



# MJ2498 Energy Resources 5.0 credits

## Energiresurser

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

Course syllabus for MJ2498 valid from Autumn 2015

## Grading scale

A, B, C, D, E, FX, F

## Education cycle

Second cycle

## Main field of study

Mechanical Engineering

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

After passing the course, the student should be able to: Understand the need of energy and its relation to a sustainable human development.

Be familiar with all transformations that energy goes through from its state as an "energy source" until usage as an "energy service".

Be aware of the consequences for the secure and strategic supply of the different energy alternatives.

account for the structure of the electricity system

Understand and be aware of the importance of issues such as energy efficiency, minimizing environmental impact, security of supply, etc

1 Explain a specific energy transformation chain from source to product and carry out calculations of varying complexity in connection to this (e.g. how much energy that is required to produce a tin?).

2 Decide the suitability of a certain energy solution (expressed as pros and cons) for a special need (e.g. using natural gas to produce electricity, future use of electric vehicles versus hybrid vehicles. . .) from global data about energy economising and from the environmental impact and the analyses of energy efficiency.

3 Explain the relationship between energy use and the human development, through examples from different regions in the world (e.g. compare energy consumption per capita versus HDI).

4 Compare the environmental impact from different energy solutions.

5. Explain the relation, expressed as energy intensity, between energy consumption and economics in a country.

6. Analyse secure energy supply in a region from economic and structural data.

7 Give a well-motivated statement about the forecasts and scenarios for future global and regional trends within energy, considering demand, production capacity and energy reserves.

8 Give a well-motivated statement concerning energy demand and the suitability of the current range of energy services (e.g. railway versus car mobility) and on the essentials in these services as such (e.g. mobility versus urban planning).

9. Draw energy flow charts (syntheses) that combine different statistical data.

## Course contents

General extent initial sessions

1. Energy systems

2. The energy model

3. Energy resources in developing countries

Session on fossil resources

4. Geopolitics of oil and gas
5. Using coal in the electricity production
6. NG and LNG chains

Session on other sources and other issues

7. The nuclear fuel cycle
8. Advanced cycles for nuclear fuel (including fusion)
9. Renewable resources
10. Against the hydrogen gas economy
11. CO<sub>2</sub> separation and absorption

## Specific prerequisites

BSc or the equivalent

## Course literature

V. Smil. Energy at the Crossroads. Global Perspectives and Uncertainties. 2003 (posterior reed.). MIT Press

## Examination

- PRO1 - Project Work, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Final Exam, 1.0 credits, grading scale: A, B, C, D, E, FX, F
- UPG1 - Assignment, 0.5 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Exercis, 2.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.

- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.