

Unit 5—Ethics & the Law...

HCCS STEM—Computer Science, IT, Engineering, Food/Nutrition, Business Studies

What do I need to be able to do?

1. You must be able to discuss the **environmental issues** associated with the use of digital devices throughout their lifecycle, including their manufacture, energy consumption, replacement cycle, and ultimate disposal as e-waste.

You must be able to understand the **ethical issues** raised by new digital technologies such as artificial intelligence, machine learning, and robotics, considering factors like accountability, safety, and algorithmic bias.

You must be able to discuss the **ethical and legal issues** concerning the collection and use of personal data and understand methods of protecting intellectual property for computer systems and software, as well as identify **cyber security threats** posed by malware and how to protect digital systems and data.



Algorithmic bias occurs when machine learning algorithms may be biased towards one group of people over another. This bias can arise because these algorithms are 'trained' using large data sets, and if the data itself reflects existing biases, the algorithm will learn and perpetuate them.

The Data Protection Act (2018) is legislation that protects personal data and provides individuals with a number of rights regarding their data. The purpose of RIPA is to provide a legal framework that regulates and controls the use of investigatory powers, such as surveillance and interception of communications, by public bodies, aiming to balance national security and crime prevention with the protection of individual privacy rights.

Malware poses a range of threats - Harmful software includes viruses, which infect computers, replicate, and can damage them by deleting, corrupting, or modifying files. Worms also replicate to spread but might only slow down networks and computers. Trojan horses, contain negative code that causes damage, takes control, or provides access to a computer. Ransomware is software that holds a computer hostage, often by locking or encrypting access to data until a ransom is paid, making recovery difficult without backups. Keyloggers log every key stroke, potentially revealing passwords and other personal information. To protect against these threats, methods include using **anti-malware software** to detect and prevent damage, employing **encryption** to secure data so it cannot be read without a key, implementing **acceptable use policies** to guide how IT should be used securely, and maintaining **backup and recovery procedures** to restore data.

Keywords

E-waste is electronic waste which is the fastest-growing trash problem and contains valuable materials.

Artificial intelligence (AI) is where machines have been programmed to act in ways that are mimicking human intelligence.

Algorithmic bias occurs when machine learning algorithms may be biased towards one group of people over another.

Personal data is data that relates to an individual, and its collection and use have associated ethical and legal issues.

The **Data Protection Act** is legislation that protects personal data and provides individuals with certain rights over their data.

Malware is harmful software intended to cause damage, such as viruses, worms, Trojans, ransomware, and key loggers.

Encryption is a method of securing data so that it cannot be read without a specific key.

Manufacture in the lifecycle of digital devices is associated with environmental issues like requiring energy sources such as gas and coal to power factories.

Accountability is an ethical issue with digital technologies like AI and robotics, about who is responsible for failures.

Copyright is a legal protection for property such as images, text, music, and software, preventing others from copying it without permission

The environmental issues lifecycle - the manufacture phase, which involves mining raw materials like Aluminium, Steel, Gold, Copper, and Lithium, many of which are non-renewable, leading to damage such as contamination and erosion. Factories powering this manufacture often rely on non-renewable energy sources like gas and coal. - The use phase, digital devices contribute to energy consumption, using electricity, although energy ratings and saving policies can help mitigate this impact. - Frequent replacement cycle of devices, sometimes due to planned obsolescence, means older devices are discarded. - Disposal, E-waste can be very harmful to humans and the environment if not processed correctly, as it contains toxic materials and components like lithium batteries that are hard to recover.

10 Test your understanding questions

Here are 10 multiple-choice questions summarising the whole unit:

1. Which of the following is considered the **fastest-growing trash problem** and contains valuable materials?
a) Plastic waste b) Paper waste c) E-waste d) Food waste
2. What is a significant **environmental issue associated with the manufacture of digital devices**?
a) Excessive water consumption b) Use of renewable energy sources c) Mining raw materials leading to contamination and erosion d) Noise pollution
3. Which ethical issue arises when **machine learning algorithms may show favouritism towards one group of people over another**?
a) Accountability b) Safety c) Legal liability d) Algorithmic bias
4. Artificial Intelligence (AI) is where machines have been programmed to act in ways that are what?
a) Random b) Mimicking Human Beings c) Predictable d) Manual
5. What is the primary purpose of the **Data Protection Act (2018)**?
a) To prevent cyber attacks b) To protect intellectual property c) To protect personal data and provide individuals with rights over their data d) To regulate internet usage
6. Which type of harmful software holds a computer hostage, often by encrypting data, until a payment is made?
a) Virus b) Trojan c) Ransomware d) Keylogger
7. What is **copyright** a legal protection for?
a) Inventions b) Trademarks and brands c) Non-physical property such as images, photos, text, video, music, and software d) Personal data
8. What is **encryption** a method of?
a) Detecting malware b) Controlling internet access c) Securing data so it cannot be read without a specific key d) Tracking user activity
9. Besides anti-malware software and encryption, which of the following is a method for **protecting digital systems and data**?
a) Social engineering b) Backup and recovery procedures c) Unpatched software d) Phishing
10. Ethical concerns regarding new digital technologies like AI and robotics include Accountability, Safety, Algorithmic Bias, and what other factor?
a) Energy consumption b) Data storage c) Legal liability d) Intellectual property

10 Test your understanding answers

1. c) 2. c) 3. d) 4. b) 5. c) 6. c) 7. c) 8. c) 9. b) 10. c)