Ansökan om medel för fakultetsgemensam forskarutbildningskurs 2018
Application for funding of faculty common course 2018

Kursnamn Sustainability in Science & Technology – Water-Energy Nexus
Name of course

Omfattning (högskolepoäng) 2 + 2
ECTS credits

Tidsperiod Spring 2018: (February/March) and (April/May)
Course period

Antal platser 30 + 30
Maximum number of participants

Undervisningsspråk English
Language of instruction

Kursens syfte samt motivering till varför den bör vara fakultetsgemensam (max 150 ord)
Aim of course and motivation as to why it should be considered “multidisciplinary” to the extent that the faculty should allocate extra financing.

To get basic and in-depth understanding of sustainability and how it crystalized in the past decades to well-formulated sets of global goals: the UN-SDG of 2016. To engage the participants in essential issues facing science and technology: WHAT is sustainability; WHY it is needed for socio-economic developments and HOW to achieve sustainable societies.

Role of science and technology to resolve the inextricable multi-layered interactions between water, energy and natural resources, in the transformation to sustainable societies, will be explained. The know-how for trans-disciplinary and trans-sectorial coupling of natural sciences and technology to society and market needs will be detailed. Energy and power production require water as much as water production, treatment, distribution and use require energy. Water and energy systems require natural resources in their lifecycles, yet they have negative impacts on environment, biodiversity and life quality. Sustainable approaches in science and technology can cure and heal this paradox.

Kursinnehåll, kursens uppläggning samt examinationsform (max 150 ord)
Contents, study format and form of examination

What is sustainability: pillars, concepts and content “UN-SDGs”

Understanding sustainability:
(1) Socio-economic systems;
(2) life-cycles of water, energy, natural resource;
(3) dynamics of complex "environment-climatic" systems (processes and interactions, ensembles and emergence, self-cleaning and rehabilitation);
(4) reverse engineering versus life-cycles "cardle to grave”;

Why sustainability:
(1) constrains and peaks of natural resources;
(2) man-made versus natural threats;
(3) nexuses in water, energy and natural resource
How to achieve sustainability:
(1) transformation from fossil-energy to renewables;
(2) implementation of circular economy (recycling, reduce and reuse);
(3) assessment of complex systems, monitoring and optimization;
(4) assessment of sustainability “Key Performance Indicators”;
(5) assessment of top-down and down-top models.

Course planning:
Part (I) Lectures, white-board assignments and seminars;
Part (II) Group instructions “lecture-based” supported by “case-studies”, seminars and individual mentoring.

Examination/assessment:
Part (I) based on participation in assignments & seminars;
Part (II) based on participation in “case-study”, seminars and individual mentoring.

Målgrupp/er (specifiera ämnen/inriktningar) samt rekommenderade förkunskaper
Target group/s (specify, if possible, subject/specialization) and recommended background

PhD students in all domains of Science and Technology where water, energy, natural resources, processing and processed materials, bio-diversity, environment, climate, nexuses are being (directly or indirectly) part of their research, including ICT, mathematics, physics, chemistry, biology, technology & society and earth sciences. The participant will gain knowledge to structure their own Career Development Plans.

Huvudansvarig institution
Department with main responsibility
Physics and Astronomy

Andra inblandade institutioner (specifiera hur).
Other departments involved (specify how).
Department of Information Technology. Professor Bengt Carlsson will contribute with material related to wastewater treatment with emphasis on energy consumption. Bengt has 20 years of experience in giving courses in wastewater engineering and has unique research competence in modelling, simulations and control of wastewater treatment plants. He is the chairman of VA-kluster Mälardalen (www.va-malardalen.se).

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

Anmälan om kursdeltagande till
Application from course participants should be sent to
farid.el-daoushy@physics.uu.se

Senast 15 December 2017 and 25 March 2018
Not later than
Kursen har tidigare givits NO
The course has previously been given (specify when and number of participants)