow</b>

## SFIAPLUS

This syllabus has been linked to the SFIA knowledge, skills and behaviours required at level 3 for an individual working in the following areas.

## KSB01

Acquiring a proper understanding of a problem or situation by breaking it down systematically into its component parts. Selecting the appropriate method/tool to resolve the problem and reflecting critically on the result, so that what is learnt is identified and assimilated.

## KSB13

Understanding the needs of the internal or external customer and keeping these in mind when taking actions or making decisions.

## KSB17

Applying specific quality standards to all tasks undertaken to ensure that deliverables are accurate and complete.

## KSB22

Establishing relationships, contributing to an open culture and maintaining contacts with people from a variety of backgrounds and disciplines. Effective, approachable and sensitive communicator in different communities and cultures. Ability to adapt style and approach to meet the needs of different audiences.

## KSB24

Working collaboratively with others to achieve a common goal.

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**KSCA3**

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Familiar with methods, techniques and technologies for ingesting, securing, processing and using data and information within and beyond an organisation.

**KSCA5**

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

**KSCA8**

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

**KSC23**

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Testing techniques used to plan and execute software tests of all application components (functional and non-functional) to verify that the software satisfies specified requirements and to detect errors.

**KSC36**

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Principles, methods, techniques and tools for the effective management of the testing process and the execution of tests throughout the lifecycle of development or integration projects.

**KSC51**

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Aware of the discipline associated with data sets so large and/or complex that traditional data processing applications are inadequate. The data files may include structured, unstructured and/or semi-structured data, such as unstructured text, audio, video, etc. Challenges include analysis, capture, curation, search, sharing, storage, transfer, manipulation, analysis, visualization and information privacy.

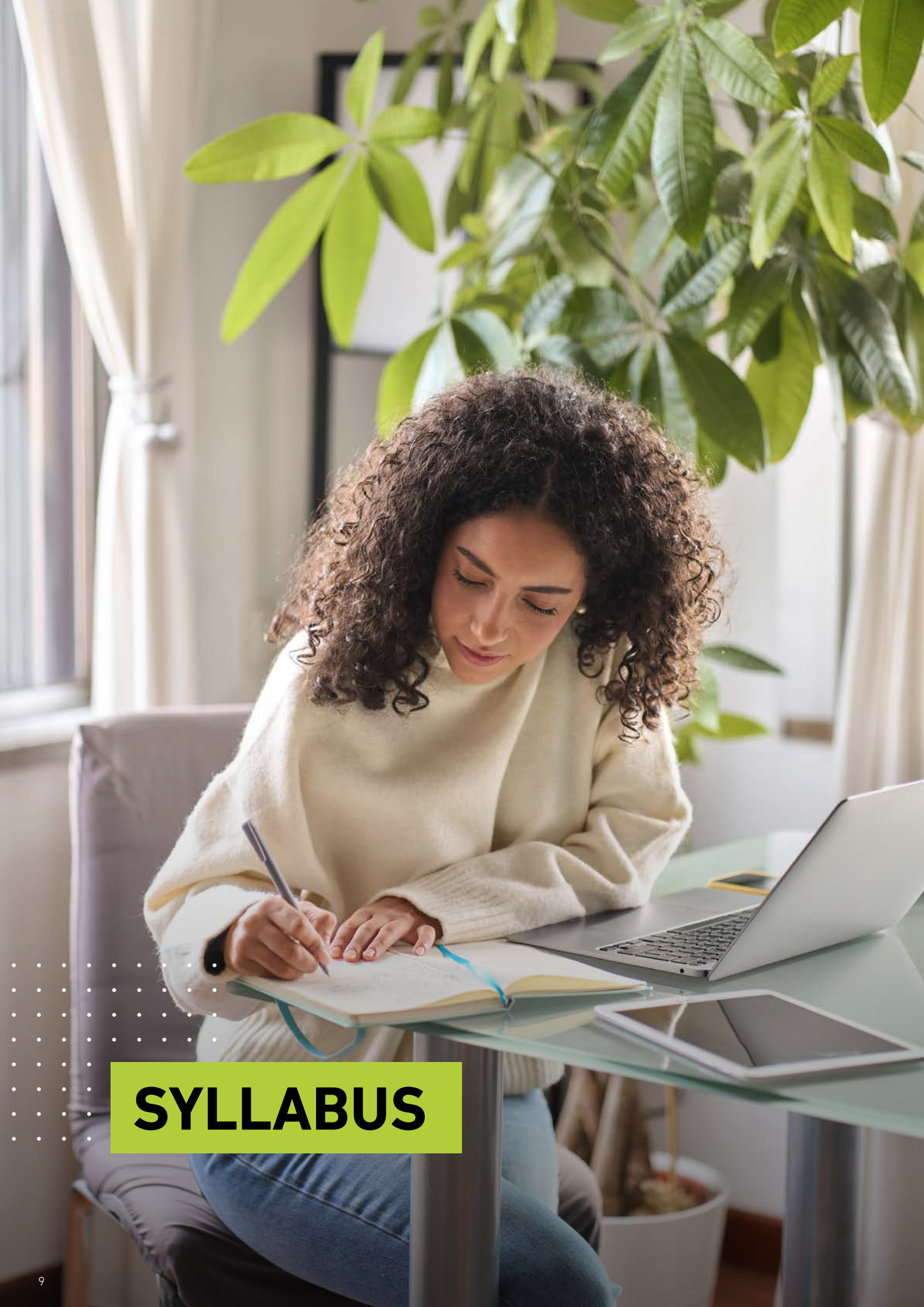
**KSD11**

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Aware of relevant national and international legislation.

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For further information regarding the SFIA Levels, please visit:  
<https://www.bcs.org/it-careers/sfiaplus-it-skills-framework/>



# SYLLABUS



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# SYLLABUS

## 1. AN ETHICAL FRAMEWORK FOR USING AI (20%) K2

### 1.1 Explain what it means to be an ethical IT professional.

#### Indicative content

- a. What are ethics?
- b. The BCS code of conduct.
- c. Professional competency.
- d. Continuing professional development.

#### Guidance

As IT professionals, we have a duty to ensure that we make IT good for society. Learners should understand what it means to act ethically and to be professionally competent, and how the BCS code of conduct, as well as our own professional development, help guide this.

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### 1.2 Identify threats to our ethical behaviour and safeguards to mitigate them.

#### Indicative content

- a. Threats:
  - Self-interest.
  - Self-review.
  - Conflict of interest.
  - Intimidation.
  - Advocacy.
- b. Safeguards:
  - Identify.
  - Evaluate.
  - Address.

#### Guidance

The ability to act ethically can be threatened in a number of ways, leading to decisions that are not in line with the expectations of ethical behaviour. Safeguards are the steps that can be taken to mitigate these threats. Learners should be aware of the threats to ethical behaviour and the ways in which they can be minimised.

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### 1.3 Explain the guiding principles of ethical AI.

#### Indicative content

- a. UK AI principles:
  - Safety, security and robustness.
  - Transparency and explainability.
  - Fairness.
  - Accountability and governance.
  - Contestability and redress.
- b. Floridi & Cowls' principles:
  - Beneficence.
  - Non-maleficence.
  - Autonomy.

#### Guidance

There are a number of different sources of principles that guide ethical AI development and use, but they share a common set that are generally accepted. Following these principles helps to ensure that AI development is ethical by design. Learners should understand these guiding principles and be able to explain their impact in the ethical development and use of AI.

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### 1.4 Explain the role of regulation in managing AI risk.

#### Indicative content

- a. Ethics vs regulation.
- b. The need for regulation.
- c. The AI regulation landscape.
- d. The consequences of unregulated AI.

#### Guidance

Ethics provide a set of shared values and behaviours that guide us, whereas regulation ensures there is clear legal accountability that governs the effective management of the risks associated with AI. Learners should understand the need for regulation that is pro-innovation but which takes a risk-based approach. They should have an understanding of the current and proposed regulations that will influence the development and use of AI in the UK and the EU.

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### 1.5 Explain the use of the DIODE framework in ensuring an ethical by design approach to AI.

#### Indicative content

- a. Define questions.
- b. Issues analysis.
- c. Options evaluation.
- d. Decision determination.
- e. Explanations dissemination.

#### Guidance

DIODE is a framework that uses flowcharts and checklists to help assess ethical issues in new technologies. Learners should understand the five stages of the framework and the way in which it can be applied to guide ethical decision making.

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## 2. INNOVATING ETHICALLY WITH AI TO DRIVE BUSINESS CHANGE (20%) K2

### 2.1 Explain the benefits that AI can provide in driving organisational and societal change.

#### Indicative content

- a. Automation of mundane or repetitive tasks.
- b. Increased efficiency and productivity.
- c. Personalisation of content.
- d. Advancements in healthcare.
- e. Helping in the fight against climate change.
- f. Improved accessibility.
- g. Enhanced security and fraud detection.

#### Guidance

Artificial intelligence is currently experiencing unprecedented growth. It offers a wealth of benefits in driving organisational and societal transformation, from the automation of mundane tasks, to helping in the global fight against climate change.

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### 2.2 Describe subsets of AI and examples of their use.

#### Indicative content

- a. Machine learning (supervised and unsupervised).
- b. Computer vision.
- c. Natural language processing (generative AI).
- d. Robotics.

#### Guidance

The field of AI encompasses a wide range of technologies and applications that can be broken down into the more general subsets listed. Learners should understand the different broad subsets of AI and examples of their practical uses in today's world.

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### 2.3 Describe common ethical concerns about the development and use of AI.

#### Indicative content

- a. Ethical dilemmas.
- b. Loss of human control vs increased AI autonomy.
- c. Environmental impact.
- d. Unintended consequences.
- e. AI data reinforcing inequalities or biases in society.
- f. Job displacement.
- g. Security risks.
- h. Deception (e.g. fraudulent activities, deepfakes)
- i. Negative impacts on human rights.
- j. Protection of intellectual property rights.
- k. Lack of accessibility.

#### Guidance

While AI offers huge opportunities, there are also commonly held ethical concerns about its increasingly widespread use. Learners should understand the different areas of concern and their potential impact.

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### 2.4 Describe common stages within the AI lifecycle.

#### Indicative content

- a. Understand the problem you are trying to solve.
- b. Data collection, preparation and analysis.
- c. Feature engineering.
- d. Model training.
- e. Evaluation.
- f. Deployment.
- g. Monitoring and maintenance.

#### Guidance

Although numerous AI technologies exist, the lifecycle of their development and use follow common stages and processes, always starting with an understanding of the problem at hand. Learners should understand the stages, as listed, and the high-level activities that take place at each stage.



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## 3. DATA PRIVACY, GOVERNANCE AND POLICY IN AI (20%) K2

### 3.1 Describe key aspects of data governance.

#### Indicative content

- a. Data discovery.
- b. Data classification.
- c. Policy.
- d. Rules.
- e. Metadata.

#### Guidance

Data governance is a comprehensive approach to managing and protecting an organisation's data and ensuring its continued accuracy, reliability and accessibility. Learners should have an understanding of each aspect of data governance listed and how this helps to support AI development.

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### 3.2 Explain the challenges of working with different types of data.

#### Indicative content

- a. Data volume.
- b. Data variety.
- c. Data quality.
- d. Data integration.
- e. Data storage and retrieval.
- f. Unwanted bias.
- g. Data governance and compliance.

#### Guidance

Huge volumes of data can originate from numerous sources and can be organised in different ways. This can present challenges in its storage, use and management, and in ensuring compliance with data regulations. Learners should understand the challenges that large and varied data presents and how it can impact the ability to draw meaningful, reliable and trustworthy insights.

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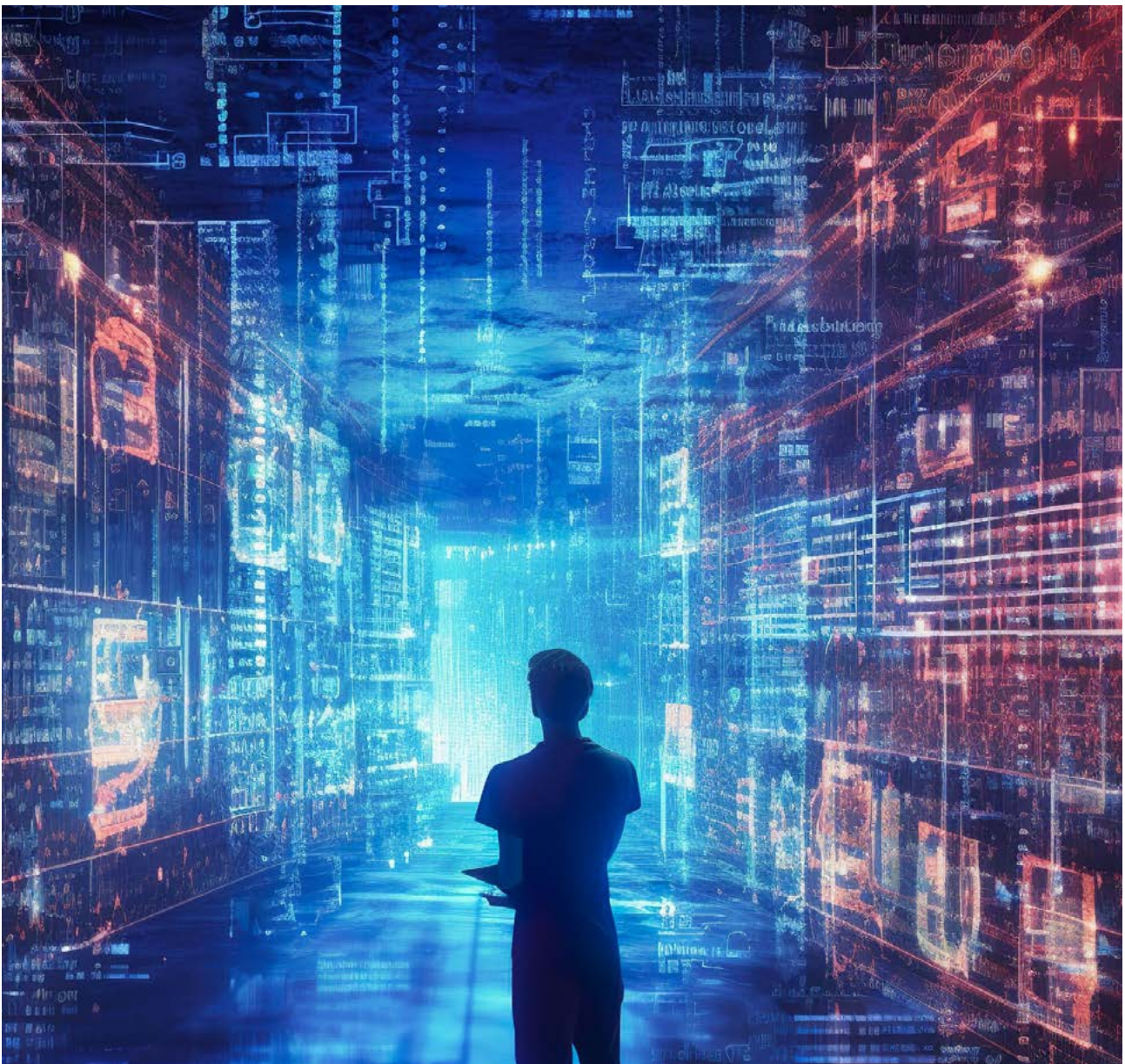
### **3.3 Describe regulation and authorities that govern the legal and ethical collection, storage and use of data and information.**

#### **Indicative content**

- a. Data Protection Act 2018 (UK GDPR).
- b. The Copyright, Designs and Patents Act 1988.
- c. The Information Commissioner's Office (ICO).

#### **Guidance**

Learners should understand the role and scope of the regulations listed, and the role and purpose of the ICO in protecting individuals and their personal data.



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### 3.4 Explain the seven data protection principles of the Data Protection Act 2018.

#### Indicative content

- a. Lawfulness, fairness and transparency.
- b. Purpose limitation.
- c. Data minimisation.
- d. Accuracy.
- e. Storage limitation.
- f. Integrity and confidentiality.
- g. Accountability.

#### Guidance

The Data Protection Act 2018 enforces seven key GDPR principles that should be at the centre of an organisation's approach to processing personal data. Learners should know the key principles and what they mean for an organisation in terms of the legal and ethical collection, storage and use of data.

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### 3.5 Describe the use of the Data Ethics Framework in guiding responsible data use.

#### Indicative content

- a. Overarching principles:
  - Transparency.
  - Accountability.
  - Fairness.
- b. Specific actions:
  - Define and understand public benefit and need.
  - Involve diverse expertise.
  - Comply with the law.
  - Review the quality and limitations of the data.
  - Evaluate and consider wider policy implications.

#### Guidance

The Data Ethics Framework provides principles and actions that can be referred to throughout the process of planning, implementing and evaluating a project involving data. Learners should be able to explain the overarching principles and describe how the specific actions listed can be used to advance transparency, accountability and fairness.

“Data legislation is vital because it mandates what an organisation **can** do when collecting and processing data. However, data ethics are concerned with what we **should** do with data; they build on, and go beyond, legal compliance.”

**BCS: Designing and Building Ethical AI.**

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## 4. DATA ARCHITECTURE, SUSTAINABILITY AND ETHICS (15%) K2

### 4.1 Describe the role of data architecture.

#### Indicative content

- a. Communicate between the technical and non-technical.
- b. Model and own the data landscape.
- c. Analyse and synthesise data.
- d. Manage metadata.
- e. Understand and adhere to relevant data governance.

#### Guidance

Data architecture is concerned with how data, metadata and information are used within an organisation. Learners should be able to describe the roles and responsibilities of data architecture, as listed.

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### 4.2 Describe the different stages of the data lifecycle and the associated ethical and legal considerations.

#### Indicative content

- a. Creation.
- b. Storage.
- c. Sharing and use.
- d. Archiving.
- e. Deletion.

#### Guidance

The data lifecycle represents the typical stages through which data passes in its useful life. At each stage, ethical behaviour should guide practice. Learners should know the different lifecycle stages, the processes and activities that typify each stage, and the ethical and legal considerations that should be taken into account.



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**4.3 Describe approaches that support the identification and management of data architecture risk.**

**Indicative content**

- a. Risk assessment (likelihood, impact).
- b. Security standards (ISO 27001).
- c. Audits.
- d. Data governance.

**Guidance**

Identifying and managing risks within data architecture is vital to ensure the reliability, security and effectiveness of systems and processes that use the data. Learners should understand the approaches listed that support data architecture.

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**4.4 Describe sustainability measures to help reduce the environmental impact of AI and its data usage requirements.**

**Indicative content**

- a. Green IT initiatives.
- b. Data centre energy and efficiency.
- c. Sustainable supply chain.
- d. Choice of algorithm.
- e. Low-code/no-code programming.
- f. Monitoring and reporting environmental impact.

**Guidance**

The development and running of AI can require significant computational power and consume substantial amounts of energy. Learners should understand the environmental considerations of AI and the different measures that can be taken throughout the AI lifecycle to reduce its environmental impact.



**Additional reading for this learning outcome:**

Responsible Computing

<https://responsiblecomputing.net/>



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## 5. ETHICALLY BUILDING AND TESTING AI SOLUTIONS (25%) K2

### 5.1 Describe organisational considerations in developing AI solutions.

#### Indicative content

- a. Understand the problem you are trying to solve.
- b. Alignment with strategy, mission and values.
- c. Established ethical values.
- d. Regulation and compliance.
- e. Governance and policies.
- f. Computing infrastructure.
- g. Technical competence.

#### Guidance

There are a number of areas for careful consideration within an organisation when thinking about using AI as an alternative to more traditional solutions. Learners should understand these typical considerations and how they influence an organisation's decision-making process.

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### 5.2 Explain the principles of human-centred design.

#### Indicative content

- a. Empathy.
- b. Identify barriers.
- c. Collaboration and communication.
- d. Compliance.
- e. User and society testing.
- f. Being iterative.

#### Guidance

Human-centred design places the needs and preferences of the end user at the very heart of the design process. Learners should understand the diverse needs and values of users and the ethical importance of including users throughout the design process.

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### 5.3 Describe processes and key considerations in the training of AI.

#### Indicative content

- a. Selection of training data.
- b. Understanding the data set.
- c. Understanding and identifying bias.
- d. Preparation of data.
- e. Data volume, variety and veracity.

#### Guidance

Training is a crucial step that teaches an AI model to learn from data and to perform a task accurately and in the intended way. Learners should understand the activities that take place during training and the important factors to consider in training AI in a safe, effective and ethical way.

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### 5.4 Explain key areas of scrutiny in the ethical and reliable testing of AI.

#### Indicative content

- a. The objective of testing.
- b. The challenges of testing.
- c. Understanding expected results.
- d. Dealing with bias and unexpected outcomes.
- e. Alignment with the guiding principles of ethical AI.
- f. Ensuring ethical behaviour.
- g. Evaluating and communicating the results of testing.

#### Guidance

AI testing evaluates the performance, reliability and robustness of artificial intelligence systems to ensure that they function as intended. It is also a vital stage to refer back to the guiding ethical principles and ethical IT professional values. Learners should understand the objective of testing and what to look for during the testing process, as well as some of the common challenges of AI testing.

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### 5.5 Describe processes involved in the continued safe running of AI.

#### Indicative content

- a. Monitoring inputs, outputs and consequences.
- b. Maintenance.
- c. Security audits.
- d. Ensuring explainability.
- e. Training.
- f. Feedback.

#### Guidance

Once an AI system is live, it is vital that it is proactively monitored and maintained to ensure that it continues to run safely and in the way that it was designed. Learners should have an understanding of these processes and their importance.

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# EXAMINATION FORMAT

This certificate 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 KNOWLEDGE  
QUESTIONS AND 10  
SCENARIO-BASED  
QUESTIONS

## DURATION

60 MINUTES

## SUPERVISED

**YES**  
THIS AWARD WILL BE  
SUPERVISED

## OPEN BOOK

**NO**  
(NO MATERIALS CAN  
BE TAKEN INTO THE  
EXAMINATION ROOM)

## PASSMARK

**(65%)**  
26/40

## DELIVERY

ONLINE FORMAT

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# QUESTION WEIGHTING

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

- 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

## Weighting

<b>1</b>	An ethical framework for using AI	<b>20%</b>
<b>2</b>	Innovating ethically with AI to drive business change	<b>20%</b>
<b>3</b>	Data privacy, governance and policy in AI	<b>20%</b>
<b>4</b>	Data architecture, sustainability and ethics	<b>15%</b>
<b>5</b>	Ethically building and testing AI solutions	<b>25%</b>

All knowledge questions are worth one mark and are multiple choice.

All scenario-based questions are worth two marks each and are multiple response.

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# ADDITIONAL READING

The following titles and sources are additional reading that can be used to support the content covered in this professional learning programme. Please note that they are not required reading, and will not form any part of the exam.

**TITLE:** Artificial Intelligence Foundations

**AUTHOR:** Andrew Lowe & Steve Lawless

**PUBLISHER:** BCS

**PUBLICATION DATE:** 2021

**ISBN:** 978-1-78017-5287

**TITLE:** Artificial Intelligence and Software Testing

**AUTHOR:** Rex Black et al.

**PUBLISHER:** BCS

**PUBLICATION DATE:** 2022

**ISBN:** 978-1-78017-5768

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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 NUMBER	CHANGES MADE
Version 1.0	Document created.

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