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# MASTER'S PROGRAMME IN ENVIRONMENTAL CHANGE AND GLOBAL SUSTAINABILITY 2020-2023

Contents

## Study lines

- Environmental change
- Global sustainability
- Biology subject teacher

Master programme in Environmental Change and Global Sustainability (ECGS) aims to educate widely-recognized multidisciplinary experts able to

- study environmental and sustainability issues in their field of spelialization
- solve socio-ecologigal sustainability problems in concert with various players in the society

**Interdisciplinary core module**, common in the programme, has a focus on environmental sustainability and the methodology used when studying interactions between science and society.

**Environmental change study line** educates experts oriented toward natural sciences with knowledge about earth and water ecosystems, and their sustainable use.

**Global sustainability study line** educates experts oriented towards human sciences. They understand the social, cultural and economical challences at global level and are able to develop fair solutions considering perspectives of both the society and environment.

Instructions for students who have been transferred to the new degree programmes in Instructions for students:

- Bio- ja ympäristötieteellinen tiedekunta
- Maatalous-metsätieteellinen tiedekunta
- Valtiotieteellinen tiedekunta

# STRUCTURE OF THE MASTER'S PROGRAMME IN ECGS

## Master's Programme in Environmental Change and Global Sustainability

**Core studies, 30 ects**

- Personal Study Plan (PSP)
- ECGS—4000 Sustainability Science, 15 ects
- ECGS-004 Master's thesis seminar, 5 ects
- Methodological studies according to students needs 10 ects
- ECGS-003 Practical application of sustainability science

**Discipline specific studies in the field of degree programme, 60 ects**

**Master's thesis in EC, 30 ects**

- Master's maturity test BY, 0 ects

**ECGS-1000 Environmental Change Study Line 30 ects**

- ECGS-610 Agriculture and environment, 15 or 30 ects
- ECGS-010 Aquatic Sciences, 15 or 30 ects
- ECGS-090 Environmental soil science, 15 or 30 ects
- ECGS-077 Chemical pollution, 15 or 30 ects
- ECGS-550 Northern ecosystems and environment, 15 or 30 ects
- ECGS-900 Urban studies, 15 or 30 ects
- ECGS-500 Baltic sea studies, 15 or 30 ects

**Master's thesis in GS, 30 ects**

Master's maturity test BY, 0 ects

**ECGS-2000 Global Sustainability, Study Line 30 ects**

- ECGS-080 Environmental policy and economics, 15 or 30 ects
- ECGS-100 Environment and development, 15 ects
- ECGS-200 Consumer citizens and sustainability transition, 15 or 30 ects
- ECGS-350 Environment, Science and society, 15 or 30 ects
- ECGS-400 Forests, global changes and sustainability , 15 or 30 ects
- SOSM-503 Science and Technology Studies, 15 or 30 ects
- ECGS-900 Urban studies, 15 or 30 ects
- ECGS-500 Baltic sea studies, 15 or 30 ects

**Thematic modules, 15 etcs**

- VIIKB-201 International Master level studies, 15 ects
- ECGS-600 Climate change, 15 ects
- ATM391 Climate university MOOC, 15 ects
- ECGS-800 Global Land use, 15 ects
- IND-500 Indigenous studies, 15 ects
- ECGS-700 Food and sustainability, 15 ects
- ECGS-900 Urban studies, 15 ects
- ECGS-500 Baltic sea studies, 15 ects

**ECGS-025 Elective studies in ECGS, 15 ects**

- According to students interests
- To deepen specialization or broaden professional expertize
- ECGS-153 Internship, ECGS-154 Research group training
- ECGS-026 Portfolio for the Future

## Master's Programme in Environmental Change and Global Sustainability
## ECGS-3000 Biology Subject Teacher Study Line

**Advanced studies, 60 etcs**

**Compulsory studies, 40 ects**

- Personal Study Plan (PSP), 0 ects
- ECGS-004 Master's thesis seminar, 5 ects
- ECGS-001 Introduction to Sustainability Science, 5 ects
- ECGS-008 Master's thesis for Subject Teacher, 30 ects
- Master's maturity test BY, 0 ects

**Methodological studies, 5 ects**

**Optional studies, 15 ects**
**Choose at least one study module, 15 ects**:

- ECGS-010 Aquatic Sciences,
- ECGS-077 Chemical pollution
- ECGS-550 Northern ecosystems and environment

- **PED100 Aineenopettajan pedagogiset opinnot (PKL), 60 ects**

# ECGS-450 CORE STUDIES IN ECGS, 30 ects

### ECGS-4000 Sustainability Science, 15 ects

Compulsory

- ECGS-001 Introduction to Sustainability Science, 5 ects
- ECGS-002 Philosophical and Methodological Foundations of Sustainability Science, 5 ects

Optional studies in Applied sustainability science (choose at least 5 ects )

- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- Work-2 (VALT-601M) Demola co-creation working life project (Master´s level), 5 ects
- ECGS-007 Science Conference Course, 5 ects
- ECGS-150 Master Class Sustainability, 5 ects
- ATM373 Leadership for Sustainable Change, 5 ects

### Methodological studies according to students's needs, 15 ects

Compulsory methodological studies, 5 ects

- ECGS-004 Master's thesis seminar 5 ects

Optional methodological studies (choose at least 10 ects )

- ECGS-081 Analytical approaches to human environmental interactions
- AGERE-002 Cost-Benefit Analysis, 5 ects
- Work-2 (VALT-601M) Demola co-creation working life project (Master´s level)
- FOR-259 GIS and RS in environmental and land use applications
- ECGS-910 Yhteiskuntatieteellisen ympäristötutkimuksen integroivat menetelmät, 5 op
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 op
- ECGS-155 Introduction to digital methods in environmental social science, 5 op
- FILK-224 Filosofisen ajattelun menetelmät, 5 ects
- FILM-353 Taloustieteen filosofia, erikoistuminen, 5 op
- FILK-222 Yhteiskuntatieteiden filosofia, 5 ects
- FILM-305 Yhteiskuntatieteiden filosofia, syventävä, 5 ects
- FOR-108 Qualitative empirical research methods, approaches and research ethics, 5 ects
- ATM308 Statistical tools for climate and atmospheric science
- Other methodological studies according to an agreement

# DISCIPLINE SPECIFIC (EC or GS) STUDIES, 60 ects

## ECGS-1000 Environmental Change Study Line, Advanced Studies, 60 ects

### Compulsory advanced studies, 30 ects

**ECGS-005 Master's thesis, 30 ects**

**VIIKB-001 Master's maturity test BY, 0 ects**

**ECGS-009 Personal study Plan (PSP), 0 ects**

### Optional advanced studies (choose at least one study module, 30 ects in total)

**ECGS-610 Agriculture and environment, 15 or 30 ects**

Compulsory studies, 15 ects

- AGRI-211 Wildlife in the Farming Environment, 5 ects
- AGRI-212 Ecological farming methods, 5 ects

Choose 5 ects

- either AGRI-213 Literature in Farmland Ecology, 5 ects,
- or AGRI-113 Environmental Technology in Crop Production, literature, 5 ects

Optional studies, 10 ects

- Study units agreed in the PSP

**ECGS-010 Aquatic Sciences, 15 or 30 ects**

Compulsory studies

- ECGS-018 Food webs of aquatic ecosystems, 5 ects
- ECGS-011 Advanced aquatic and sediment biogeochemistry, 5 ects

Optional studies

- ECGS-013 Restoration of lake ecosystems , 5 ects)
- ECGS-017 Fisheries management , 5 ects
- ECGS-019 Advanced aquatic ecosystems research (5-10 ects)
- ECGS-016 Fish research , 5 ects
- ECGS-020 Nutrient loading of aquatic ecosystems , 5 ects
- ECGS-023 Functional marine ecology , 5 ects
- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 ects

**ECGS-090 Environmental soil science, 15 or 30 etcs**

Compulsory studies

- AGRI-411 Soil Hydrology , 5 ects
- AGRI-412 Environmental Soil Science Readings II, 5 ects
- AGRI-413 Advanced Soil Science, 5 ects

Optional studies

- AGRI-414 Pedogenesis and Soil Classification, 5 ects
- AGRI-415 Soil Science Laboratory III , 10 ects

**ECGS-500 Baltic Sea studies, 15 or 30 ects**

Compulsory courses

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

Optional courses

- ECGS-502 Marine governance, 5 ects
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- AGERE-E12 International environmental agreements related to marine areas and resources, 5 ects
- AGERE-E06 Economics of Aquatic Resources: Numerical Models, 5 ects
- ECGS-017 Fisheries management, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks (this course under planning), 5 ects

**ECGS-900 Urban studies 15 or 30 ects**

Compulsory courses

- ECGS-903: Urban Ecosystem Ecology 5 ects
- ECGS-904: Urban Environmental Policy , 5 ects
- ECGS-907: Urban Biodiversity , 5 ects

Optional courses

- ECGS-901: Field Course in Urban Environmental Ecology 5 ects– every 2nd year (2021, 2023…)
- ECGS-906: Urban Climate , 5 ects
- ECGS-049: Nature-based Solutions (5 ects) – every 2nd year (2021, 2023…)
- ECGS-910 Intergrative methods in environmental social science, 5 ects
- ECGS-076 Urban ecotoxicology (replacing ECGS-908)

**ECGS-077 Chemical Pollution 15 or 30 etcs**

Compulsory

- ECGS-076 Urban Ecotoxicology 5 ects.
- ECGS-071 Advances in Environmental Chemistry. 5 ects
- ECGS-046 Advanced Course in Bio- and Environmental Technology

Optional. Choose at least 15 cr

- EGCS-074 Labcourse on Methods in Ecotoxicology. 5 ects
- ECGS-045 Laboratory Course in Environmental Biotechnology and Chemistry, 5 ects
- ECGS-073 Fate and Transport of pollutants. 5 ects
- ECGS-048 Nanobootcamps (NBC), 5 ects
- ECGS-078 Challenge Course. 5 ects

**ECGS-550 – Northern ecosystems and environment, 15 or 30 etcs**

Compulsory studies

- ECGS-031 Arctic climate change, 5 ects
- ECGS-037 Seminar in northern ecosystems and environment, 3 ects.
- ECGS-067 Past environmental change, 2 ects (former course “Introduction to paleoecology)

Optional studies

- ECGS-063 Topical issues in northern environmental research, 2 ects
- ECGS-035 Field course on arctic ecosystems and climate change, 8 ects

- ECGS-065, Practicals in past environmental change, 5 ects. Former Paleaobioindicators- course. 4 th period, in even years.
- FOR-259 GIS and RS in environmental and land use applications, 5 ects. 4 th period, in uneven years.
- ECGS-036 Arctic and human beings, 5 ects, even years, first in 2020.
- FYS2087 Air quality in a changing world, 5 ects
- GEOM-G2013 Palaeoceanography – application of marine microfossils as palaeoclimatological proxies, 5 ects, uneven years (2019, 2021)
- ECGS-038 Arctic risks – 10 op kurssi tulossa ja suunnitteilla

## ECGS-2000 Global Sustainability Study Line, Advanced studies, 60 ects

### Compulsory advanced studies, 30 ects

**ECGS-006 Master's thesis, 30 ects**

**VIIKB-001 Master's maturity test BY 0 ects**

**ECGS-009 Personal study plan (PSP), 0 ects**

### Optional advanced studies (choose at least one study module, 30 ects in total)

**ECGS-080 Environmental policy and economics, 15 or 30 etcs**

Compulsory studies

- ECGS-081 Analytical approaches to human environmental interactions 5 ects
- YET-208 Intermediate environmental economics 5 ects OR AGERE-E03 Climate and energy policy, 5 ects

Optional studies

- ECGS-082 Communication and sustainable development 5 ects
- ECGS-084 Environment, technology and culture 5 ects
- ECGS-085 Imagination in environmental politics 5 ects
- ECGS-087 The politics of environmental knowledge 5 ects
- SOSM-SP305 Käyttäytymisen muutos ja interventioiden suunnittelu 5 ects
- FOR-111 Behavioural change and sustainability (Annukka Vainio) , 5 ects
- SOSM-YP302 Sustainable welfare 5 ects
- AGERE-011 Socio-cultural valuation methods 5 ects (Christopher Raymond)
- AGERE-E01 Environmental Economics I: Theory 5 ects
- AGERE-E02 Environmental Economics II: Mechanisms 5 ects
- AGERE-E12 International Environmental Agreements related to marine areas and resources 5 ects
- AGERE-E09 Advanced natural Resource Economics 5 ects
- Environmental law, 5 ects
- Global sustainability law, 5 ects (Niko Soininen)

**ECGS-100 Environment and development, 15 ects**

Compulsory studies

- YMK-3303: Poliittinen ekologia ja luonnonvarapolitiikka, 5 ects
- YMK-3305: Kehitystutkimuksen klassikot, 5 ects
- YMK-3310 Climate change and global justice

**ECGS-200 Consumer citizens and sustainability transition courses, 15 or 30 ects**

Compulsory studies

- ECGS-201 Perspectives on sustainable consumption 5 ects

Optional studies (choose at least 10 ects)

- ECGS-202 Sociotechnical (re)construction of consumer society
- ECGS-203 Sustainability in everyday life 5 ects
- ECGS-204 Business in the natural environment 5 ects
- FOR-111 Behavioural change and sustainability 5 ects
- ME-007 Vastuullisuus metsäsektorilla 4 ects

- YET-030 Vastuullinen liiketoiminta elintarvikealalla, 5 ects (aiemmin EKM-105 Vastuullinen liiketoiminta elintarvikealalla, 5 ects)
- EDUM504 Sustainable Culinary Culture 5 ects
- SOSM-SP305 Käyttäytymisen muutos ja interventioiden suunnittelu 5 ects
- ECGS-081 Analytical approaches to human environmental interaction 5 ects
- ECGS-082 Kommunikation i hållbar utveckling 5 ects
- ECGS-085 Imagination in environmental politics 5 ects
- SOSM-YP302 Sustainable welfare 5 ects

**ECGS-350 Environment, Science and society, 15 or 30 etcs**

Compulsory courses (choose 1 of the following, 5 ects):

- ECGS-087 The politics of environmental knowledge, 5 ects
- ECGS-086 Qualitative methods for environmental studies, 5 ects
- ECGS-085 Imagination in environmental politics, 5 ects

Optional courses (choose at least 10 etcs):

- ECGS-087 The politics of environmental knowledge, 5 ects
- ECGS-086 Qualitative methods for environmental studies, 5 ects
- ECGS-085 Imagination in environmental politics, 5 ects
- ECGS-081 Analytical approaches to human environmental interaction, 5 ects
- ECGS-082 Kommunikation och hållbar utveckling, 5 ects
- ECGS-202 Sociotechnical (re)construction of consumer society, 5 ects
- SOSM-SL321 Tieteentutkimus 1, 5 ects
- SOSM-SL322 Teknologiantutkimus 1, 5 ects
- SOSM-SL323 Special course in Science and Technology Studies (e.g. Co-creation and public participation in science), 5 ects
- IND-512 Biocultural Approaches to the Environment and Conservation, 5 ects

**ECGS-400 Forests, global changes and sustainability, 15 or 30 ects**

Compulsory studies, choose at least 2 out of 3

- FOR-104 International Forest Policy II (M. Brockhaus), 5, period IV
- FOR-109 Ecosystem services: a comprehensive introduction to theory and practice (D. D'amato), 5 ects, period I,
- FOR-219 Sustainable Forest Ecosystem Management (T Kuuluvainen), 5, period II

Optional studies (choose at least 5 ects):

- FOR-101 Responsible Business Management in Global Forest Bioeconomy (A Toppinen), 5 ects, period II
- FOR-110 Economics of climate change in forestry (L Valsta), 5 ects, period III – under financial planning
- FOR-111 Behavioural change and sustainability (Annukka Vainio), 5 ects, period IV
- FOR-215 Mitigation of Climate Change in Forestry (T Kalliokoski), 5 ects, not given in 2018-19
- FOR-216 Adaptation of Forestry to Climate Change (T Kalliokoski), 5 ects, period III
- FOR-226 Restoration of degraded ecosystems: theory and practice (E Yirdaw), 5 ects, period IV (odd years)
- FOR-276 Sustainable forestry and agroforestry in the tropics (E Yirdaw), 5 ects
- FOR-253 Tropical Forests and Climate Change (E Yirdaw), 5, web-based course

**ECGS-500 Baltic Sea studies, 15 or 30 ects**

Compulsory courses

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects

- ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

Optional courses

- ECGS-502 Marine governance, 5 ects
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- AGERE-E12 International environmental agreements related to marine areas and resources, 5 ects
- AGERE-E06 Economics of Aquatic Resources: Numerical Models, 5 ects
- ECGS-017 Fisheries management, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks (this course under planning), 5 ects

**ECGS-900 Urban studies, 15 or 30 ects**

Compulsory courses

- ECGS-903: Urban Ecosystem Ecology 5 ects
- ECGS-904: Urban Environmental Policy , 5 ects
- ECGS-907: Urban Biodiversity , 5 ects

Optional courses

- ECGS-901: Field Course in Urban Environmental Ecology 5 ects– every 2nd year (2021, 2023…)
- ECGS-906: Urban Climate , 5 ects
- ECGS-049: Nature-based Solutions (5 ects) – every 2nd year (2021, 2023…)
- ECGS-910 Intergrative methods in environmental social science, 5 ects
- ECGS-076 Urban ecotoxicology (replacing ECGS-908)

**SOSM-503 Tieteen ja teknologian tutkimus/Science and Technology Studies, 15 or 30 ects**

**Compulsory studies:**

- SOSM-SL321 Tieteentutkimus (Sosiaalitieteiden maisteriohjelma), 5 ects
- SOSM-SL322 Teknologiantutkimus (Sosiaalitieteiden maisteriohjelma), 5 ects

**Optional studies (choose at least one):**

- SOSM-SL323 Tieteen- ja teknologiantutkimuksen erikoiskurssi (Sosiaalitieteiden maisteriohjelma), 5 ects
- SOSM-326 Datafication - critical perspectives (Sosiaalitieteiden maisteriohjelma),5 ects
- SOSM-321 Digitaalisen yhteiskunnan rajapinnoilla (Sosiaalitieteiden maisteriohjelma), 5 ects
- SOSM-325 Digitalisoituva sosiaalisuus (Sosiaalitieteiden maisteriohjelma), 5 ects
- ECGS-081 Analytical approaches to human environmental interaction, 5 ects
- ECGS-084 Environment, technology and culture, 5 ects
- FILK-227 Tieteenfilosofia (Filosofian kandiohjelma), 5 ects
- FILK-222 Yhteiskuntatieteiden filosofia (Filosofian kandiohjelma), 5 ects

## ELECTIVE THEMATIC MODULES

Choose one thematic study module

### ECGS-500 Baltic Sea studies, 15 ects

Compulsory courses 10 ects

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

Optional courses, choose 5 ects

- ECGS-502 Marine governance, 5 ects
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- AGERE-E12 International environmental agreements related to marine areas and resources, 5 ects
- AGERE-E06 Economics of Aquatic Resources: Numerical Models, 5 ects
- ECGS-017 Fisheries management, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks (this course under planning), 5 ects

### ECGS-900 Urban studies 15 ects

Compulsory courses

- ECGS-903: Urban Ecosystem Ecology 5 ects* compulsory
- ECGS-904: Urban Environmental Policy , 5 ects
- ECGS-907: Urban Biodiversity , 5 ects

### ECGS-600 Climate change, 15 ects

Compulsory

- ATM302: Climate change now, 5 ects

Optional (choose 10 ects)

- ECGS-601: Ecosystems and climate change, 5 ects
- ECGS-031: Arctic climate change, 5 ects
- FOR-253: Tropical forests and climate change, 5 ects
- FOR-275: Soils and climate change, 5 ects
- FOR-215: Mitigation of climate change in forestry, 5 ects
- FYS2087: Air quality in a changing world, 5 ects
- YET-214: Climate and energy, 5 ects
- GEOG-331: Climate change and rural development, 5 ects
- RUS-310: Environment & climate, 5 ects
- ALKU-305: Climate change narratives: professionals and publics, 5 ects

### ECGS-700 Food and sustainability, 15 ects (or 30 ects)

Compulsory courses (15 ects)

- AGRI-222 Sustainable Food Systems, 5 ects(Hanna Tuomisto), *odd years*
- EDUM504 Sustainable Culinary Culture, 5 ects(Johanna Mäkelä, Mari Niva), odd years, 4th period, essay course every year 2nd & 4th period
- FOOD-401 European Food Safety, 5 ects(Marina Heinonen), *even years, 3rd period*

(Optional courses (15 ects)

***Fundamental elective***
**ECGS-701 Philosophy and methodology of sustainable food production systems** (Milutin Stojanovic)

*In field of economics:*

- YET-030 Vastuullinen liiketoiminta elintarvikealalla, 5 ects (aiemmin EKM-105 Vastuullinen liiketoiminta elintarvikealalla, 5 ects) (Pasi Heikurinen)
- AGERE-002 Cost-Benefit Analysis, 5 ects(Chiara Lombardini), *even years (online course 2019-2020)*
- EKM-103 Managing Innovation in Agrifood Value Chains for Sustainability, 5 ects(Bodo Steiner)

*In field of food and crop sciences:*

- FOOD-701/AGRI-241 Food Crop Quality, 3 cr/Field Crop Quality, 5 ects(Fred Stoddard), *odd/even years*
- FOOD-110 Cereal and Pulse Ingredient Functionality, 2 ects (Tuula Sontag-Strohm)
- FOOD-402 Chemical Risk Factors, 5 ects(Velimatti Ollilainen)

*In field of agroecology and plant production:*

- AGRI-221 Agroecology: Working with the Complexity of Farming Systems, 5 ects (Iryna Herzon)
- AGRI-201 Plant Production in the Tropics, 5 ects (Johanna Kolehmainen), *odd years, 2nd period*
- AGRI-223 Literature in Agroecology of Food Systems, 5 ects (Hanna Tuomisto) )

## ECGS-800 Global land use, 15 ects

Optional studies, choose 15 ects

- GEOG-341: Geography of megatrends, environmental change and development in the Global South, 5 ects (period 1)
- GEOG-G302: Remote Sensing 1, 5 ects (period I)
- FOR-104: International Forest Policy 2, 5 ects (IV period)
- FOR-253: Tropical Forests and Climate Change, 5 ects (IV period, arranged in odd-numbered years)
- FOR-226 Restoration of degraded ecosystems: theory and practice, 5 ects, period IV (odd years)

## IND-500 Indigenous Studies Module, 15 ects (or 30 ects)

Degree requirements for 15 ects

- IND-510 Indigenous peoples, epistemic and linguistic diversity, 5 ects
- IND-511 Methodologies and research ethics in Indigenous Studies, 5 ects
- IND-512 Biocultural approaches to the environment and conservation

(Degree requirements for 30 ects additionally

- IND-513 History, power and Indigenous rights, 5 ects
- IND-514 Indigenous arts, 5 ects
- IND-515 Selected topics in Indigenous languages, 5 ects)

## ATM391 Climate University, 15 ects

Choose from optional courses, 15 ects

- ATM302 Climate.now ,2-5 ects
- ATM378 Sustainable.now, 5 ects
- ATM379 SystemChange.now, 5 ects
- ATM380 Solutions.now, 5 ects
- MAAT-051 Circular.now, 3- 5 ects
- ATM373 Leadership for sustainable change, 5 ects
- ATM308 Statistical tools for climate and atmospheric science, 5ects
- ATM382 ClimateComms.now, 2-5 ects

## VIIKB-201 Study Module Completed in a Foreign University, 15 ects

## ECGS-025 ELECTIVE STUDIES IN ECGS

- VIIKB-005 Demanding participation in administrative bodies and student organizations, 2-5 ects
- VIIKB-002 Tutoring BY, 5 ects
- ECGS-153 Internship period, 5-10 ects
- ECGS-154 Research group training, 5 ects
- ECGS-026 Portfolio for the future, 1-5 ects
- ECGS-027 Co-Creation lab (in ECGS-004)

# ECGS-3000 Biology Subject Teacher Study Line,

## Discipline specific studies, 60 ects

### Compulsory advanced studies, 40 ects

**ECGS-001 Introduction to Sustainability Science, 5 ects**
**ECGS-004 Master's thesis seminar, 5 ects**
**ECGS-008 Master's thesis for Subject teacher, 30 ects**
**VIIKB-001 Master's maturity test BY, 0 ects**
**ECGS-009 Personal Study plan (PSP)**

### Optional advanced studies (Choose at least one study module, 15 ects in total)

**ECGS-010 Aquatic Sciences, 15 or 30 ects**
**ECGS-077 Chemical Pollution, 15 or 30 etcs**
**ECGS-550 Northern ecosystems and environment, 15 or 30 etcs**

### Methodology (choose at least 5 ects)

- ECGS-910 Integrative methods in environmental social science, 5 ects
- Work-2 (VALT-601M) Demola co-creation working life project (Master's level), 5 ects
- ECGS-081 Analytical approaches to human environmental interaction, 5 ects
- AGERE-002 Cost-Benefit Analysis, 5 ects
- FOR-259 GIS and RS in environmental and land use applications, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 ects
- Other methodological courses according to an agreement

## OTHER STUDIES: Study track of Subject Teacher

**PED100 Aineenopettajan pedagogiset opinnot (PKL), 60 ects**

# MODULE DESCRIPTIONS

## ECGS-010 Aquatic sciences, 15 or 30 etcs

**Target group:** Especially **ECGS** students

**Timing:** Master studies

**Objective/Learning outcomes:**

- Comprehensive knowledge on the functioning of aquatic ecosystems, both marine and freshwater, including their food webs, and biological, chemical and physical regulatory mechanisms
- Skills in planning and carrying out aquatic ecosystem research, including both experimental and field studies
- Knowledge on diagnosing the main environmental problems of aquatic ecosystems and means to apply research-based solutions in resolving them
- Comprehensive knowledge on planning and methodology of aquatic ecosystem management and restoration

**Prerequisites:**

**Contents:**

*Compulsory courses*

- ECGS-018 Food webs of aquatic ecosystems, 5 ects
- ECGS-011 Advanced aquatic and sediment biogeochemistry , 5 ects

*Optional courses*

- ECGS-020 Nutrient loading of aquatic ecosystems , 5 ects
- ECGS-013 Restoration of lake ecosystems , 5 ects
- ECGS-017 Fisheries management , 5 ects
- ECGS-019 Advanced aquatic ecosystems research (5-10 ects)
- ECGS-016 Fish research , 5 ects
- ECGS-023 Functional marine ecology 5 ects
- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems , 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 ects

**Study materials and literature:** See the descriptions of individual courses

**Activities and teaching methods in support of learning:** See the descriptions of individual courses

**Assessment practices and criteria:** See the descriptions of individual courses

**Completion:** See the descriptions of individual courses

**Other information:**

**Responsible person:** Leena Nurminen

**Keywords:** (i.e. if Suitable for exchange students)

## ECGS-025 Elective studies in ECGS, 15 ects

**Target group:** Students in ECGS masters' programme

**Timing:** Master studies

**Learning outcomes:** Studies in this module further enhance the student's scientific expertize and professional profile.

**Contents :**

*Optional*

- VIIKB-005 Demanding participation in administrative bodies and student organizations, 2-5 ects
- VIIKB-002 Tutoring BY, 5 ects
- ECGS-153 Internship period, 5-10 ects
- ECGS-154 Research group training, 5 ects
- ECGS-026 Portfolio for the future, 1-5 ects
- Other free choice courses according to student's interests

**Responsible person** NN

## ECGS-077 Chemical Pollution (15 or 30 ects )

**Target Group:**
Predominantly students in Environmental Change and Global Sustainability Master programme as well as other interested students

**Timing:** 1st and 2nd year

**Objective / Learning outcomes:**

- This module will enable the students to gain fundamental and advanced knowledge in Aquatic Ecotoxicology, Environmental Chemistry and Environmental Technology from basic mechanisms like uptake of substances into organisms and cells, bioamplification, bioaccumulation or bioconcentration to most complex mechanisms like enzymatic based biotransformation, oxidative stress or metabolization and bioremediation methods.
- Students will learn to identify molecular initiating events (MIEs) and adverse outcome pathways (AOPs) and understand the interaction of environmental chemicals and organisms and how these possibly adverse effects will influence population and whole ecosystems.
- Students will be trained to use scientific methods, laboratory skills and their gained knowledge to critically judge environmental pollutions and also find solutions to remediate and restore the environment in a sustainable way

**Prerequisites**:
BSc degree in relevant field, y-kandi course on Basics in Ecotoxicology as well as general courses in chemistry and ecology recommended

**Contents:**
*Compulsory*
ECGS-076 Urban Ecotoxicology 5 ECTS.
ECGS-046 Advanced Course in Bio- and Environmental Technology
ECGS-071 Advances in Environmental Chemistry 5 ECTS

*Optional. Choose at least 15 cr*
EGCS-074 Lab course on Methods in Ecotoxicology. 5 ECTS
ECGS-045 Laboratory Course in Environmental Biotechnology and Chemistry, 5 ects
ECGS-073 Fate and Transport of pollutants. 5 ECTS
ECGS-048 Nanobootcamps (5 ECTS)
ECGS-078 Challenge Course. 5 ECTS, LUT

**Study material and literature**: Literature in moodle, book suggestions during the courses
**Assessment practice and criteria**: Weighted average of course grades

**Other information**:

**Relation to other study units**: Urban Ecology

**Responsible person**: Olli-Pekka Penttinen

**Keywords**: ecotoxicology, urban, environmental chemistry, adverse out pathways, environmental technology, bioremediation, low impact development systems, nature based-solutions,

## ECGS-080 Environmental policy and economics, 15 or 30 etcs

**Target group**
Environmental change and global sustainability (ECGS) master's programme
Available for other students

**Timing:** Phase of studies, when the module is completed

**Responsible teacher of the module:** Janne I. Hukkinen and Marko Lindroos

**Learning outcomes of the module**

The module provides the students with skills to analyze the economic, policy and governance asp ects of human environmental interactions and to propose economically viable transition policies toward sustainability. In particular, they can incorporate complex institutional, political, economic, socio-ecological, cognitive, behavioural, technological and cultural factors in their interdisciplinary expert assessments and recommendations. Innovative learning environments – such as group work, case studies, problem sets, simulations, discussions, lectures and text production – prepare the students for the challenging real-life interactions that characterize contemporary environmental governance in the public, private and nonprofit sectors.

**Preceding studies or preceding knowledge**

Recommended but not required: Introduction to environmental policy 5 ects& Introduction to Environmental and Resource Economics, 5 ects

**The content of the module**
*Compulsory (10 ects):*

- ECGS-081 Analytical approaches to human environmental interactions 5 ects
- YET-208 Intermediate environmental economics 5 ects OR AGERE-E03 Climate and energy policy , 5 ects

*Optional (choose at least 5 ects):*

- ECGS-082 Communication and sustainable development 5 ects
- ECGS-084 Environment, technology and culture 5 ects
- ECGS-085 Imagination in environmental politics 5 ects
- ECGS-087 The politics of environmental knowledge 5 ects
- SOSM-SP305 Käyttäytymisen muutos ja interventioiden suunnittelu 5 ects
- FOR-111 Behavioural change and sustainability (Annukka Vainio) , 5 ects
- SOSM-YP302 Sustainable welfare 5 ects
- AGERE-011 Socio-cultural valuation methods 5 ects (Christopher Raymond)
- AGERE-E01 Environmental Economics I: Theory 5 ects
- AGERE-E02 Environmental Economics II: Mechanisms 5 ects
- AGERE-E12 International Environmental Agreements related to marine areas and resources 5 ects
- AGERE-E09 Advanced natural Resource Economics 5 ects
- Environmental law, 5 ects
- Global sustainability law 5 ects (Niko Soininen)

**MODULE GRADING**

- Basics of the grading

## ECGS-090 Environmental Soil Science, 15 or 30 etcs

**Target group:** Master's Programme in Environmental Change and Global Sustainability

**Timing:** 1st and 2nd year of Master's studies

**Objective/Learning outcomes:**

After completing the module, the student:

- has in-depth knowledge of the advanced concepts and theories of Environmental Soil Science and can apply them in new contexts.
- knows advanced research methods in Environmental Soil Science
- can apply theoretical knowledge of Environmental Soil Science for solving advanced practical problems.
- has critical thinking and argumentation skills.
- can assess and develop his/her own know-how
- can work and co-operate in different transdisciplinary research groups.

**Prerequisites**:
Intermediate knowledge of Environmental Soil Science (B.Sc. level): Environmental Soil Science module MAAT-400 in the B.Sc. Programme in Agricultural Sciences (Maataloustieteiden kandiohjelma), Environmental Soil Science module ENV-320 in the the B.Sc. Programme in Environmental Sciences (Ympäristötieteiden kandiohjelma), or similar courses.

**Recommended optional studies:**

**Contents**:
*Compulsory courses*

- AGRI-411 Soil Hydrology, 5 ects
- AGRI-412 Environmental Soil Science Readings II, 5 ects
- AGRI-413 Advanced Soil Science, 5 ects

*Optional courses*

- AGRI-414 Pedogenesis and Soil Classification, 5 ects
- AGRI-415 Soil Science Laboratory III, 10 ects

**Study materials and literature:**
**Assessment practices and criteria:** Weighted average of courses

**Other information**:
The students specializing in Environmental Soil Science are strongly recommended to take AGRI-416 Environmental Soil Science Readings III (MAA570) as part of their free-choice studies.

**Responsible person**: Mari Pihlatie
**Keywords**: (i.e. if Suitable for exchange students)

## ECGS-100 Environment and development, 15 op

**Learning outcomes**
This module focuses on long-term pathways and actual debates related to development and environment in the global South. After completing this module, the student if familiar with classic thinkers and theories and current debates relevant in Development Studies. He/she has good knowledge of the main principles and relevant approaches concerning the political ecology and multi-scale resource governance in the global South and she/he is able to apply the acquired knowledge in empirical research and policy-oriented work.
**Contents**

- YMK-3303 Political ecology and resource politics
- YMK-3305 Classics in Development
- YMK-3310 Climate change and global justice

**Responsible person** Anja Nygren

## ECGS-1000: Evironmental change study line, advanced studies/Ympäristömuutoksen opintosuunta, syventävät opinnot, 60 op

**Target group:**
Compulsory to students of Master's Programme in Environmental Change and Global Sustainability. The module forms the basis for advanced studies of the Environmental Change and Global Sustainability Master's Programme.

**Objective/Learning outcome:**
After completing the advanced studies the student is able to plan and perform research work and work as an expert within the selected discipline of the Environmental Change study module and has acquired the generic abilities:

- critical thinking and reasoning between conflicting views
- dialogue, communication and argumentation skills
- solution seeking and problem solving abilities
- co-operational capacities, group working skills
- abilities to work in multidisciplinary contexts

**Prerequisites:** Bachelor's degree in relevant field

**Contents:**

**Compulsory advanced studies, 30 ects**

- ECGS-005 Master's thesis, 30 ects
- VIIKB-001 Master's maturity test BY, 0 ects
- ECGS-009 Personal study Plan (PSP), 0 ects

**Optional advanced studies** (choose at least one study module, 30 ects in total)

**ECGS-610 Agriculture and environment, 15 or 30 ects**

*Compulsory studies*, 15 ects

- AGRI-211 Wildlife in the Farming Environment, 5 ects
- AGRI-212 Ecological farming methods, 5 ects

Choose 5 ects

- either AGRI-213 Literature in Farmland Ecology, 5 ects,
- or AGRI-113 Environmental Technology in Crop Production, literature, 5 ects

*Optional studies*, 10 ects

- Study units agreed in the PSP

**ECGS-010 Aquatic Sciences, 15 or 30 ects**

*Compulsory studies*

- ECGS-018 Food webs of aquatic ecosystems, 5 ects
- ECGS-011 Advanced aquatic and sediment biogeochemistry, 5 ects

*Optional studies*

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-013 Restoration of lake ecosystems , 5 ects)
- ECGS-017 Fisheries management , 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 ects
- ECGS-019 Advanced aquatic ecosystems research (5-10 ects)
- ECGS-016 Fish research , 5 ects
- ECGS-023 Functional marine ecology , 5 ects
- ECGS-020 Nutrient loading of aquatic ecosystems , 5 ects

**ECGS-090 Environmental soil science, 15 or 30 etcs**

*Compulsory studies*

- AGRI-411 Soil Hydrology , 5 ects

- AGRI-412 Environmental Soil Science Readings II, 5 ects
- AGRI-413 Advanced Soil Science, 5 ects

*Optional studies*

- AGRI-414 Pedogenesis and Soil Classification, 5 ects
- AGRI-415 Soil Science Laboratory III , 10 ects

**ECGS-900 Urban studies, 15 or 30 ects**

*Compulsory courses*

- ECGS-903: Urban Ecosystem Ecology 5 ects
- ECGS-904: Urban Environmental Policy , 5 ects
- ECGS-907: Urban Biodiversity , 5 ects

*Optional courses*

- ECGS-901: Field Course in Urban Environmental Ecology 5 ects– every 2nd year (2021, 2023…)
- ECGS-906: Urban Climate , 5 ects
- ECGS-049: Nature-based Solutions (5 ects) – every 2nd year (2021, 2023…)
- ECGS-910 Intergrative methods in environmental social science, 5 ects
- ECGS-076 Urban ecotoxicology (replacing ECGS-908)

**ECGS-077 Chemical Pollution, 15 or 30 etcs**

*Compulsory studies*

- ECGS-076 Urban Ecotoxicology 5 ects.
- ECGS-071 Advances in Environmental Chemistry. 5 ects
- ECGS-046 Advanced Course in Bio- and Environmental Technology

*Optional. Choose at least 15 cr*

- EGCS-074 Labcourse on Methods in Ecotoxicology. 5 ects
- ECGS-045 Laboratory Course in Environmental Biotechnology and Chemistry, 5 ects
- ECGS-073 Fate and Transport of pollutants. 5 ects
- ECGS-048 Nanobootcamps (NBC), 5 ects
- ECGS-078 Challenge Course. 5 ects

**ECGS-550 Northern ecosystems and environment (15 or 30 etcs)**

*Compulsory studies*

- ECGS-031 Arctic climate change, 5 ects
- ECGS-037 Seminar in northern ecosystems and environment, 3 ects.
- ECGS-067 Past environmental change, 2 ects. (former course “Introduction to paleoecology

*Optional studies*

- ECGS-063 Topical issues in northern environmental research, 2 ects
- ECGS-035 Field course on arctic ecosystems and climate change, 8 ects mitoitus muuttuu
- ECGS-065, Practicals in past environmental change, 5 ects. Former Paleaobioindicators-course. 4 th period, in even years..
- FOR-259 GIS and RS in environmental and land use applications, 5 ects. 4 th period, in uneven years.
- ECGS-036 Arctic and human beings, 5 ects, even years, first in 2020.
- FYS2087 Air quality in a changing world
- GEOM-G2013 Palaeoceanography – application of marine microfossils as palaeoclimatological proxies, 5 ects, uneven years (2019, 2021)
- ECGS-038 Arctic risks – 10 op kurssi tulossa ja suunnitteilla

**ECGS-500 Baltic sea studies, 15 or 30 ects**

*Compulsory courses*

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

*Optional courses choose 5 ects*

- ECGS-502 Marine governance, 5 ects
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- AGERE-E12 International environmental agreements related to marine areas and resources, 5 ects

- AGERE-E06 Economics of Aquatic Resources: Numerical Models, 5 ects
- ECGS-017 Fisheries management, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks (this course under planning), 5 ects

**Assessment practices and criteria** Weighed average

**Responsible person:**

## ECGS-200: Consumer Citizens and Sustainability Transitions Courses, 15 - 30 op

**Target group:**
ECGS is in charge of this module. The module is also available for students in the Social Science Master's program and students in Food Economy and Consumption

**Timing:** 2nd year of Master's studies

**Objective/Learning outcomes**
Having completed this module,

- Students have the basic knowledge and skills enabling them to work as an expert in sustainable consumption in the public or private sector.
- They understand the research paradigms and main empirical research findings concerning sustainable consumption well enough to evaluate competing theoretical perspectives, critique research findings and critically assess policy proposals.
- They are able to structure and analyse policy, design and communications problems in sustainable consumption and to collect sensible primary and secondary data to inform solutions to these problems.
- They also have a conceptual and experiential understanding of different ways in which such problems can be framed.
- Additionally, students improve their practical research design, methods, data collection, writing and communication skills.

**Prerequisites** Students should have a good basic knowledge (corresponding to Bachelor's degree) in an appropriate subject (social sciences, environmental sciences, economics, consumer and food studies). It is also recommended that students have completed the methodological courses in their Master's subject

**Contents**
*Compulsory*

- ECGS-201 Perspectives on sustainable consumption 5 ects

*Optional.* Choose at least 10 ects

- ECGS-202 Sociotechnical (re)construction of consumer society
- ECGS-203 Sustainability in everyday life 5 ects
- ECGS-204 Business in the natural environment 5 ects
- FOR-111 Behavioural change and sustainability 5 ects
- ME-007 Vastuullisuus metsäsektorilla 4 ects
- YET-030 Vastuullinen liiketoiminta elintarvikealalla, 5 ects (aiemmin EKM-105 Vastuullinen liiketoiminta elintarvikealalla, 5 ects ) (Pasi Heikurinen)
- EDUM504 Sustainable Culinary Culture 5 ects
- SOSM-SP305 Käyttäytymisen muutos ja interventioiden suunnittelu 5 ects
- ECGS-081 Analytical approaches to human environmental interaction 5 ects
- ECGS-082 Kommunikation i hållbar utveckling 5 ects
- ECGS-085 Imagination in environmental politics 5 ects
- SOSM-YP302 Sustainable welfare 5 ects

**Assessment practices and criteria:** weighted average of course grades

**Responsible person:** Eva Heiskanen, Consumer Society Research Centre (Faculty of Social Science)

## ECGS-2000: Global sustainability study line, advanced studies/Globaalin kestävyyden opintosuunta, syventävät opinnot, 60 op

**Target group:** Compulsory in Master's Programme in Environmental Change and Global Sustainability to the students of the Global sustainability Study Line.

**Timing:** During first and second year

**Objective/Learning outcome:**
After completing the advanced studies the student is able to plan and perform research work and work as an expert within the selected discipline of the Global Sustainability study module and has acquired the generic abilities:

- critical thinking and reasoning between conflicting views
- dialogue, communication and argumentation skills
- solution seeking and problem solving abilities
- co-operational capacities, group working skills
- abilities to work in multidisciplinary contexts

**Prerequisites:** Bachelor's degree in relevant field

**Contents:**
***Compulsory advanced studies***

- ECGS-006 Master's thesis, 30 ects
- VIIKB-001 Master's maturity test BY 0 ects
- ECGS-009 Personal study plan (PSP), 0 ects

***Optional advanced studies (choose at least one study module, 30 ects in total)***

**ECGS-080 Environmental policy and economics, 15 or 30 etcs**
*Compulsory studies*

- ECGS-081 Analytical approaches to human environmental interactions 5 ects
- YET-208 Intermediate environmental economics 5 ects OR AGERE-E03 Climate and energy policy, 5 ects

*Optional studies*

- ECGS-082 Communication and sustainable development 5 ects
- ECGS-084 Environment, technology and culture 5 ects
- ECGS-085 Imagination in environmental politics 5 ects
- ECGS-087 The politics of environmental knowledge 5 ects
- SOSM-SP305 Käyttäytymisen muutos ja interventioiden suunnittelu 5 ects
- FOR-111 Behavioural change and sustainability (Annukka Vainio) , 5 ects
- SOSM-YP302 Sustainable welfare 5 ects
- AGERE-011 Socio-cultural valuation methods 5 ects (Christopher Raymond)
- AGERE-E01 Environmental Economics I: Theory 5 ects
- AGERE-E02 Environmental Economics II: Mechanisms 5 ects
- AGERE-E12 International Environmental Agreements related to marine areas and resources 5 ects
- AGERE-E09 Advanced natural Resource Economics 5 ects
- Environmental law, 5 ects
- Global sustainability law, 5 ects (Niko Soininen)

**ECGS-100 Environment and development, 15 ects**
*Compulsory studies*

- YMK-3303: Poliittinen ekologia ja luonnonvarapolitiikka, 5 ects
- YMK-3305: Kehitystutkimuksen klassikot, 5 ects
- YMK-3310 Climate change and global justice

**ECGS-200 Consumer citizens and sustainability transition courses, 15 or 30 ects**
*Compulsory studies*

- ECGS-201 Perspectives on sustainable consumption 5 ects

*Optional studies (choose at least 10 ects)*

- ECGS-202 Sociotechnical (re)construction of consumer society
- ECGS-203 Sustainability in everyday life 5 ects
- ECGS-204 Business in the natural environment 5 ects
- FOR-111 Behavioural change and sustainability 5 ects
- ME-007 Vastuullisuus metsäsektorilla 4 ects
- YET-030 Vastuullinen liiketoiminta elintarvikealalla, 5 ects (aiemmin EKM-105 Vastuullinen liiketoiminta elintarvikealalla, 5 ects) (Pasi Heikkurinen)
- EDUM504 Sustainable Culinary Culture 5 ects
- SOSM-SP305 Käyttäytymisen muutos ja interventioiden suunnittelu 5 ects
- ECGS-081 Analytical approaches to human environmental interaction 5 ects
- ECGS-082 Kommunikation i hållbar utveckling 5 ects
- ECGS-085 Imagination in environmental politics 5 ects
- SOSM-YP302 Sustainable welfare 5 ects

**ECGS-350 Environment, Science and society, 15 or 30 etcs**

*Compulsory courses* (choose 1 of the following, 5 ects):

- ECGS-087 The politics of environmental knowledge, 5 ects
- ECGS-086 Qualitative methods for environmental studies, 5 ects
- ECGS-085 Imagination in environmental politics, 5 ects

*Optional courses* (choose at least 10 etcs):

- ECGS-087 The politics of environmental knowledge, 5 ects
- ECGS-086 Qualitative methods for environmental studies, 5 ects
- ECGS-085 Imagination in environmental politics, 5 ects
- ECGS-081 Analytical approaches to human environmental interaction, 5 ects
- ECGS-082 Kommunikation och hållbar utveckling, 5 ects
- ECGS-202 Sociotechnical (re)construction of consumer society, 5 ects
- SOSM-SL321 Tieteentutkimus 1, 5 ects
- SOSM-SL322 Teknologiantutkimus 1, 5 ects
- SOSM-SL323 Special course in Science and Technology Studies (e.g. Co-creation and public participation in science), 5 ects
- IND-512 Biocultural Approaches to the Environment and Conservation, 5 ects

**ECGS-400 Forests, global changes and sustainability, 15 or 30 ects**

*Compulsory studies* (choose at least 2 out of 3):

- FOR-104 International Forest Policy II, 5 ects
- FOR-109 Ecosystem services: a comprehensive introduction to theory and practice, 5 ects
- FOR-219 Sustainable Forest Ecosystem Management, 5 ects

*Optional studies (choose at least 5 ects):*

- FOR-101 Responsible Business Management in Global Forest Bioeconomy, 5 ects
- FOR-110 Economics of climate change in forestry 5 ects,
- FOR-111 Behavioural change and sustainability 5 ects
- FOR-215 Mitigation of Climate Change in Forestry, 5 ects,
- FOR-216 Adaptation of Forestry to Climate Change, 5 ects,
- FOR-226 Restoration of degraded ecosystems: theory and practice, 5 ects,
- FOR-276 Sustainable forestry and agroforestry in the tropics, 5 ects
- FOR-253 Tropical Forests and Climate Change, 5 ects

**SOSM-503 Tieteen ja teknologian tutkimus, 15 or 30 ects**

*Compulsory studies:*

- SOSM-SL321 Tieteentutkimus (Sosiaalitieteiden maisteriohjelma), 5 ects
- SOSM-SL322 Teknologiantutkimus (Sosiaalitieteiden maisteriohjelma), 5 ects

*Optional studies (choose at least one):*

- SOSM-SL323 Tieteen- ja teknologiantutkimuksen erikoiskurssi (Sosiaalitieteiden maisteriohjelma), 5 ects
- SOSM-326 Datafication - critical perspectives (Sosiaalitieteiden maisteriohjelma),5 ects
- SOSM-321 Digitaalisen yhteiskunnan rajapinnoilla (Sosiaalitieteiden maisteriohjelma), 5 ects

- SOSM-325 Digitalisoituva sosiaalisuus (Sosiaalitieteiden maisteriohjelma), 5 ects
- ECGS-081 Analytical approaches to human environmental interaction, 5 ects
- ECGS-084 Environment, technology and culture, 5 ects
- FILK-227 Tieteenfilosofia (Filosofian kandiohjelma), 5 ects
- FILK-222 Yhteiskuntatieteiden filosofia (Filosofian kandiohjelma), 5 ects

**ECGS-900 Urban studies, 15 or 30 ects**
*Compulsory courses*

- ECGS-903: Urban Ecosystem Ecology 5 ects
- ECGS-904: Urban Environmental Policy , 5 ects
- ECGS-907: Urban Biodiversity , 5 ects

*Optional courses*

- ECGS-901: Field Course in Urban Environmental Ecology 5 ects– every 2nd year (2021, 2023…)
- ECGS-906: Urban Climate , 5 ects
- ECGS-049: Nature-based Solutions (5 ects) – every 2nd year (2021, 2023…)
- ECGS-910 Intergrative methods in environmental social science, 5 ects
- ECGS-076 Urban ecotoxicology (replacing ECGS-908)

**ECGS-500 Baltic sea studies, 15 or 30 ects**
*Compulsory courses*

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

*Optional courses choose 5 ects*

- ECGS-502 Marine governance, 5 ects
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- AGERE-E12 International environmental agreements related to marine areas and resources, 5 ects
- AGERE-E06 Economics of Aquatic Resources: Numerical Models, 5 ects
- ECGS-017 Fisheries management, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks (this course under planning), 5 ects

**Assessment practices and criteria:** Weighed average

**Responsible person:**

## ECGS-3000: Biologian aineenopettajan opintosuunta, syventävät opinnot, 60 op

**Target group:** Compulsory in Master's Programme in Environmental Change and Global Sustainability to the students of the Biology Teacher Study Line

**Timing:** During the first and the second year

**Objective/Learning outcome:**
After completing the advanced studies the student is able to plan and perform research work and work as an expert within teaching biology and has acquired the generic abilities:

- critical thinking and reasoning between conflicting views
- dialogue, communication and argumentation skills
- solution seeking and problem solving abilities
- co-operational capacities, group working skills
- abilities to work in multidisciplinary contexts

**Prerequisites:** Bachelor's degree in relevant field.

**Assessment practices and criteria** Weighed average

**Responsible person:**

## ECGS-350 Environment, Science and Society, 15 or 30 op

**Target group:** Master's students in the Environmental change and Global Sustainability Programme

**Objectives/Learning outcomes**
The focus on Environment, Science and Society equips students with the skills and capacities to examine the knowledge-making practices behind environmental problems. The courses draw on the interdisciplinary field of science and technology studies (STS) and introduces students to the main theoretical concepts (e.g. co-production, actor-network theory and sociotechnical imaginaries) and practical applications of STS in the environmental domain.

Having completed the specialization option in Environment, Science and Society, students will be able to:

- critically evaluate the role of science and scientific knowledge in understanding environmental problems and creating solutions for them
- identify and examine the social dimensions of how science and technology are developed, used, and discussed in environmental studies
- apply the theoretical concepts of science and technology studies to the analysis of historical and current environmental concerns
- understand, develop and implement qualitative research practices for analyzing environmental issues

**Preceeding studies:**
Students should have a good basic knowledge (corresponding to a Bachelor's degree) in social sciences, such as social and public policy, sociology or an appropriate field, such as environmental sciences. Students should preferably have some familiarity with environmental policy (e.g. ENV-103 Introduction to Environmental Policy).

**Contents**
Science and technology form one of the principal ways through which we understand our environment and devise solutions to environmental problems. Scientific knowledge about the environment is always embedded in social practices, norms and institutions. The aim of this specialization option on Environment, Science and Society is for students to understand and critically assess

- how knowledge is incorporated into practices of governance and, conversely,
- how governance practices influence the use of knowledge in the environmental domain. How knowledge about environmental issues is created is crucial for understanding the available options and what is missing from current approaches.

The courses offered seek to provide a fruitful ground for discussing the following questions:

- How is scientific knowledge validated and contested?
- What is the role of scientific expertise in democratic societies?
- Who is an expert and who can judge the value of scientific research? Whose knowledge counts?

The specialization option consists of one compulsory course (5 ects), selected from the following list and at least 10 ects of optional courses.
*Compulsory courses* (choose 1 of the following, 5 ects):

- ECGS-087 The politics of environmental knowledge
- ECGS-086 Qualitative methods for environmental studies
- ECGS-085 Imagination in environmental politics

*Optional (choose at least 10 ects):*

- ECGS-087 The politics of environmental knowledge, 5 ects
- ECGS-086 Qualitative methods for environmental studies, 5 ects
- ECGS-085 Imagination in environmental politics, 5 ects
- ECGS-081 Analytical approaches to human environmental interaction, 5 ects
- ECGS-082 Kommunikation och hållbar utveckling, 5 ects
- ECGS-202 Sociotechnical (re)construction of consumer society, 5 ects
- SOSM-SL321 Tieteentutkimus 1, 5 ects
- SOSM-SL322 Teknologiantutkimus 1, 5 ects

- SOSM-SL323 Special course in Science and Technology Studies (e.g. Co-creation and public participation in science), 5 ects
- SPT-374 Introduction to ecofeminist theory: climate change, animals and feminist politics, 5 ects
- SPT-373 Feminism, animals and food: intersectional perspectives, 5 ects
- IND-512 Biocultural Approaches to the Environment and Conservation, 5 ects

**Assessment practices and criteria:** As outlined in the individual courses.

**Responsible persons** Nina Janasik and Kamilla Karhunmaa

## ECGS-400 Forests, global changes and sustainability, 15 or 30 etcs

**Target group:** Optional
**Timing:** Master's year 1-2
**Objective/Learning outcomes:**

- Students will gain a holistic understanding of the crucial role of forests and forest-related people in realizing sustainability across multiple levels of governance, often in response to global drivers of change, such as climate change. They will gain an understanding of the fundamental elements of the ecological, economic, and societal dimensions of forests and their linkages.
- Students will be able to critically examine underlying politics and power in relevant international and domestic policy arenas, with particular focus on the Global South. In the context of sustainability, they understand key ecological processes and structures of forest ecosystems and how they are impacted by forest management. The students understand the role of key stakeholders, the impact of their economic and social activities on sustainability, the markets in which they operate, and responsibilities and responses by business to sustainability challenges.

**Prerequisites:** According to programme prerequisites

**Contents:**
Compulsory (choose at least 2 out of 3)

- FOR-104 International Forest Policy II (M. Brockhaus), 5 ects, period IV
- FOR-109 Ecosystem services: a comprehensive introduction to theory and practice (D. D'amato), 5 ects, period I,
- FOR FOR-219 Sustainable Forest Ecosystem Management (T Kuuluvainen), 5 ect, period II

*Optional (choose at least 5 credits):*

- FOR-101 Responsible Business Management in Global Forest Bioeconomy (A Toppinen), 5 ects , period II
- FOR-110 Economics of climate change in forestry (L Valsta), 5 ects , period III
- FOR-111 Behavioural change and sustainability (Annukka Vainio), 5 ects , period IV
- FOR-215 Mitigation of Climate Change in Forestry (T Kalliokoski), 5 ects , not given in 2018-19
- FOR-216 Adaptation of Forestry to Climate Change (T Kalliokoski), 5 ects , period III
- FOR-226 Restoration of degraded ecosystems: theory and practice (E Yirdaw), 5 ects , period IV (odd years)
- FOR-276 Sustainable forestry and agroforestry in the tropics (E Yirdaw), 5 ects
- FOR-253 Tropical Forests and Climate Change (E Yirdaw), 5, web-based course

**Activities and teaching methods in support of learning:** Contact teaching, online courses

**Assessment practices and criteria:** According to programme conventions and course requirements

**Responsible person:** Maria Brockhaus

**Keywords:** Suitable for exchange students

## ECGS-4000 Sustainability Science, 15 ects

**Target group** Compulsory to students in the ECGS-programme

**Timing** The study module is started in the first term of Master's studies with two first courses. Applied Sustainability Science may be completed at any time

**Objective/Learning outcomes**
The student has basic understanding of what sustainability science is and how human and natural systems interact. The student can describe social-ecological systems and knows the fundamental principles of systems thinking and conditions of sustainability problems and their solutions. The student knows key concepts of sustainability science, is able to describe scientific questions in sustainability science terms and to use this description to point to the multidisciplinary solutions necessary and to put the knowledge into action when seeking solutions to real-world problems in multidisciplinary teams

**Prerequisites** Relevant Bachelors' degree or equivalent studies

**Contents**
*Compulsory*
- ECGS-001 Introduction to Sustainability Science, 5 ects
- ECGS-002 Philosophical and Methodological Foundations of Sustainability Science, 5 ects

*Optional studies* in Applied sustainability science (choose at least 5 ects )
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- Work-2 (VALT-601M) Demola co-creation working life project (Master´s level), 5 ects
- ECGS-007 Science Conference Course, 5 ects
- ECGS-150 Master Class Sustainability, 5 ects

**Assessment practices and criteria:** weighted average of course grades

**Responsible person:**

## ECGS-450 CORE STUDIES IN ECGS, 30 ects

**Target group:**
A compulsory module in the ECGS Master's Programme in study lines EC and GS

**Timing**

**Objective/Learning outcomes**
The student will have a basic understanding of both natural and social scientific disciplines that make up sustainability science, and of key notions that the latter addresses, such as sustainability, resilience, complexity, planetary boundaries, socio-ecological systems, systems thinking, and interdisciplinarity. The student will have a case-based understanding of conceptual and methodological challenges in sustainability science, such as the integration of models, data, evidence and values, science-policy interface, and behavioral change and institutional transformation. The student will learn how to put this knowledge into action to solve real-world problems in multidisciplinary teams.

**Prerequisites:**
**Contents:**

**ECGS-4000 Sustainability Science, 15 ects**
*Compulsory*
- ECGS-001 Introduction to Sustainability Science, 5 ects
- ECGS-002 Philosophical and Methodological Foundations of Sustainability Science, 5 ects

*Optional studies* in Applied sustainability science (choose at least 5 ects )
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- Work-2 (VALT-601M) Demola co-creation working life project (Master´s level), 5 ects
- ECGS-007 Science Conference Course, 5 ects
- ECGS-150 Master Class Sustainability, 5 ects

**Methodological studies according to students's needs, 15 ects**

*Compulsory methodological studies*, 5 ects

- ECGS-004 Master's thesis seminar 5 ects

*Optional methodological studies* (choose from these or other studies according to…at least 10 ects )

- ECGS-081 Analytical approaches to human environmental interactions
- AGERE-002 Cost-Benefit Analysis, 5 ects
- Work-2 (VALT-601M) Demola co-creation working life project (Master´s level)
- FOR-259 GIS and RS in environmental and land use applications
- ECGS-910 Yhteiskuntatieteellisen ympäristötutkimuksen integroivat menetelmät, 5 op
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 ects
- ECGS-155 Introduction to digital methods in environmental social science, 5 op
- FILK-224 Filosofisen ajattelun menetelmät, 5 ects
- FILM-353 Taloustieteen filosofia, erikoistuminen, 5 op
- FILK-222 Yhteiskuntatieteiden filosofia, 5 ects
- FILM-305 Yhteiskuntatieteiden filosofia, syventävä, 5 ects
- FOR-108 Qualitative empirical research methods, approaches and research ethics, 5 ects
- ATM308 Statistical tools for climate and atmospheric science
- Other methodological studies according to an agreement

**Assessment practices and criteria:** weighted average of course grades

**Responsible person:**

## ECGS-500 Baltic sea studies-module, 15 or 30 ects

**Target group:**
The 'Baltic-sea studies'-module serves as a thematic module for two master programmes:

- Environmental change and global sustainability (ECGS)
- Agricultural, environmental and resource economics (AGERE)
- Optional, available for all interested students, including international students

**Objectives of the module:**

**Timing**: M.Sc. studies, 1 or 2 year

**SCOPE OF MODULE IN CREDITS**: 15 credits or 30 credits

**Responsible teacher**: Kari Hyytiäinen

**LEARNING OUTCOMES**: This module offers an overall framework for understanding, analyzing and solving regional environmental problems, using the Baltic Sea as a case study.

- The students will gain understanding about the causal interactions between the human and natural system: multiple anthropogenic and natural drivers and pressures that affect the marine ecosystem contribution of marine ecosystem services to human welfare role of mitigation and adaptation measures, national and international policies and marine governance
- The students will learn central concepts and tools from relevant disciplines (natural sciences, environmental economics and social sciences) needed in the analysis of sustainable marine management and governance.
- The student will learn to work as a group to access collective intelligence and multidisciplinary balanced view to marine management.

The courses of the module offer interested students a channel for doing the research needed for their M.Sc. thesis while taking the courses. The 'substance' courses in different disciplines offers the theories and concepts, and the 'hands on' courses on mathematical programming offer the skills needed for doing analysis using numerical methods. The students interested on this option are recommended to contact their teachers and supervisors at early phase of their M.Sc studies.

**Key words/themes studied**:

- Anthropogenic and natural drivers of Baltic sea
- multiple human pressures
- central natural processes (biogeochemical cycles, food webs)
- Environmental history of the Baltic Sea
- marine and coastal ecosystem services
- human wellbeing, use and non-use values associated to aquatic ecosystems
- cost-effective mitigation of eutrophication and reducing the risk of environmental hazards,
- environmental policies and international environmental agreements relevant for marine governance
- systemic approach to marine protection
- marine governance
- numerical optimization, integrated models
- group work skills

**PREQUISITES**

B.Sc. in environmental economics, aquatic studies, environmental studies or other relevant field. Relevant prior candidate-level courses on environmental economics and aquatic ecosystems are recommended for those students not yet familiar with the concepts of these disciplines. The student are recommended to first take the course "Diagnosis of environmental problems in aquatic ecosystems", and thereafter follow with "Management of environmental problems in aquatic ecosystems"-course.

**MODULE CONTENT**

*Compulsory courses*

- ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects
- ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

*Optional courses choose 5 ects*

- ECGS-502 Marine governance, 5 ects
- ECGS-003 Practical application of sustainability science: learning project, 5 ects
- AGERE-E12 International environmental agreements related to marine areas and resources, 5 ects
- AGERE-E06 Economics of Aquatic Resources: Numerical Models, 5 ects
- ECGS-017 Fisheries management, 5 ects
- ECGS-151 Introduction to environmental decision analysis with Bayesian networks (this course under planning), 5 ects

There are two options for implementing the module:
Basic (15 credits): two mandatory courses: course 1: Diagnosis (ECGS-014) and course 2: Management (ECGS-501), and one voluntary courses from the list
Extended (30 credits): two mandatory courses: Diagnosis (ECGS-014) and Management (ECGS-501), and four voluntary courses from the list

**MODULE GRADING**

Scale 1-5 (average of the course grades)

**LANGUAGE OF INSTRUCTION**

English

## ECGS-550 Northern ecosystems and environment, 15 or 30 etcs

**Target group:** An optional module in the ECGS Master's Programme. Courses of the module are available also for students of other Master's Programmes, but ECGS students are prioritized.

**Timing:** 1st and 2nd year MSc students

**Objective/Learning outcomes:**

The module gives the student advanced knowledge of changing northern and Arctic ecosystems and environments, their crucial environmental issues and resulting socio-ecological impacts. Upon completion of the module, the student

is capable of working in expert professions that require scientific knowledge and practical skills to study, assess and solve environmental questions in a northern context.

- The student has deeper understanding of the structure and functioning of northern ecosystems and of the ongoing changes in northern environments at different time-scales and spatial contexts, and is aware of the causes, consequences and relevance of these changes.
- The student knows central theories, concepts, study approaches and glossary of northern ecosystem and environmental research, including the relevance of temporal scales and the questions of resilience, bifurcations and critical transitions, and can critically read and evaluate studies on these subjects.
- The student knows the main research methods, approaches and data acquisition means, and has risk and uncertainty management skills.

**Prerequisites:** Bachelor's degree in environmental or related sciences. Joint introductory studies in sustainability sciences or other relevant Master's programme studies.

**Recommended optional studies: -**

**Contents:**
*Obligatory courses* (10 ects):

- ECGS-031 Arctic climate change, 5 ects
- ECGS-067 Past environmental change 2 cr
- ECGS-037 Seminar in northern ecosystems and environment, 3 cr

*Voluntary courses (5-20 ects):*

- ECGS-063 Topical issues in northern environmental research, 2 ects
- ECGS-035 Field course on Arctic ecosystems and climate change, 8 cr
- ECGS-065, Practicals in past environmental change, 5 ects
- ECGS-036 Arctic and human beings, 5 ects
- FYS2087 Air quality in a changing world , 5 ects
- FOR-259 GIS and RS in environmental and land use applications, 5 ects
- GEOM-G2013 Palaeoceanography – application of marine microfossils as palaeoclimatological proxies, 5 ects

**Study materials and literature:** See individual course descriptions

**Activities and teaching methods in support of learning:** See individual course descriptions

**Assessment practices and criteria:** Weighted mean of the individual courses.

**Responsible person:** Tarmo Virtanen

**Keywords:** Arctic, ecosystem change, climate change, ecosystem interactions, sosio-ecological-systems

## ECGS-600 Climate change, 15 ects

**Target group**: Available for all students.

**Objective/Learning outcomes**: After completing the module, the student understands the basic physical, ecological and social dimensions of climate change. Depending on the content of optional courses, the student can also more thoroughly discuss the social significance of climate change and/or describe the origin of climate change in the atmosphere, the effects of climate change on different ecosystems and/or the role of ecosystems and their management in climate change mitigation.

**Contents:**
*Compulsory*

- ATM302: Climate change now, 5 ects

*Optional (choose 10 ects)*

- ECGS-601: Ecosystems and climate change, 5 ects
- ECGS-031: Arctic climate change, 5 ects

- FOR-253: Tropical forests and climate change, 5 ects
- FOR-275: Soils and climate change, 5 ects
- FOR-215: Mitigation of climate change in forestry, 5 ects
- FYS2087: Air quality in a changing world, 5 ects
- YET-214: Climate and energy, 5 ects
- GEOG-331: Climate change and rural development, 5 ects
- RUS-310: Environment & climate, 5 ects
- ALKU-305: Climate change narratives: professionals and publics, 5 ects

**Responsible person**: David Thomas

## ECGS-610 Agriculture and environment, 15 or 30 ects

**Target group:** Optional study track for other degree students.

**Timing:** During the MSc studies.

**Objective/Learning outcome:**
The module consist of three mandatory courses and of elective courses.
Having completed the study module each student

- is able to describe the agricultural ecosystem and key features about main farming systems
- has a solid understanding of the agricultural production process as embedded into its environment can list and describe the main categories of environmental impacts of agriculture
- is able to find and interpret research reports, which consider: environmental impacts of agriculture, ecological efficiency and use of natural resources
- is able to position impacts of agriculture as a sub-system within the broader production and consumption system.
- In addition to these competences and skills, each student will have an opportunity to deepen her/his understanding of interactions between agriculture and environment as an issue of sustainability through the choices of elective courses.

**Prerequisites:** BSc level degree in a relevant field or other applicable previous studies.

**Contents:**
*Compulsory* **15 ects**

- AGRI-211 Wildlife in the Farming Environment, 5 ects
- AGRI-212 Ecological farming methods, 5 ects

*Choose* **5 ects either**

- AGRI-213 Literature in Farmland Ecology, 5 ects
- AGRI-113 Environmental Technology in Crop Production, literature, 5 ects

*Elective* **10 ects**
Study units agreed in the PSP

**Assessment practices and criteria:** Weighted average.
**Other information:** Instruction language: English.
**Responsible person:** Irina Herzon

## ECGS-700 Food and sustainability, 15 or 30 etcs

**Target group:** MSc ECGS (orientation: global sustainability)
Optional. Available by agreement to students in other programs.

**Timing:** 1st and 2nd year of the MSc program

**Objective/Learning outcomes:**
The module consist of three mandatory courses and of elective courses.
Having completed the study module each student will have

- a sound understanding of the structure and functioning of the food system from the perspective of sustainability,
- be able to find and interpret research reports in which ecological efficiency, environmental impacts, or use of natural resources have been studied over the whole production and consumption cycle
- be able to produce a list or an illustration of key issues in all three dimensions – ecological, economic, and social - of sustainability in these systems.
- be able to use conceptual frameworks such as sustainable food consumption, sustainable diet or sustainable livelihoods, to address the complexity of the challenge of sustainability in food systems

In addition to these competences and skills, each student will have had the opportunity to deepen her/his understanding of food as an issue of sustainability through the choices of elective courses.

**Prerequisites**: BSc level degree in a relevant field or other applicable previous studies.

**Contents**:

*Compulsory courses (15 ects)*

- AGRI-222 Sustainable Food Systems, 5 ects (Hanna Tuomisto), *odd years*
- EDUM504 Sustainable Culinary Culture, 5 ects (Johanna Mäkelä, Mari Niva), odd years, 4th period, essay course every year 2nd & 4th period
- FOOD-401 European Food Safety, 5 ects (Marina Heinonen), *even years, 3rd period*

***Elective courses*** **(15 ects)**

*Fundamental elective:*
ECGS-701 Philosophy and methodology of sustainable food production systems (Milutin Stojanovic)

*In field of economics:*

- YET-030 Vastuullinen liiketoiminta elintarvikealalla, 5 ects (aiemmin EKM-105 Vastuullinen liiketoiminta elintarvikealalla, 5 ects ) (Pasi Heikurinen)
- AGERE-002 Cost-Benefit Analysis, 5 ects (Chiara Lombardini), *even years (online course 2019-2020)*
- EKM-103 Managing Innovation in Agrifood Value Chains for Sustainability, 5 ects (Bodo Steiner)

*In field of food and crop sciences:*

- FOOD-701/AGRI-241 Food Crop Quality, 3 cr/Field Crop Quality, 5 ects (Fred Stoddard), *odd/even years*
- FOOD-110 Cereal and Pulse Ingredient Functionality, 2 ects (Tuula Sontag-Strohm) FOOD-402 Chemical Risk Factors, 5 ects (Velimatti Ollilainen)

*In field of agroecology and plant production:*

- AGRI-221 Agroecology: Working with the Complexity of Farming Systems, 5 ects (Iryna Herzon)
- AGRI-201 Plant Production in the Tropics, 5 ects (Johanna Kolehmainen), *odd years, 2nd period*
- AGRI-223 Literature in Agroecology of Food Systems, 5 ects (Hanna Tuomisto)

**Assessment practices and criteria:** Average of the course grades, weighed by courses' credit points.

**Responsible person:** Hanna Tuomisto

**Keywords:** food, agriculture, food chain, food system, environment, sustainability

## ECGS-800 Global land use, 15 - 20 op

**Target group:** Masters students in the EC or GS study lines seeking in-depth focus on Global Land Use issues in the context of environmental change and sustainability.

**Contents/courses**
The thematic module on Global Land Use consists of elective courses (of which students must select three in order to achieve 15 ects).
*Optional/elective courses*

- GEOG-341: Geography of megatrends, environmental change and development in the Global South, 5 ects (period 1)
- GEOG-G302: Remote Sensing 1, 5 ects (period 1)
- FOR-104: International Forest Policy 2, 5 ects (IV period)
- FOR-253: Tropical Forests and Climate Change, 5 ects (IV period, arranged in odd-numbered years)
- FOR-226: Restoration of Degraded Ecosystems: Theory and Application, 5 ects (IV period in odd-numbered years)

**Learning aims**
Having completed the study module, students will:

- Have in-depth understanding of the key concepts and current trends in global land use across a range of geographies, governance, and land types in the context of sustainable development and global change processes.
- Gain understanding of the main ecological, economic, and societal drivers of land use change in the context of sustainability.
- Be able to critically examine underlying forest policies in relevant international and domestic policy arenas, with particular focus on the Global South.
- Have the ability to apply theories, frameworks and knowledge to critically engage in research and debates related to global land use change.
- Learn the ecological basis of climate change mitigation and adaptation measures of tropical forests.
- Learn the basic theory and skills necessary to start working with remote sensing data to analyse land use change.
- Be aware of the main research gaps, the current hot topics, and future directions in global land use.

**Responsible teacher** Nicholas Hogarth

## ECGS-900: Urban Studies, 15 or 30 etcs

**Target group**: Disciplinary module for those interested in urban environmental issues, from ecology, the environment, climate, biodiversity, sustainability, nature-based solutions, policy and planning.

**Timing**: Anytime during the Master's degree studies

**Objective/Learning outcomes**: The aim is to introduce students to urban research from an environmental perspective and to help them become aware of the impacts of urbanisation on nature, the world and human beings. Both theoretical and practical courses will prepare the student to meet urbanization challenges, such as ecosystem degradation, biodiversity loss, urban climate, policy issues, sustainability, nature-based solutions, and planning. After completion, the student will be able to identify urban environmental/social problems, and have the toolkit to meet these challenges and solve the problems with other interested parties.

**Prerequisites**: Bachelor's level studies in environmental issues, or equivalent studies.

**Contents**:
The module consists of 8/9 courses;
*Compulsory courses*

- ECGS-903: Urban Ecosystem Ecology 5 ects
- ECGS-904: Urban Environmental Policy , 5 ects
- ECGS-907: Urban Biodiversity , 5 ects

*Optional courses*

- ECGS-901: Field Course in Urban Environmental Ecology 5 ects– every 2nd year (2021, 2023…)
- ECGS-906: Urban Climate , 5 ects

- ECGS-049: Nature-based Solutions (5 ects) – every 2nd year (2021, 2023…)
- ECGS-910 Intergrative methods in environmental social science, 5 ects
- ECGS-076 Urban ecotoxicology (replacing ECGS-908)

**Study materials and literature**: Specific to individual courses

**Activities and teaching methods in support of learning**: Various; lecture based, field work, lab work, group work, seminars

**Assessment practices and criteria**: Written exams, Essays, Seminar presentations

**Completion**: Specific to individual courses

**Other information**:

**Relations to other study units**: MSc in Urban Studies and Planning (https://www.helsinki.fi/en/programmes/master/urban-studies-planning)

**Responsible person**: Johan Kotze

**Keywords:**
Urban ecology
Ecosystem ecology
Urban policy
Nature-based solutions
Green infrastructure
Urban climate and air pollution
Planning

## IND-500 Indigenous Studies 15 or 30 ects

Indigenous studies gives you an opportunity to broaden your knowledge of Indigenous peoples in a global approach. It covers the following thematic, methodological, and theoretical competences: Indigenous research methods and ethics; Indigenous languages and education; biocultural diversity, Indigenous arts, and Indigenous rights. The study units introduce to Indigenous philosophies and concepts providing with new insights into epistemologies, power relations, as well as historical and contemporary perspectives in Indigenous studies. Engaging with relational and diverse teaching methods, you learn about Indigenous peoples' knowledge-making processes, which are interactive and represent lived experience and detailed observations by many generations. Indigenous studies can benefit students planning careers in policymaking, environment and sustainability sector, education, social work, health care, law, economy, museums, and various areas of culture.

**Target group**: Study module of 15 or 30 study credits (or its individual study units) are optional and open for all study programs at the University of Helsinki. Timing: Indigenous studies can be completed in one year. It can be started at any time of the year.

**Learning outcomes:**
- Student will be able effectively to apply Indigenous research methods and theories in both their research and different employments.
- Student will understand the past and present of Indigenous societies in global and local perspectives.
- Student will be able to analyze different social and political facts shaping and impacting Indigenous societies.

**Module content:**
*Degree requirements for 15 credits:*
- IND-510 Indigenous peoples, epistemic and linguistic diversity
- IND-511 Methodologies and research ethics in Indigenous Studies
- IND-512 Biocultural approaches to the environment and conservation

*Degree requirements for 30 credits additionally:*
- IND-513 History, power and Indigenous rights

- IND-514 Indigenous arts
- IND-515 Selected topics in Indigenous languages

**Perquisites**: Not required.

**Responsible person** Pirjo Kristiina Virtanen

## SOSM-503 Tieteen ja teknologian tutkimus, 15 tai 30 op

**Vastuuyksikkö:** Sosiaalitieteiden maisteriohjelma

**Opintokohteen kielet:** suomi

**Osaamistavoitteet:**

- Opintokokonaisuus perehdyttää opiskelijan tieteen- ja teknologian tutkimuksen keskeisiin kysymyksenasetteluihin sekä aiheesta Helsingin yliopistossa tehtävään tutkimukseen.
- Opintokokonaisuuden suoritettuaan opiskelija ymmärtää kuinka tiedeinstituutiota, tieteellistä tutkimusprosessia sekä tieteen ja yhteiskunnan vuorovaikutusta voidaan tutkia käyttäen hyväksi eri yhteiskuntatieteellisiä menetelmiä. Vastaavalla tavalla hän ymmärtää kuinka teknologiaa, teknologian kehitystä sekä teknologian ja yhteiskunnan vuorovaikutusta voidaan tutkia käyttäen hyväksi yhteiskuntatieteellisiä menetelmiä. Lisäksi opiskelija on perehtynyt joidenkin tieteen- ja teknologiantutkimuksen erityisalueiden keskeisiin kysymykset ja teoreettisiin lähestymistapoihin. Opiskelija osaa soveltaa kurssilla esiteltyjä tutkimuksellisia näkökulmia uusiin ilmiöihin.

**Sisältö:**

*Kokonaisuuden pakolliset opintojaksot*:

- SOSM-SL321 Tieteentutkimus (ks. valinnaiset opinnot)
- SOSM-SL322 Teknologiantutkimus (ks. valinnaiset opinnot)

*Valitse vähintään yksi seuraavista*:

- SOSM-SL323 Tieteen- ja teknologiantutkimuksen erikoiskurssi (ks. valinnaiset opinnot)
- SOSM-326 Datafication - critical perspectives (ks. valinnaiset opinnot)
- SOSM-321 Digitaalisen yhteiskunnan rajapinnoilla (ks. valinnaiset opinnot)
- SOSM-325 Digitalisoituva sosiaalisuus (ks. valinnaiset opinnot)
- Sociotechnical (re) construction of consumer society (ECGS)
- Analytical approaches to human environmental interaction (ECGS)
- Environment, technology and culture (ECGS)
- Tieteenfilosofia (Filosofia)
- Yhteiskuntatieteiden filosofia (Filosofia)

**Arviointimenetelmät ja -kriteerit:**

**Arvosanan muodostuminen**

Opintokokonaisuuteen kuuluvien opintojaksojen painotettu keskiarvo.
Asteikolla 0-5 (0 = hylätty, 1 = välttävä, 2 = tyydyttävä, 3 = hyvä, 4 = kiitettävä, 5 = erinomainen

**Vastuuhenkilö**: Petri Ylikoski

## VIIKB-201 Study Module Completed in a Foreign University, 15 ects

# COURSE DESCRIPTIONS

## ECGS-001 Introduction to Sustainability Science, 5 ects

**Target group:**
Predominantly Students in Environmental Change and Global Sustainability Master Programme, other interested students

**Timing:** 1st period

**Objective/Learning outcome:**
After the course the student

- has basic understanding what sustainability science is and knows its historical development
- learns to discern the theoretical frameworks and key concepts behind the sustainability science
- has basic understanding how human and natural (or complex adaptive) systems interact
- can describe social-ecological systems and knows the fundamental principles of systems thinking, including matter and energy flows in a global context
- gains understanding of inter- and transdisciplinary approaches and learns to communicate in interdisciplinary contexts
- is aware of planetary boundaries/opportunities to understand sustainability problems and suggest possible solutions through inter- and transdisciplinary thinking
- understands the institutional contexts and conditions of sustainability problems and their solutions
- gets an idea of the contents of the master's programme and can develop a personal study plan

**Prerequisites:** Bachelor degree in relevant field

**Contents:**
The course introduces basic principles of sustainability science with special reference to its interdisciplinary and systemic dimensions. The theoretical and methodological orientation is clarified through addressing real world sustainability problems like food security, energy production, climate change, access to clean water and other complex or wicked problems.

**Literature and study materials:**
Lecture materials and a text book (e.g. Bert J.M. de Vries: *Sustainability Science*, Cambridge University Press, New York, 585 p).

**Assessment practices and criteria**
Grading on the general scale 0-5.
The overall grade consists of:

- 25 % lecture-specific self-evaluation matrices
- 25 % final self-evaluation matrix
- 50 % group work peer-evaluation

Detailed course evaluation criteria will be available in the Moodle area.

**Completion:** 42 h of lectures, 42 h of group work, 51 h of independent activities.

**Responsible person:** Janna Pietikäinen, Kaarina Weckström

**Keywords:** Suitable for exchange students

## ECGS-002 Philosophical and Methodological Foundations of Sustainability Science, 5 ects

**Target group:** Mainly students in Environmental Change and Global Sustainability Master Programme; Other interested students are welcome but priority will be given to ECGS students in case space is limited.

**Timing:** 2nd period

**Learning outcomes**
After the course the student
- Can describe and apply key concepts discussed and used in sustainability science
- Understands the historical, methodological and ethical background of the field
- Is able to identify scientific questions in sustainability science
- Is able to identify interdisciplinary research strategies and their challenges to address these questions.
- Is able to use the key concepts to explain sustainability issues to a wider audience

**Prerequisites:** Bachelor degree in relevant fields

**Contents**
The course consists of two parts. In the first part, we introduce key theoretical concepts underlying sustainability science(s) (for example, sustainability, resilience, adaptive systems, boundary conditions, natural capital, eco-system services, multi-, inter- and transdisciplinarity) and their history and use in sustainability science. In the second part, students form teams and conduct interviews with sustainability scientists at the University; students write a team report on the methodological and other challenges in interdisciplinary sustainability science projects, and prepare for their own work.

**Literature and study materials**
Lecture materials, textbooks, and own collected data.
Books:
- Jeremy L. Caradonna (2014) : Sustainability: A History, Oxford University Press, 331 p.
- Randall Curren and Ellen Metzgger (2017): Living well now and in the future: Why sustainability matters, MIT Press, 282 p.
- Bert J.M. de Vries: Sustainability Science, Cambridge University Press, New York, 585 p.

**Assessment and grading:** Grading scale 0–5; the grade is based on exam (50%) and a group report (50%). Detailed course evaluation criteria will be available in the Moodle

**Completion:** 35 h of lectures and seminars, 50 h of independent activities, and 50 h of group work (total 135 hours=5 credits (27*5)

**Responsible person** Michiru Nagatsu

## ECGS-003 Practical application of sustainability science: learning project, 5 ects

**Vastuuyksikkö:** Ympäristömuutoksen ja globaalin kestävyyden maisteriohjelma

**Arvostelu:** Yleinen asteikko

**Opintokohteen kielet:** suomi
**Leikkaavuudet:**
- 86135Akvaattisista tieteistä toimintaa -projektikurssi4.0 op
- 863067Vaihtuva teemakurssi (YLE22.5)4.0 op

**Kohderyhmä:** Ensisijaisesti ECGS:n ja AGERE:n opiskelijoille

**Ajoitus:** Maisterivaihe

**Osaamistavoitteet:**
Opintojakson tavoitteena on, että opiskelija
- osaa pienryhmässä suunnitella ja hallita projektiluonteista työtä
- osaa jäsentää ja soveltaa oman alansa teoreettista tietoa käytäntöön ja uusien ideoiden kehittämiseen

- osaa toimia monitieteisessä ryhmässä ja hyödyntää oman tieteenalansa keskeistä tietoa ryhmän tavoitteiden saavuttamiseksi
- saa aitoja työelämäkontakteja
- harjaantuu käyttämään ryhmätyö-, vuorovaikutus- ja esiintymistaitoja oivaltaa omaa osaamistaan ja rohkaistuu siitä

**Sisältö:**
Opiskelijat perehtyvät projektisuunnittelun ja -hallinnan teoriaan ja tekevät pienryhmissä todellisia projekteja alan työnantajille. Opiskelijaryhmät esittelevät omat projektinsa muille loppuseminaarissa.

**Oppimateriaali ja kirjallisuus:** Projektityön aiheeseen liittyvä alan kirjallisuus

**Arviointimenetelmät ja -kriteerit:**
Opiskelijaryhmä saa toteuttamastaan projektista arvosanan 1-5. Lisäksi yksittäisen opiskelijan oma aktiivisuus ja panos kurssityöhön voi vaikuttaa hänen lopulliseen kurssiarvosanaansa.

**Suoritustavat:** 36 h luentoja ja niihin liittyviä harjoituksia, 100 h ryhmätyötä ja itsenäistä työskentelyä

**Yhteydet muihin opintojaksoihin:** Korvaa kurssin 86135 Akvaattisista tieteistä toimintaa projektikurssi 5 op TAI 863067 Vaihtuva teemakurssi 4 op.

**Vastuuhenkilö:** Jaanika Blomster

## ECGS-004 Master’s thesis seminar 5 ects

**Target group:** Restricted to students in Master’s Programme in Environmental Change and Global SustainabilityRestricted to students in Master’s Programme in Environmental Change and Global Sustainability

**Timing:** The course is provided twice a year; in periods I and III. It is encouraged that the course is chosen when starting the thesis process is topical.

**Objective/Learning outcome:**
Student is able to
- formulate and express in writing a research plan
- plan and give an oral presentation on own research plan
- critically analyse other students research plans and results
- give and receive feedback accordingly
- plan and prepare an oral presentation with visual material of own research results

**Prerequisites:** Introduction to Sustainability Science, Sustainability Science Concepts, methodology courses and relevant advanced studies needed for own research work.

**Contents:**
Students plan their research, write the research plan and present the results in the Master's Thesis Seminar. The seminar consists of contact teaching common to all and seminar presentations and discussion sessions in groups formed according to research topics or approaches.
For more information about the ECGS thesis process and guidelines please see Student Instructions.

**Completion:**
Contact teaching 10 h. Attending seminar groups 40 h. Individual work: reviewing peers' papers, planning of research, formulating and writing research plan 90 h.

**Relations to other study units** Linked to Master’s Thesis.

**Responsible person:** Eva Heiskanen, NN.

## ECGS-005 Master's thesis, 30 ects

**Target group:** The course is compulsory for the students of Master's Programme in Environmental Change and Global Sustainability, Environmental Change study line.

**Timing:** Mainly second year of MSc studies. Research plan periods 3-4 during the first year of MSc studies, and gathering of data in the summer of the first study year or during periods 1-2 of the second study year; data processing and writing period 3 of the second study year.

**Objective/Learning outcome:**

After completing the thesis, the student will be able to

- to plan and implement a research project in a timeframe
- to define appropriate research questions and base them with a theoretical framework
- to design and carry out data collection under supervision
- to analyse and interpret the research results
- to present the results of the research according to scientific standards
- to receive and use feedback in his/her own research and writing
- to apply ethical principles in science.

**Prerequisites:**
The student needs to have the necessary knowledge and skills for collecting the data (field/laboratory) and processing (statistics) them, and skills for scientific writing.
Prerequisite studies: Introduction to Sustainability Science and Sustainability Science Concepts.

**Contents:**

The Master's thesis is usually based on an empirical research project and critical contemplation of the results in the light of scientific literature on the topic. The thesis may also consist of a theoretical literature study. A Master's thesis project usually consists of four distinct phases

1. design and planning of the study
2. gathering the data (field work and/or laboratory work and/or mathematical modelling)
3. analysing the data (validation/quality control, statistical analysis, plotting)
4. interpreting and discussing the results in the light of existing literature.

**Literature and study materials:**
Mainly international, scientific papers depending on the topic of the Master's thesis.

**Assessment practices and criteria**
Approval and grading is based on the written Master's thesis. The MSc thesis will be graded on the scale according the guidelines of the university.

**Completion:**
Student will write the MSc thesis on the basis of guidelines delivered in the Master's seminar. In many cases, the work is carried out in a research project in which the student has a clearly defined and independent role. The total workload (corresponding 30 cr.) starting from designing the project to its completion is approximately 4.5 months (800 hrs or 20 weeks at 40 hrs/week).
Detailed information about the Master's thesis is provided by the MSc programme.

**Other information:**
The Master's thesis project may not be started before obtaining an approval for the Master's thesis plan. For further information, see the general Instructions for Master's Theses.
Each MSc thesis must have at least one supervisor at the university or elsewhere.

**Relations to other study units**
Master's Thesis work is done in connection to Master's Thesis Seminar.
The thesis may not be approved before the student has passed the maturity test.

**Responsible person:** Head of the Master programme .

## ECGS-006 Master's thesis, 30 ects

**Target group:** The course is compulsory for the students of Master's Programme in Environmental Change and Global Sustainability, Global sustainability study line.

**Timing:** Mainly second year of MSc studies. Research plan periods 3-4 during the first year of MSc studies, and gathering of data in the summer of the first study year or during periods 1-2 of the second study year; data processing and writing period 3 of the second study year.

**Objective/Learning outcome:**

After completing the thesis, the student will be able to

- to plan and implement a research project in a timeframe
- to define appropriate research questions and base them with a theoretical framework
- to design and carry out data collection under supervision
- to analyse and interpret the research results
- to present the results of the research according to scientific standards
- to receive and use feedback in his/her own research and writing
- to apply ethical principles in science.

**Prerequisites:**
The student needs to have the necessary knowledge and skills for collecting the data (field/laboratory) and processing (statistics) them, and skills for scientific writing.
Prerequisite studies: Introduction to Sustainability Science and Sustainability Science Concepts.

**Contents:**
The Master's thesis is usually based on an empirical research project and critical contemplation of the results in the light of scientific literature on the topic. The thesis may also consist of a theoretical literature study. A Master's thesis project usually consists of four distinct phases

1. design and planning of the study
2. gathering the data (field work and/or laboratory work and/or mathematical modelling)
3. analysing the data (validation/quality control, statistical analysis, plotting)
4. interpreting and discussing the results in the light of existing literature.

**Literature and study materials:**
Mainly international, scientific papers depending on the topic of the Master's thesis.

**Assessment practices and criteria**
Approval and grading is based on the written Master's thesis. The MSc thesis will be graded on the scale according the guidelines of the university.

**Completion:**
Student will write the MSc thesis on the basis of guidelines delivered in the Master's seminar. In many cases, the work is carried out in a research project in which the student has a clearly defined and independent role. The total workload (corresponding 30 cr.) starting from designing the project to its completion is approximately 4.5 months (800 hrs or 20 weeks at 40 hrs/week).
Detailed information about the Master's thesis is provided by the MSc programme.

**Other information:**
The Master's thesis project may not be started before obtaining an approval for the Master's thesis plan. For further information, see the general Instructions for Master's Theses.
Each MSc thesis must have at least one supervisor at the university or elsewhere.

**Relations to other study units**
Master's Thesis work is done in connection to Master's Thesis Seminar.

The thesis may not be approved before the student has passed the maturity test.

**Responsible person:** Head of the Master programme .

## ECGS-007 Science Conference Course, 5 ects

**Target group:** The course is optional for ECGS Master's Programme students.
When choosing course participants ECGS students are given first priority. Students from other programmes may be accepted if seats are available.

**Timing:** III period, annually

**Objective/Learning outcome:**
This course aims to develop new knowledge and skills in the design, planning and management of sustainability events. Students will be responsible for implementing an online event that will be open to all ECGS students to present on their work.

This course presents a unique opportunity to develop an event which will enable all ECGS Masters students to learn about each other's research and to develop new networks and relationships.

After completing the course student has learned to work as a part of a scientific community and communicate his/her skills and knowledge. In addition, the student has gained organisational skills such as:

- contacting potential collaborators,
- inviting and hosting guests,
- scheduling an event,
- coordinating his/her work with other organisers' input,
- advertising an event,
- preparing event material (eg. instructions),
- receiving registrations,
- communication, planning and multitasking

**Contents:**
Organising the annual ECGS Student Science Day as part of a team. Completing the Event plan and post-event self-assessment Portfolio entries, as well as the Peer review.

**Prerequisites:** Recommended previous studies: ECGS-004

**Literature and study materials:**
Articles and text excerpts, online resources and materials

**Assessment practices and criteria:** The course is graded: pass / fail. The assessment is based on the completion of course tasks and peer evaluation.

**Completion:**
- Take part in meetings with the course coordinating teacher (please see course schedule)
- Do his/her part in organizing the ECGS Science Day as agreed with the organizing team and course coordinating teacher
- Do 2 portfolio inserts: 1) The event plan and programme. 2) A post-event self-assessment
- Fill in the peer evaluation form
-

**Work load**

- Contact teaching/meetings with the course coordinating teacher appr. 8 hours
- Two Portfolio entries 26,5 hours

- Peer evaluation 3 hours
- Planning and organizing the ECGS Science Day (including meetings with the organizing team) appr. 19,5 hours/week*5 weeks= 97,5 hours
- In total: 135 hours = 5 ECTS

**Other information:** Max 10 students may be accepted. Please note that detailed instructions for each task can be found in the Moodle section: Course tasks

**Responsible person:** John Allen, Christopher Raymond

## ECGS-008 Master's thesis for Subject teacher, 30 ects

**Unit:** Master's programme in Environmental Cahnge and Global Sustainability

**Target group:** The course is compulsory for the students of Master's Programme in Environmental Change and Global Sustainability, subject teacher study line.

**Timing:** Mainly second year of MSc studies. Research plan periods 3-4 during the first year of MSc studies, and gathering of data in the summer of the first study year or during periods 1-2 of the second study year; data processing and writing period 3 of the second study year.

**Objective/Learning outcome:**

After completing the thesis, the student will be able to

- to plan and implement a research project in a timeframe
- to define appropriate research questions and base them with a theoretical framework
- to design and carry out data collection under supervision
- to analyse and interpret the research results
- to present the results of the research according to scientific standards
- to receive and use feedback in his/her own research and writing
- to apply ethical principles in science.

**Prerequisites:**
The student needs to have the necessary knowledge and skills for collecting the data (field/laboratory) and processing (statistics) them, and skills for scientific writing.
Prerequisite studies: Introduction to Sustainability Science and Sustainability Science Concepts.

**Contents:**
The Master's thesis is usually based on an empirical research project and critical contemplation of the results in the light of scientific literature on the topic. The thesis may also consist of a theoretical literature study. A Master's thesis project usually consists of four distinct phases

1. design and planning of the study
2. gathering the data (field work and/or laboratory work and/or mathematical modelling)
3. analysing the data (validation/quality control, statistical analysis, plotting)
4. interpreting and discussing the results in the light of existing literature.

**Literature and study materials:**
Mainly international, scientific papers depending on the topic of the Master's thesis.

**Assessment practices and criteria**
Approval and grading is based on the written Master's thesis. The MSc thesis will be graded on the scale according the guidelines of the university.

**Completion:**
Student will write the MSc thesis on the basis of guidelines delivered in the Master's seminar. In many cases, the work is carried out in a research project in which the student has a clearly defined and independent role. The total workload

(corresponding 30 cr.) starting from designing the project to its completion is approximately 4.5 months (800 hrs or 20 weeks at 40 hrs/week).
Detailed information about the Master's thesis is provided by the MSc programme.

**Other information:**
The Master's thesis project may not be started before obtaining an approval for the Master's thesis plan. For further information, see the general Instructions for Master's Theses.
Each MSc thesis must have at least one supervisor at the university or elsewhere.

**Relations to other study units**
Master's Thesis work is done in connection to Master's Thesis Seminar.
The thesis may not be approved before the student has passed the maturity test.

**Responsible person:** Head of the Master programme

## ECGS-009 Personal study Plan (PSP), 0 ects

**Objective/Learning outcome:**
The student is able to make an acceptable personal study plan in line of the description and timing of the courses and studies of the Master's degree study programme.

**Toteutus:** Personal study planning together with the responsible teachers

**Prerequisites:** Bachelor's degree /kandidaatintutkinto

**Other information:** The student is given consultation time for personal study planning.

## ECGS-011 Advanced aquatic and sediment biogeochemistry, 5 ects

**Target group:** Open to all

**Timing:** Period IV

**Objective/Learning outcome:**
The course develops the concepts taught in ENV-312, with a strong focus on biogeochemical processes in coastal and ocean-margin sediments

Scientific knowledge gained during the course
- Understanding of dissolved and particulate organic matter cycling in estuarine and coastal systems
- Understanding of nutrient regeneration/removal and carbon burial in estuarine and coastal systems
- Understanding of the diagenetic zonation of sediments, and coupled microbial processes in the sediment column
- Understanding of benthic oxygen fluxes and the role of benthic organisms in coastal habitats
- Understanding of silicate chemistry in ocean-margin sediments
- Understanding of authigenic mineral formation (carbonates, phosphates, sulfides) in sediments
- Understanding of the impact of sediment processes on greenhouse gas emissions

Specific skills gained or further developed during the course
- Ability to read and evaluate English-language scientific articles in the field of aquatic biogeochemistry
- Ability to perform calculations using chemical equations, for quantitative understanding of element cycling, and to place the results in context

**Prerequisites:**
It is an advantage if students have either completed, or are familiar with the concepts in, the BSc course "Akvaattinen biogeokemia" ("Aquatic biogeochemistry", ENV-312):
- Carbon, nitrogen and phosphorus cycling in aquatic systems

- Ocean circulation and the biological pump
- Early diagenesis in sediments and benthic nutrient fluxes
- Eutrophication and hypoxia
- Acid rain, acidification and recovery in freshwater systems
- Basic techniques in water and sediment chemical analysis

**Contents:**
Online lecture content
- Early diagenesis in sediments; redox zonation and microbially mediated reactions
- Coupled biogeochemical cycles in sediments and human impacts on reaction rates
- Dissolved organic matter cycling in boreal estuaries and implications for sediment organic matter composition
- Nutrient retention and release in coastal systems
- Benthic oxygen consumption and production in coastal ecosystems
- Impact of sediment processes on greenhouse gas emissions (CO2, CH4, N2O)
- Authigenic mineral formation in sediments
- Sediment chemistry in marine oxygen minimum zones: carbon and silica cycling

Computer practical exercises
- Four interactive computer exercises based on the above topics

Minisymposium
- Attendance at a minisymposium featuring 4 PhD and postdoc researchers. Students listen to the presentations and formulate constructive questions.

Compulsory reading, completion of computer exercises and minisymposium report
- Each of the above components is augmented with additional tasks. Lectures have additional reading, the computer practicals contain extra tasks to be done in your own time, and a report must be written following the minisymposium.

**Literature and study materials:**
Teachers will provide a suitable amount of additional reading to accompany each lecture. This will mainly be based on scientific articles, and some book chapters. Further information is provided during the course.

**Assessment practices and criteria:** The grade is given on a scale of 0-5.

Assessment breakdown
- Reports of computer practical exercises: 40%
- Minisymposium report: 10%
- Final exam: 50%

**Completion:**
Course components
- Watching the online lectures (8 x 2h)
- Completing the associated reading (8 x 4h)
- Attending the supervised computer practical exercises (4 x 2h)
- Completing the additional computer tasks (4 x 4h)
- Attending the minisymposium (1 x 2 h)
- Writing the minisymposium report (1 x 8 h)
- Revision of material for exam (40 h)
- Final exam (1 x 3 h)

**Total time** 129 hr (= approx. half of your study time over the 2-month period)

**Responsible person:** Tom Jilbert

## ECGS-013 Restoration of lake ecosystems, 5 ects

**Target group**: Especially students in ECGS

**Timing**: Master studies, arranged every other year

**Objective/Learning outcomes**:
Knowledge on diagnosing the environmental problems of lake ecosystems and means to apply research-based solutions in resolving them
Comprehensive knowledge on planning and methodology of lake ecosystem management and restoration
Ability to evaluate the effects and costs of different restoration methods

**Contents:**
Goals and methods of lake restoration
Planning of lake restoration
Positive and negative effects of different restoration methods
Results from case studies of restoration

**Completion:**
Participating in contact teaching
Group work
Report writing and presentation of results

**Evaluation/Assessment practices and criteria**: Fail/pass

**Responsible person**: Jukka Horppila

**Relations to other study units/Prerequisites**: ECGS-011 and ECGS-018 recommended

**Other information:**

**Realisation and working methods**: Lectures, group work, report writing

**Keywords**: (i.e. if Suitable for exchange students)
**Study materials and literature:** Announced separately

## ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 ects

**Target group:**
Mandatory for students expecting to accomplish the “Baltic Sea Studies” module. Optional for others.

**Timing:** The first or second year of the Master programme. Period I

**Objective/Learning outcome:**
The course follows the Driver-Pressure-State-Impact-Response framework. After the course, student will understand the main causal relationships in the ecosystem of the Baltic Sea. Moreover, students understand the mechanisms of how the states of the Baltic Sea ecosystem react to the various pressures. The pressures on the drainage area are in a key role.

**Prerequisites:**
B.Sc. in environmental economics, aquatic studies, environmental studies or other relevant field.

**Assessment practices and criteria**
Passing the course: 80 % times present, one-page description of each talk, seminar presentation in the end.

**Other information:** Teaching is given in English, and the final report and the seminar talk are also given in English.

**Relations to other study units**
Replaces the former course 51878 Itämeritutkimuksen ajankohtaisia kysymyksiä 5 cr OR 863067 Vaihtuva teemakurssi 4 cr.

**Responsible person:**
Sakari Kuikka

## ECGS-016 Fish research , 5 ects

**Target group:** ECGS Master's programme students

**Timing:** Period IV / every second year in even years

**Objective/Learning outcome:**
After the course students have basic knowledge of different methods used in fish research. They understand why a certain type of method should be selected and used. Laboratory work aims to give practical skills in methods commonly used in fish research.

**Contents:**
Study questions and research methods used in fish research. Lectures give theoretical background and laboratory work practical skills.

**Literature and study materials:** Lecture handout (Moodle)

**Assessment practices and criteria**
Exam (scale 0-5) gives (65 %) and personal report (pass-fail) (35 %) of points. Final grade is based on both exam and personal report with scale 0-5

**Completion:**
Course grade is based on both exam (65 %) and practical exercises (35 %) in laboratory. Lectures 10 x 2 h. After lectures practical guided exercises in laboratory 10 h and 10 h of independent working with fish samples. Practical exercises includes a short personal report (3-4 pages) of fish samples analyzed.

**Relations to other study units**
Replaces the former course 86103 Kalantutkimus, luennot 4 cr and 86104 Kalantutkimus, harjoitustyöt 8 ects

**Responsible person** Jyrki Lappalainen

## ECGS-017 Fisheries management , 5 ects

**Target group:** Master students
**Timing:**
The first or second year of the Master programme. The course will be arranged in spring, in the fourth term.

**Objective/Learning outcome:**
Understanding the theoretical grounds of fisheries management and the application of practical management actions.

**Prerequisites:**
Akvaattisten tieteiden perusteet, Kalantutkimus: luennot, Kalantutkimus: harjoitustyöt, Kalakantojen arviointi, Todennäköisyysmallit ja päätösanalyysi, Tilastollisen Bayes-päättelyn perusteet ja Tilastollisen Bayes-päättelyn jatkokurssi

**Contents:**
The concepts and models of fisheries management, uncertainty of fish productivity and fisheries, applications of Bayesian decision analysis models to fisheries management. National and international fisheries policy, management strategies and practical implementation of policy actions.

**Literature and study materials:** The material will be provided on the course.

**Assessment practices and criteria** Exam, rates 0 - 5

**Completion:** Exam and course activity

**Other information:** All lectures will be in English.
**Relations to other study units** Replaces the former course 86109 Fisheries Management 6 cr.

**Responsible person:** Sakari Kuikka

## ECGS-018 Food webs of aquatic ecosystems, 5 ects

**Target group:** Especially students in ECGS

**Timing:** Master studies

**Objective/Learning outcome:**
- comprehensive understanding on the structure and functioning of aquatic food webs
- knowledge on the interactions between different food web components
- knowledge on the theories and hypotheses describing the functioning of food webs
- ability to evaluate the responses of aquatic food webs to different disturbances

**Contents:**
- structure and components of aquatic food webs
- theories describing the functioning of aquatic food webs
- interactions between different components of aquatic food webs

**Responsible person:** Jukka Horppila

## ECGS-019 Advanced aquatic ecosystems research, 5-10 etcs

**Target group**: ECGS programme, MSc level

**Timing**: Every other year (period open)

**Objective/Learning outcomes**:
- Capability of formulating solid structured questions and setups in aquatic research to answer preset research aims in a set scientific frame
- Understanding the causal relationships between abiotic and biotic factors in aquatic ecosystems
- Ability to search, read and apply relevant literature to research theme
- Ability to apply theoretical scientific knowledge to a larger scientific frame
- Ability to produce logical scientific text
- Has good group working skills

**Contents:**
- Aquatic ecosystem research
- Causal relationship between biotic and abiotic factors
- Aquatic ecology

- Land-water interface interactions

**Completion**: Participation in contact teaching, active self-guided work, active group work, scientific presentation of results

**Evaluation/Assessment practices and criteria**: Scaling 0-5 or pass/fail

**Responsible person**: Kimmo Kahilainen

**Relations to other study units/Prerequisites**: ECGS-018 recommended,
Replaces courses ECGS-022 and ECGS-015

**Other information**:

**Realisation and working methods:**
Lectures, experimental and/or field work, self-guided work, scientific text output

**Keywords**: (i.e. if Suitable for exchange students)

**Study materials and literature**: Announced separately

## ECGS-020 Nutrient loading of aquatic ecosystems , 5 ects

**Target group:** Especially students in ECGS

**Timing:** Master studies, arranged every other year

**Objective/Learning outcomes:**
- Ability to evaluate the sources, magnitude, and consequences of external and internal nutrient loading of aquatic ecosystems
- Ability to analyze and interpret nutrient loading data
- Ability to use the field study methods in studies of internal and external loading of aquatic ecosystems
- Ability to choose and use the field equipment used in different methods
- Ability to compare the results obtained by different methods
- Skills for the methodology of continuous measurements

**Contents:**
- Sources and magnitude of nutrient loading in aquatic ecosystems
- Methodology for measurements of external and internal nutrient loading
- Consequences of nutrient loading for aquatic ecosystems
- Field methods and equipment for the estimation of nutrient loading
- The validity of different methods in various circumstances
- Calibration between methods

**Completion:**
- Participating in contact teaching
- Group work
- Report writing and presentation of results

**Evaluation/Assessment practices and criteria:** Fail/pass
**Responsible person:** Leena Nurminen

**Relations to other study units/Prerequisites:** ECGS-011 recommended

**Other information:**

**Realisation and working methods:** Lectures, field and laboratory work, report writing

**Keywords:** (i.e. if Suitable for exchange students)

**Study materials and literature:** Announced separately

## ECGS-023 Functional marine ecology, 5 ects

**Target group**: MSc level

**Timing**: Period 1, 2021 (every other year)

**Objective/Learning outcomes**:
The objective of the course is to provide students with insights on the importance of global change on marine biodiversity, and to obtain skills to describe the link between the structure and function of coastal ecosystems. Emphasis will also be placed on quantification of biodiversity and ecosystem functioning relationship, with descriptions on how anthropogenic stressors can compromise these relationships. Students will get a grasp of the conceptual and analytical procedures necessary for quantification of key ecosystem processes in coastal habitats and placing results in context for their scientific reporting.

**Contents**:

- Theoretical background on biodiversity ecosystem function studies in marine systems
- Methods for the analysis of ecosystem structure and function in benthic and pelagic habitats
- Quantification of environmental drivers affecting biodiversity
- Combination of field studies and experiments to build strength of inference in addressing context-dependence of pattern and process
- Analysis of data and reporting

**Completion:**

**Evaluation/Assessment practices and criteria:** Grades 0-5. Grade is based on pre-course exam on background literature 1/3, field and lab work 1/3 and presentation of projects and report 1/3. Attendance is mandatory for all components.

**Responsible person**: Alf Norkko

**Relations to other study units/Prerequisites**: Completed basic aquatic courses in BSc-programme

**Other information:**

**Realisation and working methods:**
Ten-day field and lab course at Tvärminne Zoological Station including a pre-course exam. The course includes lectures, demonstrations, practical work in the field and lab, and group projects.

**Keywords:** (i.e. if Suitable for exchange students)

**Study materials and literature**:

## ECGS-024 Technology in ecological research and environmental monitoring/ Teknologian käyttö ekologisessa tutkimuksessa ja ympäristömonitoroinnissa, 5 ects

**Target group:** Not compulsory and can be taken by students from other faculties

**Timing:** During Master's level studies, End of August or beginning of September for contact days

**Learning outcomes**

- Ability to independently plan missions and operate remotely operated vehicles
- Ability to process data to make orthomaps and 3d models using using online resources and photogrammetry software
- Ability to use GIS to make basic measurements on data
- Ability to use Virtual Reality for research and visualization
- Ability to construct and deploy simple data loggers and analyse the data

**Completion methods**
8 days of contact teaching at Lammi Biological Station and / or other stations. Additional written assignments and projects are part of independent study. Public poster presentation in Viikki at the end of November.

**Prerequisites** None

**Other courses supporting the knowledge the of this course**
Courses which support the use of GIS software

**Contents**

- Introduction to RPAS (Remotely Piloted Aerial Vehicle) and aquatic ROV (Remotely Operated Vehicle) technology
- Basic proficiency in operation of these vehicles. Students will complete Traficom training and pass the mandatory test for RPAS operators
- Planning and execution of 2d mapping mission
    - Planning and execution of 3d modelling mission
    - 2d orthomapping and 3d photogrammetry
- Basic GIS analysis from data gathered
- Using virtual reality in ecology and environmental monitoring
- In some years (depending on teaching resource availability) students will also have the opportunity to construct electronic measurement loggers which are placed in the field to gather data. The gathered data will also be analysed.
- Students will plan and execute their own mini research projects using techniques learned during the contact days

**Literature**

Compulsory: Traficom online training for RPAS pilots
Conservation drones, Wich and Koh 2018
Other current journal publications from the field

**Activities in support of learning**

- Students: hands on experience operating devices, planning and executing small research project, reporting of results, independent study, interaction with other students and teachers
- Teachers: lectures, demos, consultations with students

**Course evaluation and criteria:** Course grade awarded on basis of book exam, project report and poster presentation

**Responsible teacher of the course:** John Loehr
**Teaching language:** English
**Additional information:** A maximum of 12 students / year can attend the course

## ECGS-026 Portfolio for the future, 1-5 ects

**Target group** Optional for students in ECGS
**Timing** First and second year of MSc studies

**Learning outcome**
After the course student has gained e.g. following skills

- has the basic skills needed to participate seminars
- understands the importance of scientific communication
- has incresed labour market intelligence
- has gained understanding of generic skills required in future working life
- has incresed pathfinding capacity
- has increased ability to combine domain specific skills and generic skills
- recognizes the diverse elements of communication and professionalism

**Completion**
The student can participate e.g. to scientific seminars and report on student's own learning by building portfolio from the information collected from the seminar presentations. The student choses the seminars to attend from the following categories: thesis defenses, specific seminars, congresses, workshops, short courses, group mentoring, or other clearly defined scientific or education events including also a role of organizer. The seminars should be from the area of ECGS study lines. After the course, students must return a portfolio reflection assignment that includes basic information of the seminars and reflection of the followed presentations. If you are unfamiliar or need support with your portfolio-work, please see further instructions for doing a portfolio from the ECGS Portfolio Moodle-page or responsible teacher. Portfolio are created using portfolio platform Qridi (under preparation) or other available platforms. 10 full day seminars with accepted portfolio assignments correspond 5 cp; 2 thesis defense sessions correspond one full day

**Prerequisites** Bachelor's degree

**Contents** Participation to scientific seminars

**Assessment practices and criteria** Pass/fail

**Responsible person** Olli-Pekka Penttinen

## ECGS-027 Co-creation Lab, 2 ects

**Target group:**
Number of seats in Co-creation lab is limited. Depending on the overarching Lab challenge, students from all relevant Master's degree programmes are eligible to apply. Students are selected to participate in the Co-Creation Lab based on the following criteria: 1) Relevant field of studies and methodological competence, 2) Plan how to commit to the Lab schedule, 3) Motivation regarding theme, 4) Motivation regarding co-creation, 5) Contents and style of application.

ECGS-027 is elective studies, and only for students accepted to the Lab from other MSc programmes than EGGS. ECGS students accepted in the Lab, register through ECGS-004 Masters' thesis seminar and select the Lab as their seminar group.

Responsible MSc programme: Environmental Change and Global Sustainability.

**Level:** EQF 7

**Timing:** Following the guidelines and timing given for thesis planning, doing and completion by student's own MSc programme.
Starts in 3rd teaching period in spring semester and ends in the 2nd teaching period of the following autumn semester.

**Responsible teachers:** Kaisa Korhonen-Kurki, Janna Pietikäinen, Michiru Nagatsu

**Objective/Learning outcome**
After completing the course the student

- can act and work in a co-creation process
- understands what co-creation process is used for and what are the outcomes of the process
- can work in multidisciplinary and multi-actor groups
- has the experience of different steps in the co-creation process, and understands the goals of the individual steps
- has completed a master's thesis in a co-creation process

**Completion**
In the Co-Creation Lab students tackle sustainability challenges presented by partners and produce their master's thesis during the lab process. The lab is based on a cooperative, scheduled and facilitated process. During the first four lab meetings, the research topic, research questions, and the methodology and methods are developed. This is followed by a research period, during which the master's students conduct individual research work. The last two lab meetings focus on interpretation of the data and presenting the research results. The six lab events are common and obligatory to all students. In addition each student is placed in a thematic group, which is gathered around a challenge given by one of the participating organizations. Each student will approach the challenge from the point of view of their own discipline, knowledge and interests. While the overarching challenge will be shared by all students in the team, each student will shape their own thesis topic and plan and do the thesis as individual work.

**Prerequisites**
The students accepted in the Co-creation lab are required to participate in the Master's thesis seminar of their own MSc programme before or at the same time with the Co-creation lab. This does not apply to ECGS students, who (if accepted in the Lab) register through ECGS-004 Masters' thesis seminar and select the Lab as one of their seminar groups.

**Recommended optional studies:** Research methodology courses and relevant advanced studies needed for own research work.

**Contents**
The Co-creation Lab will come together six times, each time starting with a new phase of the thesis process. The lab personnel facilitates and arranges each session.

- Lab 1 Team-building: Students, supervisors, lab personnel and partners meet. Everyone gets familiar with the lab topics and through a mapping exercise each team explore mutual interests and possibilities regarding their topic

- Lab 2 Defining: All day session where the research question, societal context and methods are starting to take form.

- Lab 3 Positioning: Using a joint back casting method, the theses are positioned and contextualized.

- Lab 4 Shaping: Time for presenting the research questions and the plans for data collection to both partners and supervisors. Comments on methods and methodology.

- Individual research work

- Lab 5 Interpreting: First insights from the data. Time for analyzing, interpreting, reflecting and sharing experiences.

- Lab 6 Sharing: Event where everyone involved in the lab are invited to hear about the results of the lab.

**Evaluation/Assessment practices and criteria** Pass/fail
Successful completion of the Lab requires active participation in Lab events and challenge-based teams and completing and submitting the thesis by the submission date.

**Language of instruction.** The working language in the Lab is English.

## ECGS-031 Arctic climate change, 5 ects

**Target group:** Students in Environmental Change and Global Sustainability M.Sc. Programme, other interested students

**Timing:** 2nd period

**Objective/Learning outcomes:**

After the course the student

- has basic understanding of climate features and processes specific for Arctic areas;
- gains fundamental understanding of Arctic climatic changes during the Holocene and the Anthropocene, including future projections;
- has knowledge of the climate impacts on various Arctic ecosystems and landscape elements;
- can critically assess the role of natural versus human-induced climatic changes and factors involved;
- understands the various steps of the climate research process, including critical thinking and assessment of uncertainties;
- can apply the achieved information to environmental management and climate mitigation and adaptation

**Contents:** The course introduces past, present and future climatic changes in the Arctic and its impacts on various ecosystems and landscape elements using topical examples and comprehensive scientific literature. The course deals with terrestrial, aquatic and marine realms and introduces several research approaches in a frame of critical thinking.

**Completion:** Lectures and end examination

**Evaluation/Assessment practices and criteria:** Grading scale 0–5

**Responsible person:** Atte Korhola

**Relations to other study units/Prerequisites:** The course is an obligatory part of the module “Northern ecosystems and environment”. Bachelor degree in environmental or related sciences or corresponding knowledge

**Other information:** Other teachers include: Jussi Eronen, Maija Heikkilä, Sari Juutinen, Meri Ruppel, Tarmo Virtanen, Jan Weckström, Kaarina Weckström

**Realisation and working methods:** Lectures, independent reading of literature

**Keywords:** Climate change, climate dynamics, changing Arctic environments

**Study materials and literature:** Lecture materials and “Snow, Water, Ice and Permafrost in the Arctic” (SWIPA, 2017) report.

## ECGS-037 Seminar in northern ecosystems and environment, 3 ects

**Target group:** ECGS master students. The course is available also for other students with relevant Bachelor’s degree

**Timing:** Each year, 3. period

**Objective/Learning outcomes:** During/after the course the student

- has a wide view on topical research issues specific for artic and other northern areas
- gets an insight into environmental problems and potential solutions in northern areas
- gets practice in scientific information retrieval, writing and oral presentation
- learns to act as an opponent

**Contents:** The seminar deals with topical research in the northern areas, covering atmospheric, climatic, terrestrial, fresh water and marine environmental problems and questions.

**Completion:** Grading scale 0–5
**Evaluation/Assessment practices and criteria:** Weighted mean of an oral presentation and written essay.

**Responsible person:** Sirkku Manninen

**Relations to other study units/Prerequisites:** ECGS-031 Arctic climate change

**Other information:**

**Realisation and working methods:** Course info meeting, oral presentation and written essay, listening of presentations, acting as an opponent.

**Keywords:** Arctic, ecosystems, environment, northern

**Study materials and literature:** The seminar oral presentations and essays are prepared based on scientific articles.

## ECGS-035 Field course on arctic ecosystems and climate change, 8 ects

**Target group:** Students in ´"Environmental Change and Global Sustainability"- Master-Program and other Master programs in relevant fields, especially students of "Northern ecosystems and environment"module.

**Timing:** Each year. Starting in 4 th period, field part during summer, ends in next 1. period.

**Objective/Learning outcomes:**

After the course the student:

- has a deeper understanding of Arctic ecosystems and their structure and functioning
- has the ability to analyse and identify climate change impacts on Arctic natural and human systems
- can plan and conduct a small-scale field study on some aspect of Arctic environmental change
- can analyse and interpret field-based data and present key findings of a research exercise
- learns to work in small groups
- can apply achieved information on various topics of environmental management and conservation

**Contents:** Literature exam before the field part, research project in small groups in the field and presentation of its results in final seminar, seminar presentation in agreed topic during field part of the course.

**Completion:** Literature exam before field part, course work in the field and its reporting, seminar presentation.

**Evaluation/Assessment practices and criteria:** Rating 0-5 based on literature exam (25 %), seminar presentation during the field course (25%), group-based field research (25 %) and written and oral report of research project (25 %)

**Responsible person:** Tarmo Virtanen.

**Relations to other study units/Prerequisites:**

Bachelor degree in environmental or related sciences, course "ECGS-031 Arctic climate change"

**Other information:**

This course is taught by several teachers with expertise in various Arctic ecosystems and local cultures. Number of course participants is limited, students of "Northern ecosystems and environment"-module are prioritized.

**Realisation and working methods:**

- see contents-section

**Keywords:** (i.e. if Suitable for exchange students)

Arctic, field research, climate change impacts to ecosystems

**Study materials and literature:**

Literature will be announced in teaching program.

## ECGS-036 Arctic and human beings, 5 ects

**Target group**: ECGS students interested in Arctic area

**Timing:** III-IV period, in even years.

**Objective/Learning outcomes**: After completing this course the student

- has basic understanding of socioecological systems of the North
- gains understanding of Human and environmental history of the North (incl. archeology)
- gains understanding of Arctic people and culture, including future conditions
- has knowledge of the climate and environmental impacts on various Arctic socio-ecological systems
- can critically assess the role of humans in the Arctic, including indigenous people livelihoods and cultures
- can apply the achieved information to environmental management, climate mitigation and adaptation

**Prerequisites**: Bachelor degree in environmental, social sciences or related field, or corresponding knowledge

**Contents:**
The course introduces the broad outlines of human history in Artic, as well as environmental history since the end of the ice age. The course includes focus on socio-ecological systems in especially Fennoscandia and Barents area from the past to the present. The course deals with the human resource use in the north as well as how cultures and languages have adapted to northern conditions, and what the present situation is. During the course the future conditions in the Arctic are critically assessed, as well as what this means for human living there and their environment.

**Completion:** Lectures, Seminar presentation/report, and returned lecture diaries.

**Realisation and working methods:**

- Lectures with the following structure: short introduction to the subject followed by open discussion based on few easy-to-read scientific papers that are available before the lecture
- Seminar presentations by students based on the lecture topics (with in-depth scientific literature)
- Lecture diaries
- Course and seminar attendance obligatory (no exceptions as this is a voluntary course)

**Evaluation/Assessment practices and criteria:** Pass/fail (no grading)

**Responsible person:** Jussi Eronen (responsible teacher), Reetta Toivanen et al.

K**eywords**: (i.e. if Suitable for exchange students)

**Study materials and literature**: Lecture materials and a collection of scientific literature, incl. scientific reports
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## ECGS-038 Arctic risks – 10 op

**Target group:** The course is available for Msc level students in the ECGS Master's programme, and, if there is space, for other faculties and universities .

**Timing:** First part in the end of May, second in the end of August**.**

**Objective/Learning outcome:**
Aim is to understand the dependency of biological and economic risks in Arctic environment, to learn the interview techniques needed in risk analysis. Especially, course aims to provide skills in the use of graphical risk models, and to learn how to collect expert knowledge in risk analysis.

**Completion:** 0) Applications to the course (March), including justifications why skills are needed 1) Literature review in a wide sense (including also newspaper and e.g. Norwegian business journals) 2) one day workshop in Helsinki: timing open, but before the end of May. This is to decide about course topics. Each pair (2 students, altogether max 14 students) will complete a literature review about their topic, providing grounds for expert interviews in each field visit. 3) Field work period in Norway/Lapland 4) Final seminar, 5) Final report in manuscript format 6) Optional section to continue to write one joined article together with teachers (additional credits from this section).

**Prerequisites:** MSc studies, preferably courses in statistics or in communication.

**Recommended optional studies:**

**Contents:** Topics include: mining, reindeer husbandry, tourism, aquaculture, production of electricity. A comprehensive literature review is carried out by each pair on their agreed topic in advance (completed by first week of June), and this material is used in interviews. There are no real lectures per se, collected information comes from interactive discussions with graphical causal structure interface. A final course seminar will be arranged in September, and for those who want to continue to an article writing section of the course, additional credits will be provided.

**Literature and study materials:** Scholarly literature relevant to the topic, other relevant knowledge, expert elicitation.

**Activities and teaching methods in support of learning:** graphical thinking, discussions, learning between students with different backgrounds.

**Assessment practices and criteria** Activity during the course, preliminary report, seminar presentations, final report, potentially contribution to the article. Scale 1 – 5.

**Other information:** The field work of the course will be arranged in the northernmost part of Norway/Lapland, where several climate change sensitive economic activities are carried out.

**Responsible person:** Sakari Kuikka, other teachers**:** Sakari Kuikka, Kimmo Kahilainen, tohtoriopiskelija NN.

## ECGS-045 Laboratory Course in Environmental Biotechnology and Chemistry, 5 ects

**Target group:** M.Sc. or Ph.D. students, international students

**Timing:** Every second year in even years.

**Objective/Learning outcomes**:

The aim of the course is to learn the theory and techniques of environmental chemistry, microbiology, and molecular biology, and apply them in monitoring natural and contaminated water air, soil, and biota, as well as urban environment (e.g. bioremediation, composting, and water treatment). Through these analyses, students gain familiarity to use advanced laboratory methods and equipment that environmental scientists apply in wide range of different applications. Further aim is to connect own results to scientific literature and learn to discuss them.

After the course, the student will be able to:

- design experiments, including environmental sample collection and analysis
- conduct different chemical and biological analytical procedures, including sample treatment and related analytical instruments
- understand basic principles and quality of analytical methods and instruments
- critically report the laboratory work results, and discuss own results in scientific manners

**Prerequisites:** Fundamentals in chemistry and microbiology including laboratory courses.

**Contents:**

- The topics of the course alter based on the ongoing research and instruments available.
- The theory of methods and topics used in the course works, including experimental design, recombinant DNA technology, microbial methods and their selection, environmental remediation, sequencing, primer design, and (bio)sensors.
- Sample treatment methods for inorganic, organic, microbial and molecular analyses in the most relevant matrices in a laboratory.
- Demonstrations of analytical instruments (e.g. GC, HPLC, MS, ICP, AAS, PCR/qPCR, electrophoresis).
- Writing of the reports on the results.

**Study materials and literature:** Most of the material will be delivered as printed material or as slides in electronic material. Writing reports require reading and referring to scientific papers.

**Assessment practices and criteria:** Participation in laboratory exercises, laboratory reports, grading scale pass/fail.

**Completion:** Lectures 7 h, laboratory practices 66 h, reports, and independent learning

**Other information:** Teaching language is English in the presence of non-Finnish speaking students

**Relation to other study units:** This course will substitute courses ECGS-044 Laboratory course in environmental biotechnology, ECGS-075 Methods in environmental chemistry. Belongs to the module Chemical Pollution.

**Responsible person:** Anna-Lea Rantalainen, Merja Kontro

**Key words:** Bio- and environmental technology, environmental chemistry

## ECGS-046 Advanced course in Bio- and Environmental Technology, 5 ects

**Target group:** M.Sc. or Ph.D. students, international students

**Timing:** Period III-IV, contact teaching in uneven years, remote teaching in even years.

**Objective/Learning outcomes:** The aim of the course is to deepen students understanding of bio- and environmental technology. Students will be able to
- control and solve problems related to environmental contamination using biological, chemical and technical approaches to remediate contaminated air, water, and soil.
- evaluate water treatment and recycling techniques (wastewater, drinking water).

- critically estimate waste recycling and management techniques
- understand related bioreactor technology and bioenergy production.

**Prerequisites:** ENV-382 Bio- and Environmental Technology in Urban Context, MOLE-103 Microbial diversity, structure and function (Mikrobien monimuotoisuus, rakenne ja tominta), or other comparable studies.

**Contents:** The topics of the course include remediation of contaminated environment, including air, water and soil, and the maintenance of clean environment. In addition, the course covers advanced studies in water treatment (drinking water, wastewater), waste management, recycling, and related topics, such as bioreactors in environmental technology, and bioenergy production. The course provides students with the knowledge about biological, chemical and technical tools to approach, control and solve urban environmental challenges, and pollution problems.

**Study materials and literature:** Lectures, scientific literature, seminar presentations/group works, essays.

**Assessment practices and criteria:** Examination, grading scale 1-5.

**Completion:** Lectures, scientific literature, seminar presentations, and written essay. The lectures can be followed online and recorded lectures will be stored in moodle. The moodle examination will be held at the end of the course.Course can be completed remotely every other year.

**Other information:** Teaching language is English. All lectures can be followed online, and recorded lectures are available offline in moodle.

**Relation to other study units**: This course will replace advanced studies from courses ECGS-041 Advanced course in environmental biotechnology and ECGS-043 Environmental remediation.

**Responsible person:** Kontro Merja, Martin Romantschuk

**Key words:** Environment, technology, environmental biotechnology, water, waste, recycling, remediation

## ECGS-048 Nanobootcamps (NBC), 5 ects

**Target Group:**
predominantly students in Environmental Change and Global Sustainability Master programme as well as other interested students

**Timing:** Organized every year, $4^{th}$ period, 6 nanobootcamps a´5h, in total 30h

**Objective / Learning outcomes**:
A short essay must be written by the participants after every single NBC and uploaded in moodle within one week. Eight different Nanobootcamps are offered, the students have to take 6 to achieve 5 ETCS. Minimum requirement to run a single NBC is 4 students.

- Topic 1: Bioassays and the three “R“ concept
- Topic 2: Natural Toxins
- Topic 3: Urban Water Issues
  Topic 4: Risk Assessment in Ecotoxicology
- Topic 5: Basic Lab-skills and Experimental Planning
- Topic 6: Linkin, Researchgate & Co
- Topic 7: Environmental Disasters and what we learned
- Topic 8: Statistical Methods in Ecotoxicology

**Prerequisites:** BSc degree in relevant field, y-kandy course on Basics in Ecotoxicology as well as general courses in chemistry and ecology recommended

**Recommended optional studies:** Other studies in the ECGS-077 Chemical Pollution - module

**Study material and literature:** literature in moodle, book suggestions during the course

**Assessment practice and criteria:** Scaling 0-5. Scoring is based on the final exam (60%), seminar work (20%) and personal exercise (20%)

**Completion**: The course consists of 21 h lectures, 16 h of seminar style studies (including 120 pages to read from a textbook of Advanced Ecotoxicology).

**Other information:** Held in Viikki, Helsinki and Lahti

**Relation to other study units**: Environmental Chemistry, Biotechnology, Urban Ecology

**Responsible person** Olli-Pekka Penttinen

**Keywords:** ecotoxicology, urban, water, bioassay, microplastic, pharmaceuticals, cyanotoxins, biotransformation, metabolomics,

## ECGS-049 Nature-based Solutions, 5 ects

**Target group**: Inter-disciplinary module for Masters students of ECGS, AGERE, FOR and USP programs interested in having a more systemic understanding of the co-benefits and costs of nature on urban systems. Attendance will be recorded. Students can only miss a maximum of 10% of classroom, group or field work.

**Timing**: Period I (September-October), every 2nd year (2021, 2023…)

**Objective/Learning outcomes**:
After completing this course, it is intended that students will be able to:

- Define nature-based solutions and their applicability to different challenges in urban contexts, including environmental justice and social inclusion, human well-being, climate resilience and multi-level governance
- Use mixed-methods to assess the co-benefits and costs of nature based solutions on important urban challenges relevant to specific cases in Finland.
- Critically discuss the role of nature-based solutions in supporting transformations toward sustainability in urban contexts.

**Contents**: The course will present an overview of the policy relevance of nature-based solutions and their role in addressing important challenges in urban areas. We will then critically review and discuss different concepts and associated methods for assessing the co-benefits and costs of nature-based solutions at planning, implementation and evaluation phases. Students will then be asked to address a challenge of a city within Finland (or abroad) using a nature-based solution approach. They will create a feasibility study on the potential of their proposed NBS to address the city's challenge, including an evaluation of the costs and benefits of the NBS on two or more of the following domains: social inclusion, environmental justice, human well-being, environmental governance and/or ecosystem resilience.

**Completion**: The course will consist of lectures, a group project relevant to city needs, a final seminar and an exam.

**Evaluation/Assessment practices and criteria**: An individual essay (20%), group report (30%) and written exam (50%). Grade = 0-5

**Relations to other study units/Prerequisites**: In order to participate in this course, the student should take the course Urban Environmental Policy

**Other information**: Students should be willing to work in inter-disciplinary teams, drawing on concepts from e.g., environmental science, human geography, health sciences and political ecology. Students should also be willing to work on solutions-oriented research where the aim is to solve a problem relevant to cities in Finland or abroad.

**Realisation and working methods**:

**Keywords:** human well-being, green infrastructure, environmental perception.

**Study materials and literature**:

- Kabisch, N et al. (2016) Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions book series. Springer. Open access: https://link.springer.com/book/10.1007%2F978-3-319-56091-5
- Raymond, C.M., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Razvan Nita, M., Geneletti, D., and Calfapietra, C. (2017). A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. Environmental Science and Policy 77: 15-24.

Other materials to be provided during the course.

**Responsible person**: Christopher Raymond

## ECGS-063 Topical issues in northern environmental research, 2 ects

**Target group:** Predominantly Students in Environmental Change and Global Sustainability Master Programme, other interested students

**Timing:** 4. Period, 1st or 2nd master's study year

**Objective/Learning outcome:**

- is familiar with many topical global environmental issues and knows how to approach them scientifically
- can critically read, understand and debate on demanding technical scientific journal articles
- can summarise and comprehensively present the major findings and open questions in specific research papers using appropriate visual presentation techniques
- learns to act as an opponent
- has developed further skills for scientific discourse and argumentation and can more effectively handle conflicting views
- learns to manage and constructively resolve touchy situations

**Prerequisites:** Bachelor degree in relevant field

**Contents:** The course will exposure students with multiple wicked global environmental problems and questions with conflicting views through critical reading of demanding scientific articles and scientific discourse.

**Literature and study materials:** A compilation of thematically arranged technical scientific papers with conflicting views. The specific papers and themes will be delivered on the first meeting of the class.

**Assessment practices and criteria:** Grading scale 0–5; the grade is based on overall performance and activity during the course.

**Completion:** 4 h lectures and demonstration, 35 h independent activities and 15 h group work

**Relations to other study units:** The course is part of the " Northern ecosystems and environment" module within ECGS master programme

**Responsible person:** Atte Korhola and Jussi Eronen

## ECGS-067 Past environmental change, 2 ects.

**Target group:** Students in Environmental Change and Global Sustainability, Aquatic Sciences, Geology and Geophysics, and other interested students.

**Timing:** 3rd period

**Objective/Learning outcomes:**
After the course the student:

- can apply obtained information to various topics of environmental management and conservation - has basic understanding of palaeoecological approaches and methods, and past environmental changes
- has the ability for critical thinking in order to evaluate the strengths and the weaknesses of different approaches
- learns to distinguish between anthropogenic and natural changes in different ecosystems

**Contents:** Potential of past environmental information in detection and evaluation of natural and anthropogenic environmental changes and in environmental management. Principles of palaeoecology, environmental archives and proxies, dating methods and data treatment, palaeoecological applications.

**Completion:** Exam (flexible in Examinarium)

**Evaluation/Assessment practices and criteria:** Rating (0-5)

**Responsible person:** Jan Weckström

**Relations to other study units/Prerequisites:** Closely related to courses ECGS-065 Practicals in past environmental change; ENV-361 Suomen luonnonmaisemien kehitys ja suojelu; ECGS-032 Field course on arctic ecosystems and climate change. Replaces the former course 518032 Johdatus paleolimnologiaan 3 cr. Prerequisites: Bachelor degree in environmental or related sciences

**Other information:** This course is taught by multiple teachers with expertise in various aspects of paleoecology and environmental change

**Realisation and working methods:** Lectures, discussions and field trip

**Keywords:** Past environmental change, bioindicators, data handling, environmental archives

**Study materials and literature:** Lecture material and field trip

## ECGS-065, Practicals in past environmental change, 5 ects.

**Target group:** Students in Environmental Change and Global Sustainability, Aquatic Sciences, Geology and Geophysics, and other interested students.

**Timing:** The course is offered every other year (2020, 2022) in period IV.

**Objective/Learning outcomes:**

After the course the student can practically apply microscopic and macroscopic bioindicators preserved in lake and marine sediments to study long-term environmental change, and comprehensively understands the various steps of the research process. The student will be able to critically analyse environmental reconstructions based on palaeobioindicators and understands their importance in assessing natural and anthropogenic environmental change.

**Contents:**
The course introduces several groups of organisms that are used to study long-term environmental changes (palaeobioindicators), as well as related laboratory methods, species identification, long-term preservation, and applications in palaeolimnology, -ecology, and -oceanography. The course contains lectures, expert visits, laboratory work, microscoping, and research projects to be carried out in groups. The target groups of organisms will depend on the teachers (e.g., diatoms, dinoflagellate and chrysophyte cysts, pollen, plant macrofossils, foraminifers, water fleas, midge larvae)

**Completion:** 40 h of contact teaching (15 h of lectures, 15 h of laboratory work or other practical work, a 3-h seminar and 7 h of group guidance) and 100 h of independent studies. Attendance in contact teaching is compulsory, well-justified absence up to 20% possible.

**Evaluation/Assessment practices and criteria:** Grading scale 0–5; the grade is based on a group project report (50%), a course seminar (20%) and an essay (individual) (30%). The group grade for the project report will be individually weighted by ca. 10–20% by teachers' and peer evaluation of the involvement and teamwork ability of each individual. Thus group members may get differing grades from the same project report. Assignments are expected to be finished according to the deadlines jointly decided in the beginning of the course. Detailed course evaluation criteria, assignment matrices and the peer-evaluation matrix of group functioning will be available in the Moodle area.

**Responsible person:** Maija Heikkilä

**Relations to other study units/Prerequisites:** Completed course ECGS-064/ECGS-067 Past environmental change or equivalent knowledge required.

**Realisation and working methods:** Lectures, laboratory and microscoping work, supervised research project in groups

**Keywords:** Suitable for exchange students

**Study materials and literature:** Lecture materials and scientific literature specified during the course.

## ECGS-071 Advances in Environmental Chemistry. 5 ects

**Timing:** The cource is recommended to take at anytime during the Masters studies. It takes place every second year.

**Objective/Learning outcome:**
Objectives of the course is to deepen knowledge on behaviour of anthropogenic chemicals in the environment and gain experience of human impact on disturbed environment. Topics of the lectures are related to research at the department and the aim is to realize how chemistry can be used to solve environmental problems.

The student will be able to:
- understand a meaning of industry, waste treatment and urban issues to the environment
- explain the hazard of environmental chemicals to humans and the environment
- understand present status of environmental chemistry research

**Prerequisites:** Fundamentals in chemistry, Environmental chemistry

**Literature and study materials:**
Lecture materials are available either as printed or electronic form. Additional compulsory material is in a book: Van Loon & Duffy: Environmental chemistry; Global perspective

**Assessment practices and criteria:** Grade (0 – 5) is based on an exam.

**Completion:** Lectures will introduce the topics of the course. The exam is partly based on lecture materials and partly on the book.

**Other information:** The course is arranged in Lahti.

**Relations to other study units:** This course is part of Chemical Pollution module in ESGC masters program.

**Responsible person:** Anna-Lea Rantalainen

## ECGS-073 Fate and Transport of pollutants. 5 ects

**Target group:**

**Timing:** Any time during the Master's studies. Is arranged every second year.

**Objective/Learning outcome:**
Objectives of the course is to

- develope an understanding of the range of compounds in the air, hydrosphere and geosphere
- develope skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
- critically discuss local and global environmental issues based on scientific principles and data

**Prerequisites:** Fundamentals in chemistry, Environmental chemistry

**Literature and study materials:** Scientific literature

**Assessment practices and criteria:** Grade (0 – 5) is based on problem-based team work.

**Completion:**
Problem based learning including introductory lectures

- The team selects pollutants, which fate in the environment they assess in certain environment. They prepare a research plan and present their results in a seminar.
- In journal club the students read scientific papers and discuss the topics concerning the fate and effect of various chemicals in the environment.

**Other information:** The course is arranged in Lahti.

**Relations to other study units** This course is part of Chemical pollution module in ECGS Master's program.

**Responsible person:** Anna-Lea Rantalainen

## ECGS-074 Methods in Ecotoxicology, 5 ects

**Target group:** Students in ECGS programme and other students interested in ecotoxicology

**Timing:** Organised every 2nd year, 3rd period, next time 2021-22

**Objective/Learning outcome:**
By the end of this course student should be able to:

- to explain how chemicals may affect individuals
- understand the principles of dose-response testing
- assess laboratory-scale bioassays using aquatic or terrestrial model species
- demonstrate an understanding of and the ability to apply the scientific method in gaining technical expertise and laboratory skills
- critically evaluate and interpret scientific data, information, and laboratory results
- apply scientific understanding to real-life problems regarding polluted environments

**Prerequisites:** Basic knowledge in chemistry and environmental science

**Contents:**
This eight days course provides a broad overview of practical aspects of ecotoxicology focusing on the laboratory scale tests with both aquatic and terrestrial organisms, e.g. water flea, photobacterium, *enchytraeid* and oligochaete worms

and yeast cells. The response metrics include survival, behavior, genotoxicity, endocrine disruption and inhibition of bioluminescence. Furthermore effects on individual organisms will be assessed in interaction with their changing environment. Obtained results will be analyzed using various statistical methods.

**Literature and study materials:** Instructions and scientific literature

**Assessment practices and criteria:** Grading 0-5??**,** Accepted reports
**Completion:** Group works in the laboratory and computer room

**Responsible person:** Course coordinator: Olli-Pekka Penttinen

## ECGS-076 Urban ecotoxicology, 5 ects

**Target group:** Students in ECGS programme and other students interested in ecotoxicology

**Timing:** Organised every year, 4th period, 12 single days in Viikki á 90 min

**Objective/Learning outcome:**

- advanced knowledge in urban ecotoxicology
- knowing the big five urban pollutant at different levels
- demonstrate insight into modern ecotoxicology and their methods in an urban context
- gain knowledge on possible remediation methods
- connect ecotoxicology with urban design, urban development and urban planning

**Prerequisites:** BSc degree in relevant field, y-kandy course on Basics in Ecotoxicology as well as general courses in chemistry and ecology recommended

**Recommended studies**
Other studies in the ECGS-077 Chemical Pollution - module

**Contents:**
By 2050 almost 80% of the world`s population will live in cities leading to the formation of megacities, which has already started in some countries like Brazil or China. The Urbanization brings different aspects to our ecosystems and within this course we will point out some of those from an ecotoxicological point of view. In the beginning we will identify the “Big Urban Five”, which are Water Pollution, Air Pollution, Soil Pollution, Light Pollution and Noise Pollution and discuss them in detail. As we can´t stop the trend of mega cities we have to think on solution for some of the problems coming up. Therefor counter measures and possible solution like Urban Farming, Green Liver Systems for Water Purification etc. will be presented with own research examples from Berlin, South Korea and Brazil. Rounding up the course, the interplay between Ecotoxicology in an Urban Environment with Urban Planning, Urban Life, Urban Development and Urban Interactions will be discussed.

**Relation to other study units:** Environmental Chemistry, Biotechnology, Urban Ecology

**Literature and study materials:** Literature in Moodle, book suggestions during the course.

**Assessment practices and criteria:** Scaling 0-5. Scoring is based on the final exam (60%), seminar work (20%) and personal exercise (20%).

**Completion:** The course consists of 21 h lectures, 16 h of seminar style studies (including 120 pages to read from a textbook of Advanced Ecotoxicology).

**Responsible person:** Olli-Pekka Penttinen

## ECGS-078 Challenge Course, 5 ects

**Target group:** M.Sc. or Ph.D. students, international students

**Timing:**

**Objective/Learning outcomes:** Upon completion of the course, the student will be able to act as an active member of an interdisciplinary project team in different roles. The student can:
- describe the outline of the project plan and apply different methods to divide the project into subtasks and to schedule the project
- prepare a budget for the project and monitor it
- document the group's and her/his project work results both orally and in writing
- reflect her/his actions as a member of the team and assess the outcome of the project and the other team members' work
- recognize the key elements in project risk management,
- apply knowledge and skills acquired in other courses to complete the project

**Prerequisites:** B.Sc. degree

**Contents:** Varying themes according to the ongoing research

**Study materials and literature:** Will be given in the course

**Assessment practices and criteria:** Participation in course works, grading scale pass/fail

**Completion:** Participation in course works

**Other information:** Teaching language is English

**Relation to other study units:**

**Responsible person:** Merja Kontro

**Key words:**

## ECGS-081: Analytical approaches to human environmental interaction, 5 op

**Target group:** ECGS Master's programme

**Timing:** 3rd period;

**Objective/Learning outcome:**
After the course the students can conduct critical interdisciplinary analyses of problems arising in interactions between technology, society and the environment. They can propose theoretically sound, evidence based and sustainable solutions to complex environmental problems. They have the communication skills to convincingly present the solutions to the relevant stakeholders. They are mentally prepared to take on professional challenges in environmental policy analysis, planning, decision-making, implementation and assessment.

**Prerequisites:** Recommended: ECGS-083 Introduction to environmental policy , 5 ects; ECGS-084 Environment, technology and culture , 5 ects

**Contents:**
The course is an advanced integrative introduction to social scientific approaches for understanding interactions between key dimensions of sustainability: technology, society and environment. Guiding questions include: What is technology? What boundary conditions do technology, organizations and social institutions pose for environmental decision making? How can risks be managed in complex socio-ecological systems? How to ensure environmental

innovations based on risk taking and experiments while managing inherent environmental risks? What is expertise in sustainability? Analytical approaches covered in the course include socio-ecological systems theory, science and technology studies, institutional theory, organization theory, risk governance, and behavioral governance. Student are divided into groups that analyze an environmental policy issue by applying one or more of the analytical approaches covered in the course. Each group presents their analysis orally at the end of the course.

**Literature and study materials:**

Course reader compiled of 20-25 articles and book chapters is available on course web pages (required).
Supplementary reading (not required):

- J. Hukkinen, Institutions in Environmental Management: Constructing Mental Models and Sustainability. London: Routledge, 1999.
- Y. Haila and C. Dyke, How Nature Speaks: The Dynamics of the Human Ecological Condition. Durham: Duke University Press, 2006.
- J. Hukkinen, Sustainability Networks: Cognitive Tools for Expert Collaboration in Social-Ecological Systems. London: Routledge, 2008.
- W.E. Bijker, T.P. Hughes and T. Pinch (eds) The Social Construction of Technological Systems, Cambridge, MA: The MIT Press, 1987.

**Completion:**

1) systematic reading from course literature on environmental and technology studies
2) oral presentation with slides or poster prepared in groups and based on course themes and literature
3) individual exam.

There is a reading assignment from course literature each week. Student evaluation is based on group work (30%), and individual exam (70%). Total student workload is 135 h, of which 20 h lectures, 10 h tutoring sessions and oral presentations, 40 h group work, 62 h reading literature and individual study, 3 h exam taking. To ensure effective group work, access to the course is limited to the first 30 registered participants.

**Relations to other study units** Replaces 737110 Technology, society and environment , 5 ects

**Responsible person:** Nina Janasik

**Keywords:** Suitable for exchange students

## ECGS-082 Communication and sustainable development 5 ects

**Target group** Kursen ingår i modulen Hållbar utveckling.

**Timing** Period II

**Learning outcomes Efter genomgången kurs kan studenten**:
**-** kritiskt granska och jämföra olika teorier och perspektiv inom området miljökommunikation samt vetenskaps- och teknikstudier (science and technology studies, STS)
- tillämpa ett avancerat teoretiskt ramverk på olika fallstudier och frågeställningar utifrån kurslitteraturen
- presentera och diskutera litteraturöversikter och rapporter både muntligt och skriftligt, samt
- kritiskt värdera mediarelaterade etiska aspekter i förhållande till teorier om miljö- och hållbarhetskommunikation

**Prerequisites** Studenterna förväntas ha avlagt kursen ENV-472 Vad är hållbar utveckling (5 sp) samt ENV-473 Essä (5 sp).

**Contents** Kursen fokuserar på kommunikationsprocesser mellan olika aktörer med syftet att fördjupa förståelsen för komplexa miljöfrågor- och -problem. Speciell tonvikt läggs vid det sätt på vilket ”kampen om naturen” förs mellan olika aktörer, till exempel via olika slags inramningar och retoriska grepp. Offentliga kommunikationsstrategier analyseras och relateras till institutionella, organisationella och kognitiva strukturer såväl som till allmänhetens attityder till miljöfrågor. Teoretiskt knyter kursen samman miljökommunikation med vetenskaps- och teknikstudier (science and technology studies, STS). Empiriskt lägger kursen fokus på klimatförändringen och på de emotionella utmaningarna i kommunikationen kring denna

**Study materials and literature** Föreläsningar, därtill systematisk bredvidläsning ur artikelkompendium samt ur följande verk:

- Meadowcroft, J. & D. Fiorino (Eds.) 2017. Conceptual innovation in environmental policy. Cambridge, Massachusetts & London, England: The MIT Press.
- Cox, R. 2010. Environmental Communication. LA, London: SAGE.
- Heise, U.K. 2008. Sense of Place, Sense of Planet. The Environmental Imagination of the Global. Oxford University Press.
- Jensen, L. The Rapture. Doubleday.
- Moser, S. & L. Dilling. 2017. Creating a Climate for Change. Communicating climate change and facilitating social change. Cambridge: Cambridge University Press.
- Moodle kommer att användas.

**Assessment practices and criteria**: 0-5. Kursdagbok 80%, aktivitet 20%

**Completion:** Deltagande i föreläsningar, aktivt deltagande i grupparbeten under lektionerna. Studerandena förväntas ha läst igenom relevanta avsnitt av kursmaterialet till nästa gång. Kursdagbok (minimi 8/10 föreläsningar).

**Other information:** Kursen ingår i modulen Hållbar utveckling. Kursen lämpar sig för studeranden på ämnes- och fördjupad (magister)nivå.

**Responsible person:** Nina Janasik

**Keywords:** Suitable for exchange students

## ECGS-084 Environment, technology and culture 5 ects

**Timing:** 2nd-4th period, year 2-3

**Objective/Learning outcome:**
After the course students have the theoretical and methodological foundations for developing an interdisciplinary understanding of interactions between the environment, technology and culture. They recognize the analytical challenges involved in solving wicked sustainability problems.

**Prerequisites:** Recommended: ENV-103 Introduction to environmental policy (5 cr)

**Contents:**
The course identifies interdisciplinary connections between two pertinent analytical approaches to environmental policy: problem oriented socio-ecological research on one hand, and science and technology studies on the other.

**Literature and study materials:**
Required literature:

- Lee K N: Compass and Gyroscope: Integrating Science and Politics for the Environment, Washington, DC: Island Press.
- Cudworth E: Environment and Society. London: Routledge.
- Winner L: The Whale and the Reactor: A Search for Limits in an Age of High Technology. Chicago: University of Chicago Press.
- Hård M and Jamison A: Hubris and Hybrids: A Cultural History of Technology and Science, New York: Routledge.

**Assessment practices and criteria:** Grading 0-5 is based 100 % on the exam.

**Completion:**
Literature exam based on required course literature. The exam contains 4 essay questions, one question per book. All 4 books are examined in a single exam. The exam is an electronic exam in the Examinarium system. Total student workload is 135 h, of which 132 h is individual study and 3 h exam taking.

**Relations to other study units:** Replaces 737100 Environment and culture (5 cr)

**Responsible person:** Nina Janasik

**Keywords:** Suitable for exchange students

## ECGS-085 Imagination in environmental politics 5 ects

**Target group** Primarily ECGS master students

**Timing** Period 3.

**Objective/Learning outcome** The aim of the course is to supply the student with skills to:

- critically review existing conceptual categorizations and conceptualizations of the future within the field of environmental politics (theoretical aspect);
- critically apply these categorizations and conceptualizations in relation to specific empirical cases (empirical aspect); and
- critically assess and evaluate existing future-oriented narration of different kinds and registers (methodological aspect).

**Prerequisites** ECGS-081 and ECGS-084 are recommended but not required

**Contents**
Recently, attention has been paid to how we constantly change and recalibrate the ways we think about the environment. For example, concepts such as sustainable development, biodiversity and environmental security were once conceptual innovations but now form a central part of our cognitive repertoire. Of these, the notion of environmental security has recently gained prominence both internationally and nationally, as has its precautionary and anticipatory counterpart, that of resilience and adaptation. From the point of view of methodology, such future-oriented notions are usually linked to a specific form of future-oriented narration, that of scenarios or science-based plausible stories about the future. From the point of view of environmental imagination, however, these recent developments are not unproblematic. Future-oriented narratives and imaginaries enable and legitimize specific ways of acting while excluding others. The notion of environmental security, for instance, goes together with a rather violent imaginary articulated around the increase of climate-related conflicts around e.g. resource scarcity, and has explicitly been contrasted with the notion of not only environmental but multispecies justice, an imaginary articulated rather around peaceful cooperation. Also, more domain-specific takes abound, such as socio-technical, socio-environmental or socio-climatic imaginaries. Taken together, these developments raise the question of the more precise nature of current ways of imagining environmental futures. What kinds of environmental politics do current imaginaries / future-oriented narratives enable (and exclude)? What are the limitations of and tensions between them? In which ways have analysts of different kinds (scientific, literary, artistic) tried to overcome such limitations and tensions? The aim of the course is to explore the multiple imaginaries of environmental futures from a theoretical, empirical and methodological point of view, with an emphasis on the varieties of future-oriented narration.

**Literature and study materials** Selected readings from the following books:

- Heise, U.K. 2016. Imagining Extinction. The cultural meaning of endangered species. Chicago and London: The University of Chicago Press.
- Itäranta, E. 2014. Memory of Water. HarperCollins.
- Jensen, L. 2009. The Rapture. Doubleday.
  Meadowcroft, J. & D. Fiorino (Eds.) 2017. Conceptual innovation in environmental policy. Cambridge, Massachusetts & London, England: The MIT Press.
- Jasanoff, S. 2016. Dreamscapes of Modernity. Sociotechnical imaginaries and the fabrication of power. Chicago: University of Chicago Press.

and

- Compilation of articles focusing themes and topics related to the course

**Assessment criteria and grading** Course diary (8/10 lectures) 50%, essay 50%. General grading scale 0-5.

**Completion** Course diary, essay and active participation in lectures (independent studies of the course literature required).

**Responsible person** Nina Janasik and guest lecturers

**Keywords** Suitable for exchange students

## ECGS-086 Qualitative methods for environmental studies, 5 ects

**Target group:** ECGS Master's students, preferably those beginning to work on their Master's thesis. Max 20 students.

**Timing:** 1. period

**Objective/Learning outcome:**
By the end of this course, students will be able to:

- Understand the characteristics, roles, and importance of qualitative research
- Contrast and compare practical and methodological challenges associated with a range of qualitative research methods
- Implement different qualitative data collection techniques relevant to studying identified environmental issues
- Analyze qualitative data through hands-on experience
- Communicate the findings from a qualitative study

**Prerequisites:** Students should have some basic knowledge (corresponding to a Bachelor's degree) in social sciences, such as social and public policy, sociology or an appropriate field, such as environmental sciences.

**Contents:**
The course introduces students to qualitative research methods and methodologies that are useful in problem-oriented research on environmental issues and sustainability more broadly. The course covers the different stages of the research process from identifying a research question and developing a research design to interpreting results. The course will cover the following topics: approaches to qualitative research, case study research, interviews, qualitative content analysis, discourse analysis, ethnographic methods, and practice approaches.

The course consists of 10 x 1,5h lectures.

**Literature and study materials:**
The focus of the course is on the practical application of qualitative research methods for environmental studies. Lectures will be accompanied by relevant readings, but these are non-compulsory.
Relevant literature includes:

- Silverman, D (2006): Interpreting qualitative data: Methods for analyzing talk, text and interaction
- Flick, U (2018) The SAGE Handbook of Qualitative Data Collection
- Seale et al. (2004) Qualitative Research Practice

**Assessment practices and criteria**

- Participation in lectures
- 6-8 individual research assignments (max 1 page), akin to a course diary, (100%)

The research assignments will be graded on a scale from 0-5. The criteria will available on the course's Moodle-page.

**Completion:** According to the requirements above.

**Responsible person:** Johan Munck af Rosenschöld, Nina Janasik, Kamilla Karhunmaa

## ECGS-087 The politics of environmental knowledge 5 ects

**Target group:** Priority is given to ECGS and SOSM Master's level students. Max 25 students.

**Timing:** 4. period.

**Objective/Learning outcome:**
Students will have the knowledge and tools to critically evaluate the role of science and scientific knowledge in understanding environmental problems and creating solutions for them. Students will be able to apply the theoretical concepts from science and technology studies (STS) to the analysis of historical and current environmental issues.

**Prerequisites:**
Students should have a good basic knowledge (corresponding to a Bachelor's degree) in social sciences, such as social and public policy, sociology or an appropriate field, such as environmental sciences. Students should preferably have some familiarity with environmental policy (e.g. Introduction to Environmental Policy).

**Contents:**
This course examines how knowledge about current and historical environmental phenomena is produced through scientific practices at different levels (local, national, global). The course aims to unpack how knowledge is produced, to what ends and for what types of audiences. The course also assesses how knowledge about environmental phenomena is contested. The course focuses on the interactions between knowledge production and policy. A range of thematic topics are covered, including climate change, biodiversity and natural resource management. Students examine the politics of environmental knowledge production through case studies on global assessments (e.g. IPCC and IPBES), national debates and local struggles.
The course consists of 10 x 1,5h lectures.

**Literature and study materials:**
Course reader compiled of relevant articles.
E.g. some of the following:

- Turnhout, E., Dewulf, A., & Hulme, M. (2016). What does policy-relevant global environmental knowledge do? The cases of climate and biodiversity. Current Opinion in Environmental Sustainability, 18, 65-72.
- Lövbrand, E., Beck, S., Chilvers, J., Forsyth, T., Hedrén, J., Hulme, M., ... & Vasileiadou, E. (2015). Who speaks for the future of Earth? How critical social science can extend the conversation on the Anthropocene. Global Environmental Change, 32, 211-218.
- (selections of) Edwards, P. N. (2010). A vast machine: Computer models, climate data, and the politics of global warming. Mit Press.
- S. L. Star and J. R. Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39," Social Studies of Science 19(3): 387-420 (1989).
- B. Wynne, "Misunderstood Misunderstandings: Social Identities and Public Uptake of Science," in A. Irwin and B. Wynne, eds., Misunderstanding Science? The Public Reconstruction of Science and Technology (Cambridge: Cambridge University Press, 1996), pp. 19-46.

**Assessment practices and criteria**

- Participation in lectures
- Course readings + pre-assignments in Moodle, (20%)
- Course essay (max 2500 words), (80%)

The pre-assignments in Moodle will be graded based on completion. The students are required to post questions/commentaries on Moodle prior to the lectures for 8/10 lectures.
The essay is graded on a scale from 1-5 based on criteria presented at the beginning of the course, including: clarity and justification of argument, scope and content; use of relevant literature; style and presentation.

**Completion:** According to the requirements above.

**Responsible person:** Kamilla Karhunmaa, Nina Janasik

**Keywords:** Suitable for exchange students

## ECGS-150 Master Class Sustainability, 5 ects

**Target group:** All students with an applicable Bachelor's degree can apply.20 students from ECGS master programme are accepted to the course.

**Timing:** Recommended timing: periods 3-4 (four months in total)

**Objective/Learning outcome:**
The Master Class problem-solving process is built upon analysis, iteration and experimentation, and it can be applied to different issues. Having completed the course, students are equipped with problem-solving skills and confidence in their own abilities and potential. Students have:

- expertise in problem-solving
- understanding and appreciation of their own skills and knowledge
- a solid understanding of the theme and challenges of the program
- insight into the partner organization's operations, challenges, problem solving, future visions and research and development work
- the ability to use the model of challenge-based problem solving
- familiarity with experimentation and the design and conduct of experimentation in societal problem-solving related to sustainability
- the ability to formulate user-based solutions to problems using design thinking tools
- access to new networks appreciation of their own social impact and how they could use it

**Prerequisites:** Bachelor's degree

**Contents:**
The program is based in Michael E. Porter's and Mark R. Kramer's concept of shared value. Following an open call, about 40 Master's students, researchers and professionals from University of Helsinki partner organizations and other organizations are selected to form the Master Class teams that tackle the program challenges. The teams are helped by a group of mentors and other experts.
The Master Class follows a process of "Challenge, Experiment, Solve & Share". The first part of the process focuses on understanding and analyzing the challenges and their context. The second part, Experiment, has to do with (re)defining the problem, ideating, co-creating and testing the solutions. During the third part "Solve & Share", the teams finalize and pitch their solution. Team building and team work as well as informal bonding and chats are just as important as the official events (clinics, workshops and boot camp) in the Master Class program.

**Literature and study materials:**
2-5 scientific articles and 1-2 professional papers/reports related to the specific topic of the Master Class. Details will be given prior to the course.

**Assessment practices and criteria:**
Grading: pass/fail. Grading is based on active participation in all the activities of the Master Class

**Completion:**
Course completion: Contact teaching (44 h), groupwork and reading (88.5) h) Students need to commit to working together with their team during 4 months.

**Other information:**
Coursework is completed in English.

**Relations to other study units:**
This course is one optional way to complete the course Applied Sustainability Science.

**Responsible person:** Research Coordinator, Docent, Kaisa Korhonen-Kurki, Helsinki University Centre for Environment University of Helsinki

## ECGS-151 Introduction to environmental decision analysis with Bayesian networks, 5 ects

**Target group:** Maximum number of students: 18

**Objective/Learning outcome:**
After the course the students:

- Understand the principles of probabilistic decision analysis
- Can structure different types of environmental management problems in causal decision-analytic format
- Are able to build simple decision analytic models using a Bayesian network software

**Contents:**

- Principles of formal decision analysis
- Proactive and operational environmental decisions
- Structuring and framing of decision-making problems
- Probabilistic causal inference with Bayesian networks
- Analysing environmental systems and their management under uncertainty

**Literature and study materials:** Lectures and Materials provided in Moodle
**Assessment practices and criteria** Grade 0-5, based on home exercises, course project (group work) and active participation

**Responsible person: NN**

## ECGS-153 Internship period/Työharjoittelu

**Target group:** Elective as a part of the ECGS master's programme studies (working life skills)

**Timing:** ECGS master's programme, any time

**Objective/Learning outcome:**
After engaging in internship, the student

- is familiar with working life on her/his own field
- can integrate theory and practice by applying their field specific knowledge in a work environment
- knows her/his competence better for the future carrier development
- is able to reflect her/his strengths and weaknesses
- has gained larger network of colleagues and co-operation partners

**Completion:**
The student must agree with the coordinator university lecturer Anna-Lea Rantalainen (anna-lea.rantalainen@helsinki.fi) that their planned traineeship is suitable for the programme. Minimum length of the traineeship is one month (5 cr) or two months (10 cr). A minimum duration of a university subsided traineeship is two months. More information on traineeship can be found on the page: https://guide.student.helsinki.fi/en/traineeships

**Realisation and working methods:**
After permission to perform the traineeship in selected place, first portfolio is returned to Moodle (https://moodle.helsinki.fi/course/view.php?id=31008). After the traineeship, the second portfolio is returned along with work certificate. Instructions for portfolios are available as general UH guidelines for internships: https://guide.student.helsinki.fi/en/article/traineeship-nutshell and ECGS Portfolio Moodle-page.

**Contents:** Practical training and portfolio performances.

**Activities and teaching methods in support of learning:** Student needs to do good advance preparation in order to make full use of the traineeship period and a thorough reflection and reporting afterwards.

**Assessment practices and criteria:** Approved internship portfolios and a certificate of the work.
**Responsible person:** Anna-Lea Rantalainen

## ECGS-154 Research group training, 5 ects

**Target group:** Master's students in Environmental Change and Global Sustainability

**Timing:** Organised every year, period I- IV, recommended for 2nd year students

**Objective/Learning outcome:**
After the course the student

- has a basic knowledge of practical research work in the research group
- has the basic skills needed to work independently in a research group
- is able to interact with researchers
- has sufficient domain knowledge of the research area
- can evaluate personal research results in the light of corresponding research in the subject area.
- can collaborate and manage time
- be able to write a clear report of the work done.

**Prerequisites**
BSc in relevant field. The theoretical major subject studies should be completed to an appropriate extent, and the student should be sufficiently familiar with relevant research methods

**Contents:**
The goal of this course is to provide students short-term experience in the practical work in a research group at the University, a research institute or a company. The minimum practical training period consists of 15 working days. The student and the research group must negotiate the timetable. Prior to the practical work, the student should contact the responsible teacher and agree upon the project with him. After the course, student will write a portfolio with specific artefacts indicating importance of the work and what was student's own role in the project. The portfolio should include a timeline of activities during the training period, as well as information on knowledge and basic skills received during the training period.

**Study materials and literature:**
Scientific literature related to the project

**Assessment practices and criteria**
Scaling pass/fail (report and supervisor's statement)

**Completion:**
Portfolio assessment. Purpose of an assessment portfolio is to document student's learning during Research group training (RGT). The items in the portfolio must be designed to elicit the knowledge and skill specified in the outcomes. Instruction preparing for portfolio is given in the Moodle page of the RGT (course id= 37507)

## ECGS-155 Introduction to digital methods in environmental social science, 5 op

## ECGS-201 Perspectives on sustainable consumption, 5 op

**Target group**

- Master's students in Environmental Change and Global Sustainability
- Master's students in Social Sciences
- Master's students in Food Economy and Consumption

**Timing:** 1st period, recommended timing second year

**Learning outcomes:**
Having completed this course, students are able to identify, describe and critically assess the basic research approaches (economics, sociology, psychology) and main research contributions to sustainable consumption. Students are able to explain how and why different theoretical and methodological research traditions present different pictures of sustainable consumption. Students are also able to apply the different research approaches and findings to practical and policy problems and anticipate their policy implications. They have a basic capacity to develop real-world research questions and find appropriate theoretical and methodological ways to answer them. They are able to describe the skills-set of experts working in this field and can imagine what skills they themselves would need to serve in such expert positions. They can also present constructive and academically grounded criticism toward present-day sustainable consumption policies.

**Prerequisites:** BSc or equivalent proficiency in an appropriate subject

**Contents:**
- Research traditions in consumer studies and their implications for sustainable consumption research and policy
- Relationships between individualist and structural approaches to sustainable consumption research and policy interventions
- Research-policy interactions in sustainable consumption and the nature of sustainable consumption expertise

**Study materials and literature:**

1)Holt, D. B. (2012). Constructing sustainable consumption from ethical values to the cultural transformation of unsustainable markets. The Annals of the American Academy of Political and Social Science, 644(1), 236-255.
2) Heiskanen, E. (2005). The performative nature of consumer research: Consumers' environmental awareness as an example. Journal of Consumer Policy, 28(2), 179-201.
3) Newton, P., & Meyer, D. (2013). Exploring the attitudes-action gap in household resource consumption: Does "environmental lifestyle" segmentation align with consumer behaviour? Sustainability, 5(3), 1211-1233.
4) Ölander, F., & Thøgersen, J. (2014). Informing versus nudging in environmental policy. Journal of Consumer Policy, 37(3), 341-356.
5) Spaargaren, G. (2011). Theories of practices: Agency, technology, and culture: Exploring the relevance of practice theories for the governance of sustainable consumption practices in the new world-order. Global Environmental Change, 21(3), 813-822.
6) Shove, E. (2014). Putting practice into policy: reconfiguring questions of consumption and climate change. Contemporary Social Science, 9(4), 415-429.
7) Heiskanen, E., Mont, O., & Power, K. (2014). A map is not a territory—making research more helpful for sustainable consumption policy. Journal of Consumer Policy, 37(1), 27-44.

**Assessment practices and criteria:**

Graded on a scale of 0-5. Attendance in class and participation in group assignments (30%), exam (based on lectures, assignments and readings, 70%). Evaluation criteria for exam: application of knowledge, understanding, argumentation, logical structure, personal reflection. More detailed criteria available on the course Moodle page.

**Completion:**

The course consists of 21 hours of classroom teaching (+21 hours notes & reflection), 10 hours of off-campus assignment, 50 hours of readings, and a take-home exam (20 hours incl. preparation).
Alternative way to complete the course: https://moodle.helsinki.fi/course/view.php?id=26234

**Other information** This is a multilingual course. Lectures and readings are in English but students can submit papers in Finnish or Swedish.

**Relation to other study units:** The course can be replaced with the course KE52 Kulutus ja ympäristö

**Responsible person:** Eva Heiskanen, Centre for Consumer Society Research, Helsingin yliopisto

**Key words:** Suitable for exchange students

## ECGS-202 Sociotechnical (re)construction of consumer society, 5 op

**Target group:**

- Master's students in Social Sciences
- Master's students in Environmental Change and Global Sustainability

**Timing:** 3rd period, recommended to be completed in 2nd year of Master's studies

**Objective/Learning outcome:**
Students are able to analyse consumption patterns in a broader socio-technical context. They are familiar with the main research traditions in science and technology studies that are relevant to sustainable consumption. They are able to use historical, statistical and media data to investigate the historical evolution of consumption and production patterns and conceptualize processes of socio-technical change. Students have experience of collaboratively investigating major ongoing efforts to change the course of unsustainable consumption patterns. They have the ability to develop researchable problems, compile answers to these problems, critically evaluate their own and others' research findings, and identify relevant implications for policy and practice.

**Prerequisites:**
Students should have a good basic knowledge (corresponding to Bachelor's degree) in an appropriate subject (social sciences, environmental sciences, economics, consumer studies). It is also helpful if students have completed the methodological courses in their Master's subject.

**Contents:**

- Theoretical frameworks of sociotechnical change
- Empirical findings concerning the historical evolution of main consumption domains (built environment, mobility, food, urban infrastructures) and their sustainability implications
- Application of theoretical frameworks to practical present-day problems
- Analysis of forces of stability and change in successful and unsuccessful attempts toward sustainability

**Literature and study materials:**

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. Research Policy, 41(6), 955–967. https://doi.org/10.1016/j.respol.2012.02.013

Geels, F. W. (2018). Low-carbon transition via system reconfiguration? A socio-technical whole system analysis of passenger mobility in Great Britain (1990–2016). Energy Research & Social Science, 46, 86–102. https://doi.org/10.1016/j.erss.2018.07.008

Shove, E., & Walker, G. (2010). Governing transitions in the sustainability of everyday life. Research Policy, 39(4), 471–476. https://doi.org/10.1016/j.respol.2010.01.019

Verbong, G. P. J., & Geels, F. W. (2010). Exploring sustainability transitions in the electricity sector with socio-technical pathways. Technological Forecasting and Social Change, 77(8), 1214–1221. https://doi.org/10.1016/j.techfore.2010.04.008

Kaljonen, M., Peltola, T., Salo, M., & Furman, E. (2019). Attentive, speculative experimental research for sustainability transitions: An exploration in sustainable eating. Journal of Cleaner Production, 206, 365–373. https://doi.org/10.1016/j.jclepro.2018.09.206

Ballon, P. and Schuurman, D. 2015. Living labs: concepts, tools and cases. info, 17, 4. https://doi.org/10.1108/info-04-2015-0024

Heiskanen, E., Jalas, M., Rinkinen, J., & Tainio, P. (2015). The local community as a "low-carbon lab": Promises and perils. Environmental Innovation and Societal Transitions, 14, 149–164. https://doi.org/10.1016/j.eist.2014.08.001

Ho K., & Hanssens, D. M. (2016). Advertising and Word-of-Mouth Effects on Pre- Launch Consumer Interest and Initial Sales of Experience Products. Journal of Interactive Marketing, 37(2), 57–74.
https://doi.org/10.1016/j.intmar.2016.08.001

**Assessment practices and criteria** Graded on a scale of 0-5. Attendance in class (20%), contribution in group report (40%) and group assignment (40%). Detailed criteria available on the course Moodle page.

**Completion:**
Lectures and seminar sessions (15 h), readings (40 h), groupwork assignment: analysis of system evolution and reform efforts in a selected field (individual contributions and a group presentation) (80 h).
Alternative way to complete the course: https://moodle.helsinki.fi/course/view.php?id=26236. If you want to complete the course in this alternative way, please contact Senja Laakso (senja.laakso@helsinki.fi)!

**Other information:** This course is part of a multilingual program: papers and assignments can be written and presented in English, Finnish or Swedish.

**Relations to other study units**
In the Social Science Master's program, this course is part of the Consumer Studies orientation (opintosuunta). In the Environmental Change and Global Sustainability Master's program, this course is part of the Consumer Citizens and Sustainability Transitions course package. In these two packages, it can be replaced with the course Sustainable culinary cultures from the Food and Sustainability program.
This course can also be included in the Science and Technology Studies orientation (opintosuunta) in the Social Science Master's program.

**Responsible person:** Kaisa Matschoss, Senja Laakso, Consumer Society Research Centre (Faculty of Social Science)

**Keywords:** Suitable for exchange students

## ECGS-203 Sustainability in everyday life, 5 op

**Target group:**

- Master's students in Food Economy and Consumption
- Master's Programme in Education
- Master's students in Environmental Change and Global Sustainability
- Master's Programme in Human Nutrition and Food-related Behaviour
- Master's students in Social Sciences

Suitable for exchange students (max 5 students)

**Timing:** 2nd period, recommended to be completed in 2nd year of Master's studies

**Objective/Learning outcome:**
Students understand and are able to apply *practice theory* to analyse and improve the conditions for sustainable consumption. They can identify relevant everyday consumption issues that have sustainability implications. They master basic research design, data collection and analysis methods (focus on qualitative and observational methods), research writing skills, as well as groupwork organization skills. They are able to condense and communicate pertinent insights from their small-scale research and identify relevant addressees for their research implications. They have gained personal experience of research communication using social media.

**Prerequisites:** BSc or equivalent proficiency in an appropriate subject

**Contents:**

- Practice theory: practice-as-performance and practice-as-entity
- Observational analysis of everyday life practices
- Policy implications of more and less sustainable everyday practices
- Succinct communication of research findings

**Literature and study materials:**

1) Shove, E., Pantzar, M., & Watson, M. (2012). The dynamics of social practice: Everyday life and how it changes. Sage Publications.

2) Shove, E. (2003). Converging conventions of comfort, cleanliness and convenience. Journal of Consumer policy, 26(4), 395-418.

3) Shove, E., & Pantzar, M. (2007). Recruitment and reproduction: the careers and carriers of digital photography and floorball. Human Affairs, (2), 154-167.

4) Røpke I (2009) Theories of practice — New inspiration for ecological economic studies on consumption. Ecological Economics 68 (10), 2490–2497.

5) Sahakian, M., & Wilhite, H. (2013). Making practice theory practicable: Towards more sustainable forms of consumption. Journal of Consumer Culture, 1469540513505607.

6) Smart, B. (2010). Consumer society: Critical issues & environmental consequences. Sage Publications. (selected chapters, to be announced)

**Assessment practices and criteria** Graded on a scale of 0-5. Attendance in class (10%), reaction papers (30%) and group assignment (60%). Detailed criteria available on the course Moodle page.

**Completion:**
Course completion: Lectures (10 h) + readings (30 h) + reaction papers (30 h), groupwork assignment (paper, presentation and social media communication) on identification and researching of a selected consumption practice using different methods (interviews, observation), as well as reflection on the reasons for unsustainability and options for improvement (65 h).
Alternative way to complete the course: https://moodle.helsinki.fi/course/view.php?id=26235

**Other information:** Lectures and readings are in English but students can submit papers in Finnish or Swedish.

**Relations to other study units**

This course is part of three Master's programs:

- Environmental Change and Global Sustainability Master's program, where this course is part of the Consumer citizens and sustainability transitions course package (Faculty of Biological and Environmental Sciences)
- Food Economics and Consumption program (Faculty of Agriculture and Forestry).
- Social Science Master's program, Sustainable Consumption orientation (opintosuunta), Faculty of Social Science

**Responsible person:** Eva Heiskanen, Consumer Society Research Centre (Faculty of Social Science) and Minna Autio

**Keywords:** Suitable for exchange students

## ECGS-204 Business in the natural environment 5 ects

**Target group:**

**Timing:** Periods 1 and 3

**Learning outcomes:**
After having completed the course, students are familiar with the main discussions, developments, organizations and tools in corporate environmental responsibility and have the capability to monitor developments in the field and find further information. Students understand the mainstream and critical research perspectives on business and the natural environment and are able to develop an empirical research question that connects to a body of academic research in the field. They can write credibly, objectively and critically about corporate environmental responsibility

**Completion:**
Independent study, including reading articles, watching webcasts, analyzing statistics and news items (40 hours) in order to answer questions in **Moodle exam**. Reading the textbook (40 hours) and writing the assigned essay (55 hours). The course consists of two parts:

1. Overview: Each student completes an online (Moodle) exam consisting of 10 short questions. Each question points to online information sources: webcasts, research articles, websites of relevant organizations or statistical reports, which you will need to study in order to answer the question. The aim of this part of the course is to ensure that you have an overview of the field and its practices (such as environmental management systems, the global reporting initiative, product-service systems)
2. Research perspectives essay: Drawing on the book Hoffman, A. & Georg, S. (2018) Business and the Natural Environment (Routledge Focus), each student should write a 10-page essay where you:
   a. select and describe a research perspective on business sustainability that interests you (3-4 p.)
   b. select and describe an empirical research topic that you could investigate from this perspective (3-4 p.)
   c. frame and motivate your essay with a good introduction (1-2 p.)
   d. end your essay with concluding reflections concerning the pros and cons of using this research perspective (1-2 p.)
   e. carefully copy-edit your text and make sure your references are in good order.

**Responsible person:** Eva Heiskanen

## ECGS-501 Management of environmental problems in aquatic ecosystems, 5 ects

**Target group:** Mandatory for students expecting to accomplish the “Baltic Sea Studies” module. Optional for others.

**Timing:** Recommended: The first or second year of the Master programme, 2nd period

**Objective/Learning outcome:**
The course focuses on identifying solutions to contemporary and prospective environmental problems in the Baltic Sea. The specific learning objective are to:

- understand the role of marine ecosystem on our wellbeing
- be able to design cost-effective programmes of measures to mitigate existing problems (such as eutrophication) and prevent environmental hazards (such as oil spills)
- learn the spectrum of national policy instruments and international environmental policies necessary for successful marine protection

**Completion:**
The course will be offered in the form of lectures and compulsory exercises. Students are required to keep a diary, and to write brief essays of all lectures.

**Prerequisites:**
B.Sc. in environmental economics, aquatic studies, environmental studies or other relevant field.

**Recommended optional studies:** The students are recommended to take a course ECGS-014 Diagnosis of environmental problems in aquatic ecosystems, 5 credits, prior to this course.
Relevant prior candidate-level courses on environmental economics and aquatic ecosystems are recommended for those students not yet familiar with the concepts of these disciplines.

**Contents:**
The themes studied in the course include: cost-benefit analysis to combat eutrophication in the Baltic Sea, cost-effective mitigation of nutrient loads, impacts of global socioeconomic trends and changing climate on the Baltic Sea drainage basin and the sea, how to reduce the risks and damages of oil accidents, effective prevention of species invasions, how to reach sustainable fishing, energy production in the Baltic, national and international environmental policies.

**Literature and study materials:** Literature and materials will be delivered during the course.

**Assessment practices and criteria** Diaries are assessed in the scale 1-5.

**Relations to other study units**
Belongs to ECGS-500: Baltic Sea Studies -module
Replaces the course 863067 863067 Vaihtuva teemakurssi 4 cr.

**Responsible person:** Kari Hyytiäinen

**Keywords:** Suitable for exchange students

## ECGS-502 Marine governance, 5 ects

**Target group:** Open to all interested students

**Timing:** 3rd period

**Objective/Learning outcomes:** The objective of the course is to provide students with understanding on marine governance and its main types and concepts in general, and characteristics of Baltic marine governance in particular. Most importantly, the course gives preparedness to apply this understanding in the students' own work. The students learn to view environmental issues in their governance context, and discern the requirements that complex environmental problems set for governance.

**Contents:** The course addresses guiding principles and values of governance, institutional frameworks of governance (e.g. organizations, roles, policies, laws, rules), and operational governance from problem framing to implementation of decisions. Major approaches, theories, typologies, and concepts for analyzing governance are introduced with examples revolving around fisheries, shipping, eutrophication, and marine spatial planning, and applied by the students to their own case studies (Group work).

**Completion:** 1) Reading Circle Briefs (1 page, compiled individually after each Reading Circle), 2) Case study-based Group work reported (10 pages) and presented

**Realisation and working methods:** The course consists of 1) contact sessions (lecturing + reading circles), and 2) case study sessions (lecturing + group work). In addition, the course requires homework to a) read articles for the reading circles, b) write a summary of each reading circle discussion, and c) compile the coursework in small groups.

**Relations to other study units/Prerequisites:**

**Evaluation/Assessment practices and criteria:**

**Study materials and literature:**

**Other information:**

**Responsible person: NN**

**Keywords:** (i.e. if Suitable for exchange students)

## ECGS-601: Ecosystems and climate change, 5 ects

**Target group:**

**Timing:** Period 3, suggested for the 1st study year

**Objective/Learning outcome:**

By completing the course, you will be able (1) to describe the links between organisms and functioning in different ecosystems and (2) to describe the potential changes that will appear in these links under climate change. You will also (3) be prepared for providing evidence and validating your arguments when discussing current and future climate change effects on ecosystems.

**Prerequisites:** You are supposed to understand essentials of ecology.

**Contents**
The course includes lectures, scientific talks and literature of the effects of climate change on the organisms (plants, herbivores, decomposers) and functioning (primary production, decomposition, element cycles) of terrestrial, peatland, freshwater and marine ecosystems. Lectures will cover the subject in a broader ecological context, while the scientific talks, given by PhD students and postdoctoral researchers, will provide a glimpse on ongoing climate change research in different ecosystems. The Synthesis Report by the Intergovernmental Panel on Climate Change (IPCC)

**Learning material and literature:**
Course literature is freely available in the internet.

**Evaluation/Assessment practices and criteria:** The course will be graded as 0-5 using the scores achieved in the exam (50%), literature assignment (30%) and summaries of the scientific talks (20%).

**Completion:**
To complete the course, you are supposed to listen to the lectures and scientific talks, pass the exam of the contents of the lectures, write two summaries of the contents of the scientific talks and prepare a document based on the provided IPCC material. The course consists of 26 h of lectures, 5 h of scientific talks, a 2-h exam and 102 h of independent work.

**Responsible person:** David Thomas

## ECGS-701 Philosophy and methodology of sustainable food production systems, 5 ects

**Target group:** MSc in ECGS, Agricultural sciences, Philosophy of science, and Development studies

**Timing:** period III, in 2021.

**Background and Context:**

Food systems are one of the few most important systems for sustainability. They lie at the crucial nexus between societal and ecological systems, reflecting humanity's nature dependency, abiding environmental impacts, and having unique and irreplaceable societal roles. Usual focus on sustainability transformations and behavioral change in the food-distribution and -consumption spheres neglect the more basic problem that sustainable production models are currently fundamentally contested, flawed and practically unavailable.

**Objective/Learning outcomes:**

The main objective of this course is that students will learn to analyze multi-disciplinary modeling of sustainable food systems and understand its philosophical and methodological background. The course focuses on production models and investigates specific inter- and trans-disciplinary explanations in the context of sustainability science.

By the end of the course, students will be able to:

- independently identify and explain various relevant theoretical conceptions, particularly from sustainability, social, and agricultural sciences
- compare and analyze the approaches of different multidisciplinary models to sustainable food systems
- develop critical reflections on learning and responsibilities in addressing food systems issues

**Contents:**
The course consists of lectures (2 cp), literature exam (2 cp), and discussion with group and individual work, including seminar presentation (1 cp).
The content will include various philosophical and methodological aspects of sustainable food systems (SFS), including currently implemented agricultural models, discussion of divergent trends – notably sustainable intensification and agroecology, relevance of food systems for United Nation's Sustainable Development Goals and relation with the planetary boundaries framework, history of agriculture and relation to sustainability, background economic dynamics, legal and ethical frameworks, rural and food sustainability, multidisciplinary issues in SFS research and methodological limitations for further integration.

**The course has three parts:**
Part I - Conceptualization and modelling of SFS:

- Concept of "Sustainable Food Systems"
- Food systems and sustainability
- Modeling SFS – Socio-ecological systems thinking
- Inter- and transdisciplinarity in SFS research

Part II - Divergent approaches to SFS:

- History of agriculture – 2nd and 3rd agricultural revolutions
- Sustainable Intensification approaches + their problems
- Agroecology + its problems
- Future SFS

Part III: E-Socio-economic, political, and ethical aspects of SFS:

- Economic dynamics driving food systems (FS) development
- Legal issues and food politics
- Role of ethics and systemic social inequities in FS (+associated concepts, e.g. food security/sovereignty, colonialism, racism, exploitation of land and other beings)

**Completion:** Lectures are completed by submission of a lecture diary, group work is completed by sufficient contribution to group work and giving a presentation, including passing group members' peer evaluation, and literature exam is completed by passing the oral exam or by submission of a home essay (based on the student's topic of interest) or by a similar appropriate form (relative to the student's goals).

**Evaluation/Assessment practices and criteria:**

Learning diary 20% weight of the lectures, presentation 40%, and group work and discussions 40%. Passing is conditional to peer evaluation of group work contribution, or to completing an additional task (worth 1 cp).

**Responsible persons** Milutin Stojanovic, Rachel Mazac

**Relations to other study units/Prerequisites:** Course: "ECGS-4000 Sustainability Science"; also helpful "AGRI-222 Sustainable Food Systems"

**Other information:** working language will be English. The course welcomes a broad range of skill sets and individuals from diverse backgrounds, from applied to theoretical knowledge (ranging from agricultural and economics to philosophy and the social sciences). Students that may have varied interests in food systems issues or practical experience as farmers, chefs, gardeners, or related previous courses are also welcome in the course as valuable forms of theoretical or experiential knowledge.

**Realization and working methods:** Lectures, discussions, group or individual exercises, final exam.

**Keywords:** Sustainable food systems, agricultural models, sustainability science, methodology, multi-, inter- and transdisciplinarity, sustainable intensification, agroecology, philosophy of science, social sciences, ecological and environmental economics.

**Possible study materials and literature:**


- Allen & Prosperi 2016. Modeling Sustainable Food Systems. Environmental Management 57: 956. https://doi.org/10.1007/s00267-016-0664-8
- Altieri et al 2017. Technological Approaches to Sustainable Agriculture at a Crossroads: An Agroecological Perspective, Sustainability, vol. 9. 1-13. doi:10.3390/su9030349
- Bommarco, R.; Kleijn, D.; Potts, S.G. Ecological intensification: Harnessing ecosystem services for food security. Trends Ecol. Evol. 2013, 28, 230–238
- Brunori G, Guarino A (2010) Security for whom? Changing discourses on food in Europe in times of a global food crisis. In: Lawrence G, Lyons K, Wallington T (eds) Food security, nutrition and sustainability.
- Carpenter S, Walker B, Anderies JM, Abel N (2001) From metaphor to measurement: resilience of what to what? Ecosystems 4:765–781
- Clapp, Jennifer, Peter Newell, and Zoe W Brent. 2018. "The Global Political Economy of Climate Change, Agriculture and Food Systems". Journal of Peasant Studies 45(1): 80-88. http://www.tandfonline.com/doi/full/10.1080/03066150.2017.1381602.
- Clapp, Jennifer. 2018. "Mega Mergers on the Menu: Corporate Concentration and the Politics of Sustainability in the Global Food System". Global Environmental Politics 18(3): 12-33. https://www.mitpressjournals.org/doi/abs/10.1162/glep_a_00454.
- Costanza, R., Cumberland, J. H., Daly, H., Goodland, R., Norgaard, R. B., Kubiszewski, I., . (2014). An introduction to ecological economics (2nd ed.). CRC Press.
- Eksvard K., Rydberg T. 2010. Integrating participatory learning and action research and systems ecology: a potential for sustainable agriculture transitions
- Ervin D.E., Glenna L.L., Jussaume R.A. 2010. Are biotechnology and sustainable agriculture compatible?
- Foran et al. 2014. Taking Complexity in Food Systems Seriously: An Interdisciplinary Analysis. World Development. Volume 61, September 2014, Pages 85-101.
- Gliessman, S.R.; Rosemeyer, M. The Conversion to Sustainable Agriculture: Principles, Processes and Practices; CRC Press: Boca Raton, FL, USA, 2009
- Hinrichs (2010), Conceptualizing and creating S food systems: how interdisciplinarity can help. in Palmer (ed.). 2010. Imagining Sustainable Food Systems : Theory and Practice. Ashgate Publishing.
- IPES 2017. Too big to feed: impacts of mega-mergers. International Panel of Experts on Sustainable Food Systems (IPES–Food). (in Bene et al. 2019) [also IPES 2016. Paradigm shif from industrial ag. to diversified agroecological systems.!]
- Keleman A., Uromi M.G., Dooley K. 2010. Conservation and the agricultural frontier: collapsing conceptual boundaries
- Kulshreshtha, Ag practices as barriers to S. in Olaf Christen (ed.) Interdisciplinarity and sustainability issues in food and agriculture, Vol.III. EOLSS Publications.
- Mahon et al 2017. Sustainable intensification – "oxymoron" or "third-way"? A systematic review. Ecological Indicators. Volume 74, pp 73–97.
- Molina & Casado 2017. Agroecology and Ecological Intensification. A Discussion from a Metabolic Point of View. Sustainability 2017, 9(1), 86; https://doi.org/10.3390/su9010086
- Ponisio & Enrlich 2016. Diversification, Yield and a New Agricultural Revolution: Problems and Prospects (Review). Sustainability, 8(11), 1118; doi:10.3390/su8111118
- Rosset, P.M.; Altieri, M.A. Agroecology versus input substitution: A fundamental contradiction of sustainable agriculture. Soc. Nat. Resour. 1997, 10, 283–295.
- Sulser T.B., Duryea M.L., Frolich L.M., Guevara-Cuaspud E. 2001. A field practical approach for assessing biophysical sustainability of alternative agricultural systems
- Weiler, A.M., Hergesheimer, C., Brisbois, B., Wittman, H., Yassi, A., Spiegel, J.M., 2014. Food sovereignty, food security and health equity: a meta-narrative mapping exercise. Health Policy and Planning 30, 1078–1092. doi:10.1093/heapol/czu109

## ECGS-901: Field Course in Urban Environmental Ecology, 5 ects

**Target group**: Students in Environmental Ecology, ECGS MSc students, and other students interested in urban ecology

**Timing**: Period IV, every 2nd year (2021, 2023…)

**Objective/Learning outcomes**: In this field/laboratory course students will learn some basic research methods in urban environmental ecology. Using these skills the knowledge they have gained during lectures will be practically implemented. "Urban laboratories" in the Helsinki metropolitan area, primarily in Lahti, will serve as model sites to teach students how to use scientific research methods in management and planning processes in environments of varying degrees of urbanisation.

**Contents**: The course consists of introductory lectures, field excursions and fieldwork, laboratory work and a seminar. Various urban themes are explored, for instance; urban soils, urban air, urban water, urban biodiversity, social.

**Completion**: Intensive fieldwork, 2 times per week (full days), primarily in Lahti, for about a month (mid April to the end of May).

**Evaluation/Assessment practices and criteria**: Group report on one of the themes executed during the course. Seminar presentation and participation. Grade = 0-5

**Responsible person**: Johan Kotze

**Relations to other study units/Prerequisites**: In order to participate in this course, the student should take the course ECGS-903 Urban Ecosystem Ecology

**Other information**: Note that the course takes place in the Lahti campus, 100 km N of Helsinki.

**Realisation and working methods**: Active participation in the “start-up” lectures, in collecting data in the field, in analysing the data in the laboratory, basic statistical analyses of the data, writing a report and participate in the seminar (both presenting and critiquing other presentations).

**Keywords: (i.e. if Suitable for exchange students)**: Urban ecology, urban ecosystem ecology, field methods, laboratory methods, experimental design

**Study materials and literature**: Literature on the basics of experimental design will be provided, together with summary articles on the themes chosen for that particular year.

## ECGS-903: Urban Ecosystem Ecology, 5 ects

**Target group**: Students in Environmental Ecology, ECGS MSc students and Urban Studies and Planning MSc students (https://www.helsinki.fi/en/programmes/master/urban-studies-planning), and other students interested in urban ecology.

**Timing**: Period III, yearly

**Objective/Learning outcome**: This course builds upon introducing and understanding two concepts of urban ecology: 1) ecology in cities, and 2) ecology of cities. The former focuses on examining urban sites as “novel ecosystems” into which species from the surrounding natural ecosystems should adapt in order to establish viable populations/communities. The latter considers cities/towns as ecosystems focusing on ecosystem-level phenomena in urbanised areas, such as material cycles as energy flows. Additionally we learn about ecosystem services, the treats urbanization causes to urbanites, and ways to mitigate these various challenges.

**Contents**: Lecture titles: 1. Introduction to Urbanisation; human impacts at a global level, 2. Are cities ecosystems, 3. Urbanisation and water resources, 4. Urban water management, 5. Urban ecology in Finland I – beetles, 6. Urban ecology in Finland II – vegetation, 7. Urban ecosystems – how do plants adapt in?, 8. Carbon and nutrient cycles in terrestrial urban ecosystems. Contemporary global research performed by the Lahti team.

**Completion**: The course consists of eight 2 hr online lectures (16h), a discussion session on contemporary research performed in Lahti, a one-day field trip in the city of Lahti and a seminar based on urban environmental issues discussed during the course. Students will participate in small group projects focusing on specific challenges, develop solutions to their own challenge, based on the content of the lectures and seeking relevant supplementary material. Each group will prepare a seminar presentation and present this to their peers and the teachers. Students will then have two weeks' time to finalize reports of their projects, utilizing the feedback from their peers. The lectures will be made available online. Students will need to attend three full days in Lahti in March.

**Evaluation/Assessment practices and criteria**: A written exam (60% of the final grade) and a group essay (40% of the final grade). Grade = 0-5

**Responsible person**: Heikki Setälä

**Relations to other study units/Prerequisites**: Basic knowledge in ecology and/or environmental science

**Other information**: All lectures are online. Three compulsory contact days in Lahti, usually in March.

**Realisation and working methods**: Online lectures, field trip, group working, seminar

**Keywords: (i.e. if Suitable for exchange students)**: Ecology, Ecosystem ecology, urbanisation

**Study materials and literature**: Lecture material and scientific literature (book available in Moodle).
Book: Adler FR, & Tanner CJ 2013. Urban ecosystems: ecological principles for the built environment. Cambridge University Press.

## ECGS-904: Urban Environmental Policy, 5 ects

**Target group**: Major and minor students, maximum of 25 participants. The course is for MA level students.

**Timing**: Period II, yearly

**Objective/Learning outcomes**: The objective is to introduce the main concepts of urban environmental policy in the context of global urbanisation and increasing use of natural resources. At the end of the course, the students will have a good grasp of how environmental policy in urban areas is made.

**Contents**: The main theoretical approaches in urban environmental policy are explored, as well as the main concepts that are related to the way in which environmental policy is discussed in the urban context. The course also covers different modes of urban governance, the actors involved in decision making and instruments used in steering environmental action in the urban context.

**Completion**: The course consists of lectures (16h), compulsory core readings for lectures, a presentation and an essay in English.

**Evaluation/Assessment practices and criteria**: Grade = 0-5

**Responsible person**: Sirkku Juhola

**Relations to other study units/Prerequisites**: A good knowledge of policy processes. The course is for MA level students.

**Other information**:

**Realisation and working methods**:

**Keywords: (i.e. if Suitable for exchange students)**:

**Study materials and literature**:

## ECGS-906: Urban Climate, 5 ects

**Target group**: The course is open to other Master degree programs, but the priority is for ECGS and USP master program students.

**Timing**: Period III, yearly

**Objective/Learning outcomes**:

- The student can describe the basic principles of urban climate (Urban heat island, wind, pollution) and what are its controlling effects
- The student can describe the basic principles of thermal effects and surface-atmosphere interactions
- The student knows basic principles of QGIS based The Urban Multi-scale Environmental Predictor (UMEP) model
- The student can simulate simple urban planning scenarios with UMEP
- The student has basic understanding on the connection between urban planning and climate

**Contents**:

- Basics and controlling factors of urban climate including urban heat island, pollution and wind
- Basics on the interaction between the urban surface and the atmosphere including radiation and energy balance
- Basics of UMEP
- Application of climate knowledge in urban planning and design

**Completion**: The course consists of lectures, exercises, group work, final report and presentation of the group work.

**Evaluation/Assessment practices and criteria**: Grading in scale 0–5. Evaluation matrix can be found from Moodle pages. 50 % of the exercises needs to be calculated. Grading is based on exercises (20%), project work evaluated by each group (10%) and final report and presentation (70%).

**Responsible person**: Leena Järvi

**Relations to other study units/Prerequisites**:

**Other information**:

**Realisation and working methods**: Contact teaching + Exercises + group work + final report and presentation. Grading: Exercises 20%, final report and presentation 70%, 10% group evaluation. 50% of the exercises needs to be made in order to pass the course.

**Keywords: (i.e. if Suitable for exchange students)**:

**Study materials and literature**: Book: Oke et al., Urban Climate, 2018 + lecture material + UMEP manual

## ECGS-907 Urban Biodiversity, 5 ects

**Target group**: Students in Environmental Ecology, ECGS MSc students, and other students interested in urban ecology and biodiversity

**Timing**: Yearly, preferably Period III or IV

**Objective/Learning outcomes**: This course introduces various theoretical concepts related to biodiversity and how the urban environment drives wildlife communities and our thinking of patterns and processes in nature. Methodological tools are also provided for urban biodiversity studies, as well as way to link the generated knowledge in the practical world.

**Contents**:
- Community ecology and biodiversity concepts and measurements
- Urban ecology concepts and paradigms
- Methodological approaches to tackle urban biodiversity questions
- General responses of wildlife groups to urbanization

**Completion**: Students will actively participate in lectures, discussion sessions and go on a 1-day field trip to 4 sites in Helsinki. Students will develop a group work based on the data gathered in the field. The course will culminate in a final seminar and a final exam that will consist on an essay that ought to include aspects reviewed in the course. Invited talks may take place upon acceptance of fellow colleagues, which would add one day to the course.

**Evaluation/Assessment practices and criteria**: Field trip participation (20%), presentation in seminar (30%), final exam (50%). Grade = 0–5

**Responsible person**: Ian MacGregor-Fors

**Relations to other study units/Prerequisites**: Basic knowledge in biodiversity, ecology and/or environmental science

**Other information**:

**Realisation and working methods**:

**Keywords: (i.e. if Suitable for exchange students)**: Biodiversity, urban, extinction, fragmentation, disturbance

**Study materials and literature**: Literature will be distributed before lectures. Book: Ossola A & Niemelä J 2017. Urban Biodiversity. From research to practice. Routledge Studies in Urban Ecology, 274 pp.

## ECGS-910 Intergrative methods in environmental social science, 5 ects

**Target group**: Major students, maximum of 25 participants. The course is for MA level students.

**Timing**: Period II, yearly

**Objective/Learning outcomes**: The aim of the course is to deepen the knowledge of research methods in social sciences. This includes study of methodology literature and understanding research problem framing and the application of suitable methods. The student will use one or more methods during the course in a research exercise and will write up a research report.

**Contents**: The course discusses the use of research methods in environmental social sciences and their application. The course also discusses the integration of several methods in one research project and the benefits and limits of several methods.

**Completion**: Compulsory articles for each lecture and supplementary reading list for the course. These will be provided before the course. Participation in a research project in small groups.

**Evaluation/Assessment practices and criteria**: Grade = 0-5

**Responsible person**: Sirkku Juhola

**Relations to other study units/Prerequisites**: A good knowledge of social science research methods.

**Other information**:

**Realisation and working methods**: 14hrs lectures, 14rs seminars, 30hrs group work, 20hrs writing research report, 30hrs independent study, group self-assessment 10hr

**Keywords: (i.e. if Suitable for exchange *students)***:

***Study materials and literature***:

## VIIKB-001 Master's maturity test BY, 0 ects

**Vastuuyksikkö:** Bio- ja ympäristötieteellinen tiedekunta
**Arvostelu:** Hyväksytty-Hylätty
**Opintokohteen kielet:** suomi
**Leikkaavuudet:**
570018FM-tutkinnon suomenkielinen kypsyysnäyte (perehtyneisyys opinnäytteen alaan)0.0 op
570023FM-tutkinnon englanninkielinen kypsyysnäyte (perehtyneisyys opinnäytteen alaan sekä suomen, ruotsin tai englannin kielen taitoa)0.0 op
80061Maisterin suomenkielinen kypsyysnäyte0.0 op
**Relations to other study units**

## VIIKB-002 Tutoring BY, 5 ects

**Vastuuyksikkö:** Bio- ja ympäristötieteellinen tiedekunta
**Arvostelu:** Hyväksytty-Hylätty

**Ajoitus:**
Kandivaiheen tuutorointi pääsääntöisesti kandiopintojen 1. tai 2. lukuvuoden keväällä (tuutorikoulutus) ja 2. tai 3. lukuvuoden syksyllä (tuutorointi). Maisterivaiheen tuutorointi maisteriopintojen 1. lukuvuoden keväällä (tuutorikoulutus) ja 2. lukuvuoden syksyllä (tuutorointi).
IV periodi (tuutorikoulutus) ja orientoiva viikko (tuutorointi)

**Osaamistavoitteet**
Opiskelija tutustuu ryhmän perustamisen lainalaisuuksiin, ryhmäytymisen tukemiseen ja ryhmänohjaamiseen. Hän osaa myös vastata opintojen aloittamiseen liittyviin käytännön kysymyksiin. Opintojakson suoritettuaan opiskelija osaa ottaa vastuuta pienryhmäohjauksesta ja valmistaa toimintasuunnitelman ryhmän yhteisen tavoitteen saavuttamiseksi. Opiskelija syventää tietojaan Helsingin yliopistosta, omasta kampuksesta ja koulutusohjelmastaan sekä soveltaa niitä auttaessaan uutta opiskelijaa integroitumaan yliopistoyhteisöön.

**Edeltävä osaaminen:** Ei pakollisia edeltäviä opintoja

**Sisältö:**
Opintojen aloittamiseen ja oppimisympäristöön liittyvät käytännön tiedot. Tuutorisuunnitelman laatiminen itsenäisesti ja yhteistyössä muiden tuutoreiden ja koulutusohjelman henkilökunnan kanssa. Ryhmäteorian perusteet ja ryhmäytymisharjoitukset. Tuutoroinnin toteutus ja sen sekä oman oppimisen arviointi kirjallisessa tuutoriloppuraportissa.

**Oppimateriaali ja kirjallisuus:** Kirjallisuus ja muu oppimateriaali on saatavilla tuutorikoulutuksen Moodle-alueella.

**Arviointimenetelmät ja -kriteerit:**
Arvioinnin perusteena on osallistuminen tuutorikoulutukseen, tuutorointi orientoivalla viikolla sekä tuutorisuunnitelman ja tuutoriraportin palautus. Arviointiasteikko hyväksytty/hylätty

**Suoritustavat:**

Opintojakso sisältää muutaman pakollisen lähiopetuskerran. Sen lisäksi opiskelija opiskelee itsenäisesti hänelle osoitetun kirjallisuuden ja muun oppimateriaalin, tekee tuutorisuunnitelman, toimii tuutorina orientoivalla viikolla ja lopuksi kirjoittaa tuutoriraportin.

**Lisätiedot:**
Tuutorikoulutus on yhteinen BYtdk:n ja MMtdk:n tuutoreille. Opetuskielenä suomi/ruotsi/englanti.
Lisätietoa Opiskelijan ohjeissa: https://guide.student.helsinki.fi/fi/artikkeli/hae-tuutoriksi

**Yhteydet muihin opintojaksoihin**
Korvaa kurssit 570007 Opiskelijatuutorointi, 2 op ja 80077 Opiskelijatuutorivalmennus (Y205), 5 op

**Vastuuhenkilö:**
Bio- ja ympäristötieteellinen tiedekunta

## VIIKB-005 Demanding participation in administrative bodies and student organizations, 2-5 ects

**Vastuuyksikkö:** Bio- ja ympäristötieteellinen tiedekunta
**Arvostelu:** Hyväksytty-Hylätty

**Opintokohteen kielet:** suomi
**Kohderyhmä**
Nämä ohjeet koskevat 1.8.2017 tai sen jälkeen alkaneiden bio- ja ympäristötieteellisen tiedekunnan koulutusohjelmien opiskelijoita. Ohjeita löydät myös Opiskelijan ohjeista.
Hallinto- ja ainejärjestötoiminnasta myönnettävien opintopisteiden myöntämisperusteet eroavat ennen ja jälkeen 1.8.2017 alkaneissa koulutusohjelmissa. Jos opiskelet ennen 1.8.2017 alkaneessa koulutusohjelmassa, katso ohjeet Flammasta. Tällöin suoritat opintojakson 570006.

**Osaamistavoitteet:**
Tavoitteena on kehittää opiskelijan vuorovaikutustaitoja ja oman osaamisen ja asiantuntijaidentiteetin tunnistamista. Opiskelija saa hallinto- ja opiskelijajärjestötoiminnassa kuvan hallinnon toimintaperiaatteista ja osaa toimia aktiivisesti järjestötehtävissä. Opiskelijoiden osallistuminen hallinto- ja opiskelijajärjestötoimintaan tukee myös Helsingin yliopiston strategisia tavoitteita vahvistaa vuorovaikutusta ja oppimista tiedeyhteisössä sekä kehittää kilpailukykyisiä koulutusohjelmia ja tutkintoja opiskelijalähtöisesti.

**Toteutus:**
Opiskelijan tulee hakea hallinto- ja järjestötoiminnasta saatavia opintopisteitä ja osoittaa osaamisensa. Hakemus toimitetaan Opiskelijaneuvonnan Opiskelijapalvelupisteeseen.
Opiskelijan tulee osoittaa hallinto- ja opiskelijajärjestötoiminnan osaaminen toimielimen puheenjohtajan tai sihteerin tai järjestön vastaavan henkilön antamalla todistuksella. Todistuksesta tulee käydä ilmi opiskelijan rooli ja tehtävät sekä se, että opiskelijan toiminta on ollut aktiivista toimielimessä tai järjestössä. Toimielimen osalta todistuksesta tulee lisäksi käydä ilmi, kuinka suuressa osassa kokouksista opiskelija on ollut läsnä.
Toimiminen samassa toimielimessä tai järjestötehtävässä huomioidaan vain kerran.

**Sisältö:**
Osallistumisesta järjestötoimintaan annetaan opintopisteitä seuraavasti:
Opiskelijan on oltava läsnä vähintään puolessa pidetyistä kokouksista vähintään lukuvuoden tai kalenterivuoden ajan
Yliopistokollegio, hallitus, tiedekuntaneuvosto, laitosneuvosto, johtokunta, neuvottelukunta, opetustaitotoimikunta, opiskelijavalintatoimikunta/lautakunta, koulutusohjelman johtoryhmä, oikeusturvalautakunta tai muu rehtorin, vararehtorin tai tiedekunnan päätöksellä perustettu monijäseninen toimielin:
nimetty jäsen tai varajäsen: 1 opintopiste
Ylioppilaskunnan piirissä toimivan järjestön hallitus (luettelo järjestöistä on osoitteessa https://hyy.helsinki.fi/fi/j%C3%A4rjest%C3%B6t/hyyn-j%C3%A4rjest%C3%B6t)

- nimetty jäsen: yksi opintopiste
- puheenjohtaja, taloudenhoitaja tai sihteeri: kaksi opintopistettä
- Ylioppilaskunnan piirissä toimivan järjestön virkailija (luettelo järjestöistä on osoitteessa https://hyy.helsinki.fi/fi/j%C3%A4rjest%C3%B6t/hyyn-j%C3%A4rjest%C3%B6t)

- nimetty virkailija: yksi opintopiste (edellytetään määriteltyjä tehtäviä ja aktiivista toimintaa (esim. tapahtumien järjestäminen)
- Ylioppilaskunnan edustajisto, hallitus tai valiokunta
- jäsen: yksi opintopiste
- valiokunnan puheenjohtaja tai sihteeri: kaksi opintopistettä,
- hallituksen puheenjohtaja: kolme opintopistettä
- Oman opiskelualan kansallinen tai kansainvälinen opiskelijajärjestö
- jäsen: yksi opintopiste
- valiokunnan puheenjohtaja, taloudenhoitaja tai sihteeri: kaksi opintopistettä,
- hallituksen puheenjohtaja: kolme opintopistettä
- nimetty virkailija: yksi opintopiste (edellytetään määriteltyjä tehtäviä ja aktiivista toimintaa, esim. tapahtumien järjestäminen)

**Arviointimenetelmät ja -kriteerit:** Hallinto- ja opiskelijajärjestötoiminnan osaamisen arviointiasteikkona on hyväksytty-hylätty.

**Suoritustavat:**
Opiskelijan tulee hakea hallinto- ja järjestötoiminnasta saatavia opintopisteitä ja osoittaa osaamisensa. Hakemus toimitetaan Opiskelijaneuvonnan Opiskelijapalvelupisteeseen.
Opintopisteitä on mahdollista saada 2-5 op kandissa ja 2-5 op maisterivaiheessa ja 2-5 op tohtoritutkinnossa.

**Yhteydet muihin opintojaksoihin:**
Vastaa biologian kandiohjelmassa jaksoa 570006 Yliopiston hallinto- ja opiskelijajärjestötoiminta 2 op, vastaa ympäristötieteiden kandissa jaksoa 80114 (Y206) ja 570006.