Kursnamn på svenska Hållbarhet inom naturvetenskap och teknik
Swedish course title

Kursnamn på engelska Sustainability in Science and Technology
English course title

Omfattnings (högskolepoäng) 4
Higher education credits

Undervisningsspråk English
Language of instruction

Rekommenderade förkunskaper
Recommended prerequisites
Ph.D. student in Science, Technology and Engineering

Kursens syfte och mål
General course objective/s and learning outcomes
To give basic and in-depth understanding of sustainability and how it crystalized in the past decades to well-formulated global goals: the Paris Agreement and UNSDG of 2016. To engage the participants in current and future issues facing science and technology to form and achieve sustainable societies: WHAT is sustainability; WHY it is needed for socio-economic-environment transformation; and HOW to achieve sustainable societies.

To explain the Role of science and technology to resolve the inextricable multilayered interactions in water, energy and natural resources, on the one hand, and the involved trans-sectorial and trans-disciplinary "socio-economic-environment" synergies for achieving sustainable societies on the other hand. This said, Ph.D. researchers in science, technology and engineering will: (1) acquire introductory & basic knowledge on sustainability, where system operation, optimization, material & product lifecycles are essential features; (2) attain a global overview on large-scale and long-term issues of sustainable management of water, energy & natural resources in socio-economic-environment perspective; (3) contribute and engage in high-level discussions in the progress and advance of Sustainability in Science and Technology not only for the Faculty but also for the society and higher education in general, and Uppsala University and Uppsala City in particular. In this context knowhow will be gained on how to couple science, technology and engineering to various societal and market sectors on several levels.

Kursinnehåll
Course contents
Introduction. The course content given here is a comprehensive update based on the recommendations and suggestions of the Evaluation of the first version of the course "Sustainability in Science &Technology: Water, Energy & Natural Resources Nexus" that was given in two parts in Spring 2018 (February/March and May). This update will strengthen and enrich the Objectives and Learning Outcomes of the Course where its, multidisciplinary and multi-sectorial, nature involves stronger and wider coupling of "Science and Technology" to the global "Socio-Economic-Environment" aspects of Sustainability.

The Course Content. Understanding and inventing sustainable synergies for coupling science, technology and engineering of water, energy & natural resources to the "socio-economic-environment" infrastructures of responsible societies. What is sustainability: pillars; concepts; UN-SDGs & Paris Agreement, with general background on the shortcomings of existing management systems and policies:
(1) socio-economic-environment systems and existing synergies
(2) life-cycles of water, energy, natural resources and existing impacts
(3) processes/interaction of environment-climatic systems and existing impacts
(4) bio-diversity, food and ecosystems services and existing degradation
(5) eco- and environmental economy and existing weaknesses

Why sustainability:
(1) constrains and peaks "Supply/Production/Demand" of natural resources
(2) man-made versus natural threats (global warming and waste/pollution pile-up)
(3) nexuses in water, energy and natural resource (security & conflict challenges)
(4) over-population, poverty, education, health, natural resources food constrains
(5) short-comings of rural-urban management versus "ecosystems-water-energy"

How to achieve sustainability:
(1) transformation from fossil-energy to renewables
(2) circular economy: fossil resources and responsible resource management
(3) models and assessment of complex systems, monitoring, ICT-automation
(4) assessment and management of sustainability "Key Performance Indicators"
(5) coupling of "science & technology" to "social, economic & environment" sectors

Undervisning (kursens uppläggning)
Instruction (course structure)
Lectures, seminars and assignments supported by case-studies and study visits.

Examination
Assessment (form of examination)
Participation in course: lectures (80%), seminars/assignments (100%)

Huvudansvarig institution Department of Physics and Astronomy
Department with main responsibility

Kontaktperson/er (namn, e-postadress)
Contact person (name, e-mail address)
Farid El-Daoushy, farid.el-daoushy@physics.uu.se

Kurs datum/period Autumn 2019 (October/November 2019)
Course dates/period

Antal platser 30
Maximum number of participants

Anmälan om antagning till kursen ska skickas till
Application for admission to the course is to be sent to
farid.el-daoushy@physics.uu.se

Skicka anmälan senast 15th of October 2019
Submit application not later than
Målgrupp/er (om möjligt, specifera ämnen/inriktningar)

Target group/s (specify, if possible, subject/specialization) PhD students in all domains of Science and Technology where water, energy, natural resources, processing and processed materials, bio-diversity, environment, climate, nexuses are, directly or indirectly, part of their research, including ICT, mathematics, physics, chemistry, biology, technology & society and earth sciences. If possible, very limited number of other early researchers ‘Career Development Plans’ can fit in.

Andra inblandade institutioner (specifiera hur).

Other departments involved (specify how):
Department of Information Technology, Systems and Control, Uppsala University
Department of Engineering Sciences, Electricity Division, Uppsala University
Dept. of Civil & Architectural Engineering, Hydraulic Engineering, Royal Institute of Technology (KTH)
Department of Earth Sciences, Natural Resources and Sustainable Development, Uppsala University
Department of Peace and Conflict Research, Uppsala University
Department of Economic History, Uppsala University
Uppsala Water and Waste “vatten och avfall”, Uppsala Municipality
Stena Recycling, Response Resource Management (Sweden/Denmark/Finland/Poland/Norway)

Others contributions, not yet known, from Government Offices, Humanities and Social Sciences, … …

Motivering till varför kursen bör vara fakultetsgemensam (max 150 ord)

Motivation as to why it should be considered “multidisciplinary” to the extent that the faculty should allocate extra financing. Science, technology and engineering are indispensable for resolving the inextricable multi-layered interactions between water, energy and natural resources. The transformation to sustainable societies (UN-SDGs and Paris Agreement) requires trans-disciplinary and trans-sectorial interactions within and between these drivers (water, energy and natural resources). Also, synergetic coupling to the complex web of economic, social and environmental infrastructures of welfare and responsible societies that seeks sharing healthy and wealthy planet.

Energy, power production and use (oil, gas, coal, hydropower, geothermal, nuclear power, bio-fuel, wind, wave, solar) require water as much as water production, treatment, distribution and use (water treatment, wastewater treatment from energy production/use, industry, agriculture, household, sanitation, desalination, water reuse/recycling, urbanized-natural water cycle interactions) require energy. Water and energy systems require natural resources in their lifecycles, yet they have negative impacts on environment, biodiversity and all life forms on Earth. Sustainable approaches in science and technology can cure and heal this paradox.

Kursen har tidigare givits (ange när) Spring 2018 med 21 deltagare (ange antal)

The course has previously been given (specify when and number of participants)

Budget

Kostnader (SEK). Sökt finansiering skall motiveras nedan. Medel utbetalas i efterskott

Costs, funding applied for should be motivated below. Approved funding will be transferred after the course is completed.

<table>
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<tr>
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<th>Bidrag från institution/er</th>
<th>Fakultetsfinansiering (sökt belopp)</th>
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<tr>
<td></td>
<td>Contribution from department/s</td>
<td>Faculty funding (applied for)</td>
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<tr>
<td>Lärartid</td>
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<td>Time by involved teachers</td>
<td>Website sustain-earth.com</td>
<td>Science &amp; Technology UU</td>
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<td></td>
<td>(initiated 2011) based on</td>
<td>49 hr x 960 = 47 040 kr</td>
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<td></td>
<td>El-Daoushy R&amp;D /teaching</td>
<td>(14 hr lectures; (20+10)/2</td>
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<td>- Editing 80 000 kr</td>
<td>hr seminars; 20 hr followup</td>
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<td>- Other inputs 8 000 kr</td>
<td>and assignments )</td>
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<td>Gästföreläsare</td>
<td>Other external lecturers</td>
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<td>Guest lecturers</td>
<td>18 hr x 960 = 17 280 kr</td>
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<td>Laborationer ed.</td>
<td>Study Visits</td>
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<td>Practical exercises</td>
<td>10 hr x 820 kr = 8 020 kr</td>
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<td>Andra kostnader</td>
<td>Compendium &amp; Database</td>
<td>Additional costs</td>
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<td>Other costs (specify)</td>
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Motivering till sökta medel (max 300 ord)

The course has two main Components involving mainly in-house expertise from "Science and Technology at Uppsala University" and external expertise from "Social, Economic and Environment" sector organizations in Sweden. At the moment, there are no plans to have international contributions. The course will involve suitable number of Ph.D. participants from various disciplines in "Science, Technology and Engineering" at the Uppsala University, at different stages of progress, with different cultures and scientific background.

The First Component "Science, Technology and Engineering of Water, Energy and Natural Resources" will focus on understanding the inextricable multi-layered interactions between water, energy and natural resources on the global scales including regional and local interactions. Principles and concepts of trans-disciplinary nexuses, of these drivers, in science, technology and R&D will be examined and detailed. Possible and relevant coupling to "socio-economic-environment" issues will be briefly introduced.

In the Second Component, the underlying "Socio-Economic-Environment" infrastructures, and the involved trans-sectorial issues, will be examined with focus on detailing the involved synergies for coupling these infrastructures to the "Science, Technology and Engineering of Water, Energy and Natural Resources", i.e. to promote and achieve sustainable societies. In this context, the Paris Agreement and UN-SDG of 2016 will be of focal importance for understanding how future welfare and responsible societies can contribute in shaping and sharing a healthy and wealthy planet. Layout and structure of the Course consider the complexities to deliver the best possible outcome to all and everyone of the participants. It will give in-depth training in debating, discussing and sharing knowledge with and mong the individual participant and lecturers. The Course will give enough time for open discussions to all participants throughout the lecturers (32 hours including 8-10 hours discussions), seminars (20 hours for assignments and case-studies) and study visits (10 hours) and with step-by-step interactions to support individual Career-Development-Plans.

Ansökan registreras