T172
Working with our Environment

Technology for a sustainable future

First Tutorial 21/2/04

Introductions

- name
- where are you from?
- what do you do?
- other OU courses?
- why are you taking T172?

Course Aims

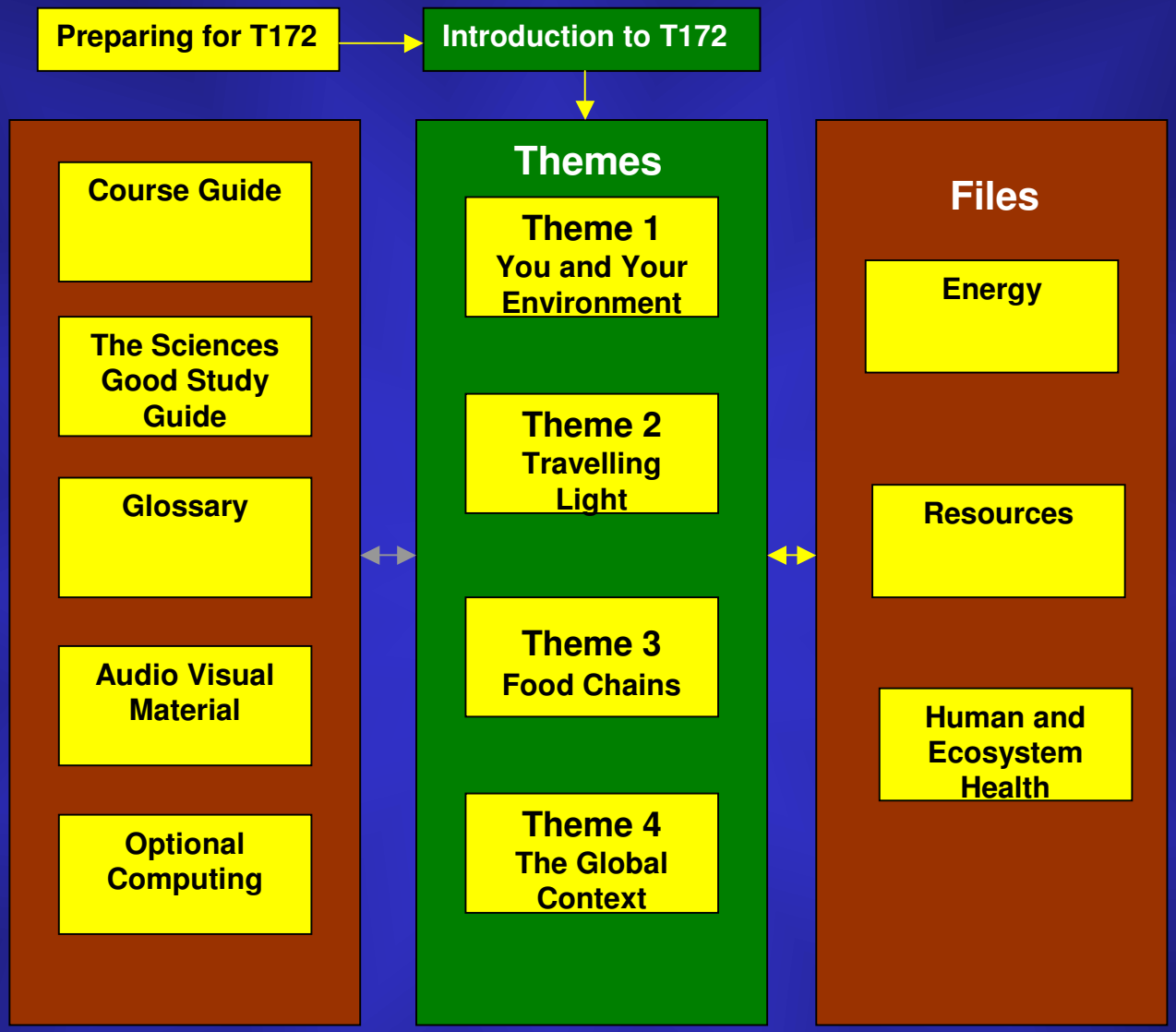
To enable you to understand:

1. a) how the use of technology to meet human material needs contributes to environmental effects, and

   b) how technology may be used to protect the environment;

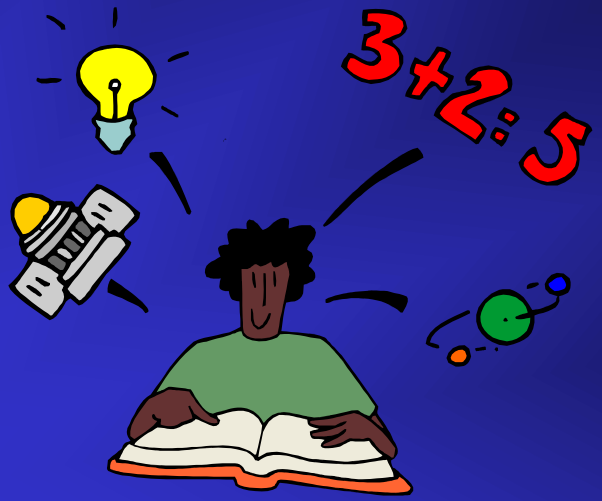
2. how technology may be employed to design products, processes and systems that contribute to the development of an environmentally sustainable future.

Course structure



Study techniques

- Allocate time
- Use “dead” time
- Plan ahead
- Be selective
- Tutor support
- Self study groups



Assessment

- Preparatory exercises
- 5 TMAs
- End of course assessment (ECA)

TMAs

- Plan ahead
- Don’t leave until last minute!
- Read questions carefully
- Look at mark allocations
- Try to answer all questions
- Tidy and legible
- Appropriate length
- Post before cut off date
- Get certificate of posting
- Weigh - ensure enough stamps!
- Extensions

Any problems?

Maths

- ughhh!

Our Impact on the environment

- List the main environmental impacts caused by UK households
- Rank them

What is energy?

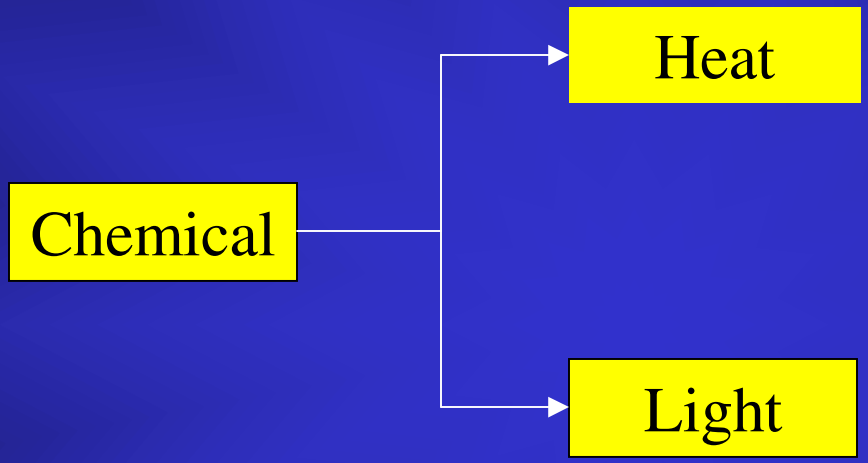
- Capacity to do work
- Units
  - joules (J)
  - 1J = 1 Nm

Energy Conversion

- Energy cannot be created or destroyed
- It is converted from one form to another
- List some forms of energy
- What is the exception to this rule?
- $E = mc^2$

Energy Conversion

- Example - A fire burning



Exercise - Energy conversion

1. Electricity supplied to an electric drill
2. An immersion heater heating water for a bath
3. Car tyres heated up as the car brakes rapidly
4. A clockwork toy train running round a track
5. Water from a reservoir used to generate electricity

What is power?

- Rate of work, or
- Rate of energy conversion
- Units
  - watts (W) = Js^{-1}

An Analogy

Distance travelled
≡ energy

Speed
≡ Power

Exercise

- An electric fire has a rating of 1000 W.
  How many joules does it consume in 1 hour?

Answer

Power (watts) = $\frac{\text{Energy (joules)}}{\text{time (secs)}}$

So, Energy (joules) = Power (watts) x time (secs)

So, Energy = 1000 W x (60 x 60 s)

= 1000 W x 3600 s

= 3,600,000 J

= 3.6×10^6 J

= 3.6 MJ

Units

- kilowatt hours (kWh)
- Alternative unit of **energy**
- 1 kWh = 3.6 MJ *

* See previous page for derivation of this relationship

Units - Prefixes

- kilo 10^3
- Mega 10^6
- Giga 10^9
- Terra 10^{12}
- Peta 10^{15}
- Exa 10^{18}

KMGTPE

(King Midas' golden touch poisoned everything)

Exercise

- Express 1,000,000 kJ as
  - MJ
  - TJ
  - PJ

Answer

- 1,000,000 kJ is equivalent to
  - 1,000 MJ
  - 0.001TJ
  - 0.000001 PJ

Exercise

- Express 7.2×10^6 kJ as
  - MJ
  - GJ
  - PJ
  - kWh

Answers

- 7.2×10^{6} kJ is equivalent to:
  - 7.2×10^{3} MJ
  - 7.2 GJ
  - 7.2×10^{-6} PJ
  - 2×10^{3} kWh

Exercise

- Convert the following into kWh
  - 3.6 MJ
  - 3.6 GJ
  - 7.2 PJ

Answers

- 3.6 MJ = 1 kWh
- 3.6 GJ = 1,000 kWh
- 7.2 PJ = 2 x 10^9 kWh