



DEPARTMENT OF BIOLOGICAL AND ENVIRONMENTAL SCIENCES

ES2614 Resource efficiency - energy, material flows and ecosystem services, 7.5 credits

Resurseffektivitet - energi, materialflöden och ekosystemtjänster, 7,5 högskolepoäng
Second Cycle

Confirmation

This course syllabus was confirmed by Faculty of Science on 2011-10-27 and was last revised on 2023-12-12 by Department of Biological and Environmental Sciences to be valid from 2023-12-12, autumn semester of 2023.

Field of education: Science 100%

Department: Department of Biological and Environmental Sciences

Position in the educational system

The course is the second course in the master programme Environmental Science at the Faculty of Science, University of Gothenburg, but the course could also be chosen as a freestanding course. The course is recommended for students with a Bachelor of Science, including at least 15 HEC in environmental science

The course is at Second cycle level in Environmental science

The course can be part of the following programme: 1) Environmental Sciences (N2MVN)

Main field of studies

Environmental Science

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

120 HEC out of which at least 90 HEC are in natural science (biology, chemistry, earth science, environmental science with emphasis on natural science, physics) or technology, and at least 15 HEC in environmental science. Students with equivalent education can be allowed to enter the course. Applicants must prove their knowledge of English

corresponding to English 6/English B from Swedish Upper Secondary School. For more information, see English language requirements on Universityadmissions.se

Learning outcomes

The course provides knowledge about the possibilities to and need for an improved resource efficiency in the areas of energy, material flows and ecosystem services. Both the role of policy instruments and new technology solutions will be addressed. Conflicts between different interests regarding natural resources will be discussed and analyzed. The course begins with a short introduction to the overall situation in the three chosen sectors; energy usage, material flows in society and the provision of resources and services from different ecosystems. The ecosystem services part takes the Millennium Ecosystem Assessment as its starting point.

Knowledge and understanding

To pass the course the participants should have a far reaching understanding of:

- • The energy usage in different sectors of society like housing, industry, transport, especially from the efficiency aspect.
- • The possibilities and measures for energy efficiency improvements in different sectors and for different types of actors.
- • The societal material flows in general, including the usage of water.
- • The so called waste hierarchy, including strategies to change the behaviour of citizens/organisations and companies upwards in this hierarchy.
- • The potential of promoting reduce reuse, recycle, recover, in a European and Swedish context, together with examples of good practising.
- • Tools and concepts like Ecological footprints, virtual water, Life cycle costing calculations, Waste hierarchy, Factor 10, relative and absolute decoupling, urban mining, rebound effect.
- • New technology solutions and their potential within the energy efficiency and waste management sectors.
- • The present extraction and use of renewable natural resources in general
- • The Millennium Ecosystem Assessment together with major follow-up reports
- • The most pressing conflicts between present usage and a sustainable usage of ecosystem services, like e.g. depletion of fish stocks, unsustainable forestry, over-use of ground water, land-use conflicts, and so forth.
- • Concepts like resilience, bio-capacity and ecosystem services.
- • New methods and ideas about sustainable harvesting of eco-system services, including good examples already implemented.
- • Major evaluations of the future needs for a radically improved resource efficiency made by UN, EEA, OECD, and organisations like e.g. WBCSD, WWF, and major research institutes.
- • UN, EU and Swedish policies within the studied areas mentioned above.

Skills and abilities

After completed course, the participants should have shown ability to summarize, analyze and orally present a scientific paper, perform a computer simulation, formulate questions and find answers concerning the conflicting interests of the usage of natural resources.

Judgement and approach

After completion of the course the student should be able to critically discuss the concepts of renewable natural resources and non-renewable resources, in the light of scarcity, possibilities for substitution and time trends. The students should be able to describe and discuss consequences of conflicting interests regarding usage of ecosystem services, like e.g. biodiversity contra intensive production of timber and pulp wood, local economic interests contra larger economic interests regarding land-use, present economic needs contra possibilities of future generations, production of crops for bio-fuel or for food, etc.

The course is sustainability-focused, which means that at least one of the learning outcomes clearly shows that the course content meets at least one of the University of Gothenburg's confirmed sustainability criteria. The content also constitutes the course's main focus.

Course content

The course begins with an analysis of the current situation in the three areas mentioned above in terms of resource efficiency, including already implemented good examples. The great challenge of providing society with enough resources without jeopardizing future generations possibilities is studied more closely. Policy measures, both implemented and proposed, are analyzed and discussed. Tools and concepts like relative and absolute decoupling, Ecological footprints, virtual water, Life cycle costing calculations, the waste hierarchy, Factor 10, rebound effect, resilience, bio-capacity, etc. are studied.

The course consists of three subparts:

- 1) Compulsory elements, in the form of e.g. computer simulation/problem solving exercise, literature seminar and other similar moments marked in the course schedule as compulsory, corresponding to a maximal extent of one week. Students that do not take part in compulsory elements of the course are required to submit written summaries of the content of these moments to pass the course (1,5 HEC).
- 2) Final individual exam in written form (hall exam) on theoretical parts (5 HEC)

3) A written report and oral presentation (group task) to a literature seminar (1 HEC)

Form of teaching

The forms of studies during the course include lectures, seminars, computer simulation/problem solving exercise, group exercise and one oral presentation. The course is given at daytime, full time.

Language of instruction: English

Assessment

In order to pass the course, the student must receive Pass on all three subparts.

A student who has failed a test twice has the right to change examiners, if it is possible.

A written application should be sent to the Department.

The number of examinations is limited to five occasions.

If the course is discontinued or major changes have been made, the student is guaranteed at least three examination occasions (including the ordinary examination occasion) during a time of at least one year from the last time the course was given in the original form.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

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In order to be awarded Pass for the whole course of 7,5 HEC, Pass is required on all three subparts. For Pass with Distinction on the course, Pass with Distinction is required on subpart 2 and Pass on both subparts 1 and 3. On subparts 1 and 3, Fail (U) and Pass (G) are the only grades given.

Course evaluation

A written evaluation will be done at the end of the course. The result of the evaluation will be presented to the students and to the following courses students.