

Summary

Topic 2 - Resource Management and Sustainable Production

| Subject | Year | Start date | Duration |
|-------------------|------|-----------------|-------------------------|
| Design Technology | IB1 | Week 2, January | 6 weeks 22 hours |

Course Part

Description

The areas of study within this topic are:

- Resources and reserves
- Waste mitigation strategies
- Energy utilization, storage and distribution
- Clean technology
- Green design
- Eco-design

Inquiry & Purpose

Inquiry / Higher Order Questions

Type

Inquiry Questions

Content-based

What impact would implementing a circular economy rather than a linear economy in electronics have on the environment.

Curriculum

Aims

Enable students, through the overarching theme of the nature of design, to develop:

An ability to explore concepts, ideas and issues with personal, local and global significance to acquire in-depth knowledge and understanding of design and technology

Initiative in applying thinking skills critically and creatively to identify and resolve complex social and technological problems through reasoned ethical decision-making

An ability to understand and express ideas confidently and creatively using a variety of communication techniques through collaboration with others

Objectives

Demonstrate knowledge and understanding of

facts, concepts, principles and terminology

methods of communicating and presenting technological information

Demonstrate the appropriate research, experimentation, modelling and personal skills necessary to carry out innovative, insightful, ethical and effective designing

Apply and use

facts, concepts, principles and terminology

Construct, analyse and evaluate

data, information and technological explanations

 Syllabus Content

Core

2. Resource management and sustainable production

2.1 Resources and reserves

Renewable and non-renewable resources

Reserves

Renewability

2.2 Waste mitigation strategies

Re-use

Recycle

Repair

Recondition

Re-engineer

Pollution/waste

Methodologies for waste reduction and designing out waste

Dematerialization

Product recovery strategies at end of life/disposal

Circular economy—the use of waste as a resource within a closed loop system

2.3 Energy utilization, storage and distribution

Embodied energy

Distributing energy: national and international grid systems

Local combined heat and power (CHP)

Systems for individual energy generation

Quantification and mitigation of carbon emissions

Batteries, capacitors and capacities considering relative cost, efficiency, environmental impact and reliability

2.4 Clean technology

Drivers for cleaning up manufacturing: promoting positive impacts; ensuring neutral impact or minimizing negative impacts through conserving natural resources; reducing pollution and use of energy; reducing wastage of energy and resources

International legislation and targets for reducing pollution and waste

End-of-pipe technologies

Incremental and radical solutions

System level solutions

2.5 Green design

Strategies for green design (incremental and radical)

Green legislation

Timescale to implement green design

Drivers for green design (consumer pressure and legislation)

Design objectives for green products

Strategies for designing green products

The prevention principle

The precautionary principle

2.6 Eco-design

Timescale for implementing eco-design

The “cradle to grave” and “cradle to cradle” philosophy

Life cycle analysis (LCA)

LCA stages: pre-production; production; distribution including packaging; utilization and disposal

Environmental considerations

Environmental impact assessment matrix

Product life cycle stages: the role of the designer, manufacturer and user

The major considerations of the United Nations Environmental Programme Manual on Eco-design

“Design for the environment” software

Converging technologies

Concepts

- Renewable and non-renewable resources

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- Reserves
- Renewability
- Re-use
- Recycle
- Repair
- Recondition
- Re-engineer
- Pollution/waste
- Methodologies for waste reduction and designing out waste
- Dematerialisation
- Product recovery strategies at end of life/disposal
- Circular economy—the use of waste as a resource within a closed loop system
- Embodied energy
- Distributing energy: national and international grid systems
- Local combined heat and power (CHP)
- Systems for individual energy generation
- Quantification and mitigation of carbon emissions
- Batteries, capacitors and capacities considering relative cost, efficiency, environmental impact and reliability
- Drivers for cleaning up manufacturing: promoting positive impacts; ensuring neutral impact or minimising negative impacts through conserving natural resources; reducing pollution and use of energy; reducing wastage of energy and resources
- International legislation and targets for reducing pollution and waste
- End-of-pipe technologies
- Incremental and radical solutions
- System level solutions
- Strategies for green design (incremental and radical)
- Green legislation
- Timescale to implement green design
- Drivers for green design (consumer pressure and legislation)
- Design objectives for green products
- Strategies for designing green products
- The prevention principle
- The precautionary principle
- Timescale for implementing eco-design
- The “cradle to grave” and “cradle to cradle” philosophy
- Life cycle analysis (LCA) • LCA stages: pre-production; production; distribution including packaging; utilization and disposal
- Environmental considerations
- Environmental impact assessment matrix
- Product life cycle stages: the role of the designer, manufacturer and user
- The major considerations of the United Nations Environmental Programme Manual on Eco- design
- “Design for the environment” software
- Converging technologies

ATL Skills

Approaches to Learning



Social

- In this unit, we will

have students work in small groups

allocate, or ask students to allocate among themselves, different roles in a classroom discussion or activity

have students discuss their understanding of a text or idea among themselves and come up with a shared understanding

encourage students to consider alternative points of view or to take the perspective of others



Communication

- In this unit, we will

ask students to explain their understanding of a text or idea to each other

have students give an oral presentation without reading from their notes



Developing IB Learners

Learner Profile



Knowledgeable



Caring



Reflective



Assessment



Assessment criteria

SL Criteria

External Assessment

Paper 2

A: Data-based and short-answer questions on the core material

B: Extended-response question on the core material

HL Criteria

External Assessment

IB DP IB1 DT 2020/21 HL (IB1)

Paper 2

A: Data-based and short-answer questions on the core material

B: Extended-response question on the core material

Description