

## **Environment and Technology**

### **Lecturers:**

Dr. Luewton Lemos

### **Course description:**

#### - **Course objectives**

To give insight in the impact of technological processes on the environment and to show that and how technology can facilitate sustainable development.

#### - **Subject**

Technology may facilitate pollution prevention / clean-up of the three environmental compartments: water, air and soil. However, technology alone will not solve all the problems.

#### - **Content / topics**

- Environmental technology is highlighted by several actual/global issues as the use of fossil fuels, global warming, decreasing availability of minerals, water scarcity etc.
- Technologically much is possible. However, technology is not the only answer, but it facilitates pollution prevention and pollution control / clean-up. Laws, attitudes of personnel and citizens, and knowledge are as important as the correct technology.
- Water technology: water availability & scarcity, waste water treatment & drinkable water production
- Soil: fertility of the soil & quality parameters, soil erosion (+prevention) & soil pollution (+ prevention & clean-up)
- Air: impacts & pollution prevention techniques, legislation: situation in the EU (BREF) and the Netherlands (provinces and municipalities).
- Students learn (how) to design & select a solution for certain situations. To analyse the situation (and what tools to use), what technologies are available, and how to select the appropriate or best technology for the situation.
- Furthermore, we pay attention to mass balances and flow sheeting to analyse e.g. production processes, waste flows, and to calculate the effect of certain implemented improvements (like a heat exchanger, or the reuse of wastewater).
- Both pollution prevention and pollution control are the red-wires of this course.
- **Course learning objectives**
- Analysing processes and be able to visualize these processes by preparing flow schemes.
- Be able to calculate mass balances
- Global insight in environmental problems
- Specific knowledge about technologies to prevent water, soil and air pollution
- Specific knowledge about treatment technologies to clean up polluted water, soil and air.
- Develop a critical attitude towards the role of technology in sustainable development

### **Course materials:**

- Hand-outs
- Websites: (EU, Infomil)

### **Instructional working methods:**

5 lecture days

1 excursion

1 group assignment (with a mark)

### **Assessment:**

The study is assessed by

- An individual written exam (75% of final score)
- group assignment (25% of final score)

The exam contains both multiple choices as open questions. The exam is an open-book exam. Use of hand-outs is not allowed.

Each exam consist of 3 parts: The first exam will cover sustainability, process & product improvements, mass balances and water technology and the second exam; soil technology, air technology and solid waste management.

The 2 exams will be arithmetically averaged and will, together, count for 75% of the final mark.

The 2 case studies will be also averaged and will count for the other 25% of the final mark.

The students pass whenever the total mark is a rounded up 6 AND the final exam mark is > 5. If the exam mark is < 5 the student take a second exam. The exam mark (second opportunity) should also be >5. The second opportunity exam covers the whole course programme.

During the lectures some extra activities (practical exercises, lab work) will be also performed. These activities can be used, if necessary, to adjust the final score (maximum of 0.2 score) in the case that the total exam mark is > 5 but the case study mark is < 5.5. The use of these activities will be previously informed by the lecturer.

### **Relationships with other courses:**

Environmental management

Management of the humankind's interaction with and impact upon the environment is closely related to application of environmental technology.

Energy management

The use of technology to reduce the use of fossil fuels, to make apparatus & processes more energy efficient & the cascade use of energy are examples of the relationships between energy management and environmental technology

Ecology, Society and Sustainable Development

Sustainable development is inextricable connected to environmental technology

### **Relation of course with final attainment targets:**

- **Primary relationship**
  - Graduates have basic knowledge of and insight in a variety of clean(er) and treatment technologies relevant for environmental and energy management, and tools that can be used for assessing the options for improving the environmental and energy impacts of products and production processes. They are able to make basic calculations for some of these tools and to make judgements about what technological solutions are appropriate for specific situations. (2)
- **Secondary relationship**
  - Graduates understand the concept of sustainable development and the relationships between resource utilization, production processes, societal processes and environmental pressure and are able to apply combinations of concepts and theories in environmental and energy management to the situation in the home country or other specific real life situations. (5)
  - Graduates are able to reflect on matters and issues in the domain, are able to form an opinion and to contribute to both scientific and practitioners' discussions and e.g. to critically reflect on the role of technology in the process towards sustainable development. (13)
- **Tertiary relationship**
  - Graduates have knowledge of and insight in the relevant key concepts and theories of policy studies and law and can describe and categorise relevant policy instruments, describe the legal basis of common policy instruments used in environmental and energy management and are able to assess their usefulness and feasibility in various contexts. (1)
  - Graduates are able and willing to recognise the ethical aspects related to their activities. (11)