

**UNU Institute for the Advanced Study of Sustainability (UNU-IAS)
Spring 2021 Semester-Competency Course**

As of March 01, 2021

Title of Course: Environmental Statistics and Research Methods (ESRM)

Coordinators: Kensuke Fukushi, Javzan Sukhbaatar,

Course Schedule: Please see the schedule

Course description: The research design and methodology is a course designed to help the students in developing their research proposal. This course is focused on the application of relevant research methodology for the research problems that students are interested to solve. This course aims at active discussion and presentation of research proposal by the participants based on the solid academic and practical readings. Individual consultation of students with professors is expected to take place during the semester. Critical analysis of relevant research articles is a part of the requirements. Considering that environmental investigation often covers a broad range of disciplines from the social science to natural science, and the study systems/problems are complex, the course contain information about the main statistical methods to interpret project results.

Course Learning Objectives:

1. Enhance students' understanding of the research process from idea formulation through data analysis and interpretation;
2. Enable students to use gained knowledge to design their own research on a topic of personal interest;
3. Improve students' ability to critically read and understand the research literature; and
4. Improve students' confidence in applying selected research methods.

Course Outline

Lecture	Date	Content	Instructor
Lecture 1	April 5 th 16:00-17:30	Introduction to the course Introduction to research: Why research is of value, what is research, business research, applied and basic (fundamental) research, Scientific Research Process: Purposiveness, rigor, testability, replicability, precision & confidence, objectivity, generalizability	Dr. Sukhbaatar
Lecture 2	April 12 th 16:00-17:30	Types of research: experimental, correlational, survey, ethnographic, historical, and action research, case study - General types: descriptive, associational, intervention; - qualitative & quantitative	Dr. Sukhbaatar
Lecture 3	April 19 th	- The research process: Broad problem	Dr. Sukhbaatar

	16:00-17:30	area, research problem statement, research questions, characteristics of good research questions, hypotheses, variables	
Lecture 4	April 26 th 16:00-17:30	Theoretical/conceptual framework: why you need one, purpose, usefulness, hypotheses development, primary and secondary data sources	Dr. Sukhbaatar
Lecture 5	May 10 th 16:00-17:30	Literature review: reasons, how to write literature review, sources	Dr. Sukhbaatar
Lecture 6	May 17 th 16:00-17:30	Data collection methods : observation, interview, questionnaire, other methods of data collection, issues in data collection, survey research	Dr. Sukhbaatar
Lecture 7	May 24 th 16:00-17:30	Sampling: basic assumptions, process, types, and sizes	Dr. Sukhbaatar
Lecture 8	May 31 th 16:00-17:30	Data analysis and interpretation: quantitative data analysis, coding, entry, testing goodness of data, analysis methods, interpretation and inference	Dr. Sukhbaatar
Lecture 9	June 7 th 16:00-17:30	Qualitative research methods and data interpretation	Dr. Sukhbaatar
Lecture 10	June 14 th 16:00-17:30	Chi-square Test -Chi-square as a Test for Comparing Variance -Chi-square as a Non-parametric test -Conditions for the Application of Chi-square test -Hands-on exercise of Chi-square test using SPSS software	Dr. Sukhbaatar
Lecture 11	June 21 th 16:00-17:30	Analysis of Variance and Covariance -What is ANOVA -Basic Principle of ANOVA -ANOVA Technique -Analysis of Co-variance (ANOCOVA) -Hands-on exercise of ANOVA test using SPSS software	Dr. Sukhbaatar
Lecture 12	June 28 th 16:00-17:30	- Description of the data and analysis methods Examples of multivariate regression and hands-on exercise using SPSS software	Dr. Sukhbaatar
Lecture 13	July 5 th 16:00-17:30	Research proposal/report: components and structure, types of report (article, report, monograph, master's paper, doctoral thesis) Academic writing standards	Dr. Sukhbaatar
Lecture 14	July 12 th 16:00-17:30	Research implications and discussion, research ethics (interpretation of research findings, defining research implications for future research and policy and practice, discussion of research	Dr. Sukhbaatar

		findings in light of previous research research ethics)	
Lecture 15	July 19 th 16:00-17:30	- Student presentation of research proposal, course evaluation	Dr. Sukhbaatar

Assessment:

- Class participation: 30%
- Research report/article analysis: 20%
- Research proposal writing and presentation: 50%

Text books and reading materials:

Textbooks

1. How to design and evaluate research in education (ninth edition) by Jack Fraenkel & Norman Wallen 2014 McGraw-Hill Companies New York, NY
2. Educational research: Planning conducting, and evaluating quantitative and qualitative research. John W. Creswell, (fifth edition) 2014 Pearson Education, Inc., Upper Saddle River, New Jersey.
3. Survey research methods (fifth edition) by Floyd J. Fowler, Jr. (Applied social research methods; v.1) 2014 Sage Publications, Inc., Thousand Oaks, CA
4. Moustakes, C.E. 1994 *Phenomenological research methods*. Sage publications, Inc. Thousand Oaks, CA
5. Efron S.E., & Ravid R., 2013. *Action research in education: a practical guide*. The Guilford Press. New York, NY
6. Creswell J. W., & Poth C.N. 2018. *Qualitative Inquiry & research design: Choosing among five approaches*. Sage Publications, Inc. Thousand Oaks, CA
7. C. Philip Wheater & Penny A. Cook (2000): *Using Statistics to Understand the Environment*, Routledge.
8. Breakwell G.M., Hammond S., Fife-Schow C., & Smith J.A (eds) 2006 *Research Methods in Psychology*. Chapter 6 Surveys and Sampling. Sage publications, Inc. London
9. Walford G., Tucker E., & Wiswanathan M. 2010 *The Sage Handbook of Measurement*. Chapter 6: Studying Teacher Effectiveness: The Challenges of Developing Valid Measures. Sage Publications, Inc. London

Additional reading materials

To be determined and selected by instructors for each session.

From SDGs to Climate Change

Implementation Strategies for its Adaption and Mitigation

United Nations University
(UNU-IAS, Operating Unit Ishikawa-Kanazawa-OUIK)

Spring 2021

Location: Online

Time: See schedule

Lecturer:

Dr. Kensuke Fukushi, Dr. Akio Takemoto, Dr. Juan Pastor-Ivars

Contact Information :

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Office Hours: by appointment

1. Course Description

Since the mid-20th century, humans have increased energy consumption and levels of greenhouse emissions. Such facts have had an unprecedented impact on Earth's climate, causing an alteration on a global scale. Climate change, with current global warming of 1.1°C and deviations in weather patterns, threatens people with food insecurity, flooding, diseases, extreme heat, displacement, ecosystem transformation, degradation, and the stress it places on political, economic, and social systems. Because of this, the WHO claims climate change is the greatest threat to humans in the 21st century. A response to climate change relies on mitigation, reducing climate change, and adaptation, fitting to current or expected change. In the Paris Agreement, adopted in 2015, nations agreed to keep warming well under 2.0 °C. With the COVID-19 pandemic, greenhouse gas emissions are forecasted to decline due to travel restrictions and economic deceleration. However, this temporary improvement will not interrupt climate change. Limiting warming to 1.5 °C would require halving emissions by 2030 and achieving near-zero emissions by 2050.

In 2015, countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals, including Goal 13: Climate Action, which aims to take urgent action to prevent climate change and its impacts. Sustainable Development Goals (SDGs) can be seen as ‘antibodies’ against climate change: threatened by its effects but the remedy to reduce them. The SDGs framework interconnects society’s prosperity, human health, quality education, energy savings, wildlife conservation, circular economy, cities’ sustainability, correct usage of natural resources, world peace, among others. Therefore, SDGs should be synchronized between them to achieve Goal 13. While some SDGs goals will act as a mitigating mechanism for climate change, others will become indicators of how appropriately we adapt to it. If so, the SDGs framework will become a useful tool to alleviate climate change not only until the 2030 Agenda but for the rest of the 21st century. In this course, we will address Goal 13 as a focal point for the mitigation and adaption of climate change interconnecting the rest of the SDGs, keeping in mind the Goals complexity.

2. Course Objectives and Learning Goals:

This course explores scientific, social, and political ways to prevent climate change. It examines how climate action can be delivered through the framework of the SDGs: explain how SDGs-based solutions understood as sustainable and resilient frameworks, can reduce the adverse health, poverty, energy, environmental, injustice, economic, etc., impacts derived from climate change and can generate substantial non-climate human benefits in a just and equitable manner. It further explores what actions need to be taken to improve local climate action, governance and financing for sustainable energy and natural resources consumption, and critical institutions and agents to make this possible. There are three blocks:

1. Block 1: Introduction to climate change. Which are the human impacts on the natural world?
2. Block 2: Climate change and 17 SDGs: What are the 17 goals, and how are they interlinked through Goal 13? How will the Sustainable Development Goals be implemented within the global context, and how can they help mitigate and adapt to climate change?
3. Block 3: From Global Policies to Local Action. How will Sustainable Development Goal 13 be monitored at the local level? What can other international frameworks be connected to climate action?

3. Requirements and Grading Policy

- Class Participation and Discussion: 7%
- **Assignment 1: Annotated bibliography for lecture topic**
 - 14x2%=28% (Lecture 1 to 14)

- Write an annotated bibliography on key topics discussed (from Lecture 1 to 14)
- 4 References @ 75-100words (journal articles only) per summary. You can certainly use those from the reading list or other journal articles
- Arial 12, 1.5 space, justified alignment
- Course name, assignment number, lecture topic, student name and number, are in the header
- Harvard referencing style
- **Assignment 2: Policy Brief**
 - **20%** of total marks
 - Write an issue-based policy brief outlining an aspect of climate change you think needs to be tackled by your hometown city government, and how this issue is related to Goal 13 and the other SDGs.
 - Recommend three to four possible solutions for the climate change mitigation/adaptation action issue drawing examples from different cities around the world.
 - Arial 12, 1.5 space, justified alignment, double side, cover page, references (reports and academic articles)
 - Harvard referencing style
 - Maximum of 2,000 words (including references)
 - Include a works cited section on references you cite within the brief.
- **Assignment 3: Practical Exercise: Online/Onsite Visit to UNU- IAS OUIK (Operating Unit Ishikawa-Kanazawa) meet Local practices on Climate Change.**
 - Write a report based on 1) the visit to OUIK and local practices and 2) examine how you can persuasively discuss the harmful effects of climate change on human life to motivate change in your local community. How do you encourage your friends, family, neighbors, and community leaders to take meaningful action to address these impacts?
 - Best reports will be published on the OUIK website.
- **Assignment 4: Research Paper**
 - Write a research paper on a specific city from a geo-region you select during class.
 1. Provide a brief summary of relevant information in regard to the climate action.
 2. Provide an overview of how well the selected geo-region is meeting Goal 13, as well as what issues is facing in regard to the other 16 Sustainable Development Goals.
 - a. **Note:** this should not be an exhaustive list – two to three sentences with supporting references are enough for each of the SDGs you discuss. This information can be presented in table format.

- b. Examine the literature you can find in relation to each of the SDGs for the city, and
 3. Propose three of the SDGs you would prioritize for climate action governance. Explain why these SDGs should be priority areas for your area?
 4. Propose what research is needed to better understand the problem related to the three SDGs you propose prioritizing.
- **35%** of total marks
 - Arial 12, 1.5 space, justified alignment, double side, cover page, references (in-text, bibliography, can include both reports and academic articles)
 - Harvard referencing style
 - Maximum of 3,000-3,500 words (not including references)
 - Include a works cited section on references you cite within the brief.
- **Assignment 4: Class Presentation (of assignment 3)**
 - **10%** of total marks
 - 5-minute presentation make your presentation to the Mayor city from the geo-region you selected.
 - Maximum 5 slides
 1. City overview
 2. Progress in implementing SDG 13
 3. Issues regarding the other 16 SDGs
 4. Proposal for 3 SDGs to be prioritized and why
 5. Research needs for the priorities

1. Course Outline

Lecture / Assignment	Date	Content	Instructor
Block 1: Introduction to Climate Change			
Lecture 1	April 6 th 16:00-17:30	Introduction of the course Human impacts on the natural world	Dr. Kensuke Fukushi Dr. Thomas Elmqvist
Lecture 2	April 13 th 16:00-17:30	Introduction: Overview of the 17 SDGs and key interlinkages with SDG 13	Dr. Tarek Katramiz
Assignment 1		Annotated bibliography (Lecture 2 to 14) due on the Tuesday after the class	
Block 2: Climate Change and 17 SDGs			
Lecture 3	April 20 th 16:00-17:30	Climate change and food security	Expert in Food TBC
Lecture 4	April 27 th 16:00-17:30	Climate change and wellbeing	Expert in Health. TBC
Lecture 5	May 11 th 16:00-17:30	Climate change and education for sustainable development	Dr. Philip Vaughter
Lecture 6	May 18 th 16:00-17:30	Climate change and gender equity, decent work	Dr. Yuki Takamura
Lecture 7	May 25 th 16:00-17:30	Climate change and energy, water, and natural resources	Dr. Suzuki Masachika Dr. Akio Takemoto
Lecture 8	June 1 th 16:00-17:30	Climate change and circular economy	Dr. Yukari Takamura
Assignment 2: Policy brief			
Lecture 9	June 8 th 16:00-17:30	Climate change and green-blue cities, and mobility	Dr. Juan Pastor Ivars
Lecture 10	June 15 th 16:00-17:30	Climate change and biological diversity conservation	Dr. Kanako Morita
Lecture 11	June 22 th 16:00-17:30	Climate change and partnership and peace	Dr. David Malone
Assignment 3: Practical exercise			UNU-IAS OUIK
Block 3: From Global Policies to Local Action			
Lecture 12	June 29 th 16:00-17:30	Climate change and UNU Policies, Recommendations and Programs	Dr. Akio Takemoto
Lecture 13	July 6 th 16:00-17:30	Governing climate change at global level	Dr. Okitasari Mahesti
Lecture 14	July 13 th 16:00-17:30	Sustainability and resilience at local level	UNU EHS. TBC
Assignment 4: Research paper			
Lecture 15	July 16 th 11:00-12:30	Summary of classes	Dr. Kensuke Fukushi
Assignment 5		Class Presentation	

2. Course Readings

Lecture	Topics	- Recommended readings for annotated bibliography (AB), Required readings are in bold,
Lecture 1	Introduction	Under preparation
Lecture 2	Introduction: Overview of the 17 SDGS and key interlinkages with SDG 13	Under preparation
Lecture 3	Climate change and food security	Under preparation
Lecture 4	Climate change and wellbeing	Under preparation
Lecture 5	Climate change and education for sustainable development	Under preparation
Lecture 6	Climate change and gender equity, decent work	Under preparation
Lecture 7	Climate change and energy, water, and natural resources	Under preparation
Lecture 8	Climate change and circular economy	Under preparation
Lecture 9	Climate change and green-blue cities, and mobility	Under preparation
Lecture 10	Climate change and biological diversity conservation	Under preparation
Lecture 11	Climate change and partnership and peace	Under preparation
Lecture 12	Climate change and UNU Policies, Recommendations and Programs	Under preparation

Lecture	Topics	- Recommended readings for annotated bibliography (AB), Required readings are in bold,
Lecture 13	Governing climate change at global level	Under preparation
Lecture 14	Sustainability and resilience at local level	Under preparation
Lecture 15	Class Presentation	Under preparation



**United Nations University – Institute for the Advanced Study of Sustainability
Postgraduate Programme 2020-2021**

Title: Inclusive Learning Technology for Sustainable Development (2 cp)

Lecturer(s): Dr. Jonghwi Park and Dr. Philip Vaughter (Guest lecturer: Prof Shinobu Yamaguchi)

Schedule: April 2021 – June 2021

Version: February 26, 2021

Course Description:

Education and lifelong learning is a key drive to the successful implementation and achievement for sustainable development. From climate changes, to responsible consumption, to resource management, to gender equality, and to the recent pandemic, the pressing global issues will unlikely be solvable without people from all walks of life actively participating in making urgent changes in view of building a sustainable society. This can be done through empowering communities and individuals to have a sound understanding of the underlying and interconnected issues and be part of the solutions.

As such, the movement of education for sustainable development (ESD) emphasizes a vital role of education and lifelong learning in achieving the 17 SDGs and moving towards a sustainable future. It stresses that learning should not stop at the formal schooling and that learning opportunities should be accessible to anyone, anytime and anywhere throughout one's life.

With the rapidly advancing information and communication technology (ICT), educational opportunities can indeed go beyond the formal education and learners can pursue flexible learning paths at their own paces throughout their lives. But the very same technology has proven during the Covid-19 pandemic and its ensuing school closure and distance learning that it can worsen the learning inequality between learners with access to technology and those without, often further associated with the family environment and economic and social status. From a lifelong learning perspective, learning technology for sustainable development should take a careful consideration on inclusive and respectful designs in order not to leave anyone behind. This includes, not limited to, those who have low literacy skills, disabilities, geographical disadvantages and language minorities as well as those who are forcefully displaced from their homes.

This 2-credit project-based course is to provide students with a comprehensive overview of the roles of and current issues in ESD from a lifelong learning perspective. It also explores a landscape of innovative and inclusive design of technology in expanding equal access to quality learning for sustainable development in a variety of settings, from emerging and low-income countries to advanced and highly connected nations. The course pays the equal attention to potential risks that digital technologies may impose in human and social development, well-being and energy consumption. Finally, students will have an opportunity as a group to design an innovative,

inclusive and evidence-based educational programme for a local sustainability issue of their choice which aims to develop skills, knowledge and attitudes to help address the identified issues and build a sustainable future.

Learning Objectives:

At the end of the course, students will be able to:

- Explain the roles of education and lifelong learning in progressing towards SDGs by 2030
- Select a local sustainability issue that can be addressed by education and lifelong learning
- Analyse a local sustainability issue and identify target learners to provide educational interventions
- Design an education programme that is appropriate for the target learners and effective for the intended learning outcomes
- Integrate innovation learning technology into an education programme purposefully to enhance quality, equity and inclusiveness.
- Evaluate feasibility, sustainability and scalability of an education programme
- Create a monitoring plan to measure the outcome of an education programme

Assessment:

- Attendance and class participation (10%)
- Assignments: (40%)
 - A short paper on a global or local sustainability issue of your interest, potential benefits and challenges in addressing the issues with ESD, and potential learners and rationales (max 1,500 words) (Individual - 25%)
 - A group presentation on a global or local sustainability issue of your team's choice, including the selection and negotiation process of the choice, collectively refined analysis of potential benefits and challenges in addressing the issues with ESD, and collectively improved rationales for target learners. (Group - This will become the basis for your project rationale. – 15%)
- Project:
 - ESD programme proposal (Group - 40%)
 - Presentation (Group- 10%)

Assessment Criteria:

Threshold Standards: in order to demonstrate the achievement of learning outcomes for the course, students must:

- Display a working knowledge of the integrated sustainable development agenda and how it relates to education
- Provide insights in how to engage with given audiences of learners in education for sustainable development thru literature review and analysis
- Showcase how to design and implement an inclusive education programme on sustainable development with appropriate use of technology

Grading Criteria: the grading scale in this course will be set as (TBA):

- A:
- B:

- C:
- D:
- F:

General Criteria: Each written assignment should be in MS format and single-spaced, 12-point Times New Roman font. All written assignments must have a title, a proper introduction and conclusion section and all material that is used to support the student's argument must be clearly cited. For the in-text citations and the bibliography, we suggest that students use APA style citations. For a reference for APA style citations see: https://www.umuc.edu/library/libhow/apa_examples.cfm. A works cited page should come after the end of each written assignment. Reference programs such as Endnote, Citavi or RefWorks are very useful for collecting, organizing and formatting citations and students are strongly encouraged to make use of these. Assignments should be carefully edited for grammar and spelling before submission – British English will be used for spelling rules in this course.

Reading Material:

- April 14th – UNESCO. (2016). Unpacking Sustainable Development Goal 4 Education 2030. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000246300/PDF/246300eng.pdf.multi>
- April 21st - Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability science*, 6(2), 203-218.
- April 28th - Alsop, S., Dipbo, D., & Zandvliet, D. B. (2007). Teacher education as or for social and ecological transformation: Place - based reflections on local and global participatory methods and collaborative practices. *Journal of Education for Teaching*, 33(2), 207-223.
- May 19th
 - Selwyn, N., Hillman, T., Eynon, R., Ferreira, G., Knox, J., Macgilchrist, F., & J. Sancho-Gil. (2020). What's next for Ed-Tech? Critical hopes and concerns for the 2020s, *Learning, Media and Technology*, 45:1, 1-6, DOI: 10.1080/17439884.2020.1694945
 - UNESCO. (2020). UNESCO Covid-19 Education Response Series: Open and distance learning to support youth and adult learning. <https://unesdoc.unesco.org/ark:/48223/pf0000373815>
- May 26th
 - UNDG. (2011). *Result-based Management Handbook*. (Part 1 and Part 2 only, p.1-22). <https://unsdg.un.org/sites/default/files/UNDG-RBM-Handbook-2012.pdf>
- June 16, June 23 – UNESCO. (2020). *Global Education Monitoring Report Summary: Inclusion and Education: All means All*. <https://unesdoc.unesco.org/ark:/48223/pf0000373721>
- June 30th - O'Flaherty, J., & Liddy, M. (2018). The impact of development education and education for sustainable development interventions: a synthesis of the research. *Environmental Education Research*, 24(7), 1031-1049.

Timetable:

No.	Outline	Date	Lecturer
1	<p>Introduction</p> <ul style="list-style-type: none"> • Global challenges: How much do we know? • Learning goals • Team formation 	April 7 th	Jonghwi Park, Philip Vaughter & Shinobu Yamaguchi
2	<p>Lecture:</p> <ul style="list-style-type: none"> • Introduction to ESD: Why education? • SDG4: Education 2030 Agenda • ESD and lifelong learning 	April 14 th	Jonghwi Park
3	<p>Lecture:</p> <ul style="list-style-type: none"> • ESD: Why education? • Introduction to ESD: Trends, main issues and remaining challenges • ESD 2030 Roadmap: Five priority areas 	April 21 st	Philip Vaughter
4	<p>Lecture</p> <ul style="list-style-type: none"> • ESD: Global agenda to local actions • What is main sustainability issues in your local community? 	April 28 th	Philip Vaughter
5	<p>Lecture:</p> <ul style="list-style-type: none"> • What is innovation? (Guest Lecture) • Cases: Innovative ESD programmes (policies, learning environment, teachers, youth, and community involvement) 	May 12 th <i>Due date for the short paper (individual assignment)</i>	Guest Lecturer: Shinobu Yamaguchi Philip Vaughter
6	<p>Lecture:</p> <ul style="list-style-type: none"> • Technologies in education: Pros and cons • Inclusive and respectful design of technology 	May 19 th	Jonghwi Park
7	<p>Lecture:</p> <ul style="list-style-type: none"> • Intro to learning activity design (evidence-based, result-oriented) • Learning theories (1): Constructivism 	May 26 th	Jonghwi Park
8	<p>Lecture:</p> <ul style="list-style-type: none"> • Learning theories (2): social learning • Discussion on the group project 	June 2 nd	Jonghwi Park
9	<p>Presentation:</p> <p>Each student group will present the progress of the project, including</p> <ul style="list-style-type: none"> • Sustainability issue • Target learners 	June 9 th	Jonghwi Park, Philip Vaughter

	<ul style="list-style-type: none"> • Topic areas • Rationales (evidence-based) 		
10	<p>Lecture:</p> <ul style="list-style-type: none"> • Diverse needs of marginalized learners • Learning strategies for ESD 	June 16 th	Jonghwi Park
11	<p>Lecture:</p> <ul style="list-style-type: none"> • Designing inclusive learning materials for ESD • Key considerations to leave no one behind 	June 23 rd	Jonghwi Park
12	<p>Lecture:</p> <ul style="list-style-type: none"> • ESD and assessment • Challenges in measuring the impact of ESD 	June 30 th	Philip Vaughter
13	<p>Lecture:</p> <ul style="list-style-type: none"> • Implementations: Risks and mitigating measures • Group discussion - peer review 	July 7 th	Jonghwi Park & Philip Vaughter
14	<p>Lecture:</p> <ul style="list-style-type: none"> • Monitoring a development project: core values and challenges 	July 14 th	Philip Vaughter
15	Final presentation	July 21 st	Shinobu Yamaguchi, Jonghwi Park and Philip Vaughter

Title: Remote Sensing, Geographical Information Systems and Analysis: Theory and Application

Lecturer: Kensuke Fukushi and Ronald C. Estoque

Course Description:

The course aims to provide an introductory understanding of the concepts and principles of Geographical Information Systems (GIS) and remote sensing (RS) and their applications to social-ecological research, management planning, and decision making. This course is divided into two parts. The first part will introduce fundamental concepts of GIS, including some important and commonly used geoprocessing and spatial analysis tools and techniques, such as vector-raster conversion, proximity, surface interpolation, reclassification, map algebra, cross tabulation, and zonal analysis. The second part will focus on RS satellite data processing, including the derivation of various spectral indices and some examples of satellite image classification methods. All of these will be achieved through a series of lectures and guided hands-on training sessions. The course will use ArcGIS – the world’s leading GIS software package.

Learning Outcomes:

The overall goal of this course is for students to gain some understanding of the concepts and principles of GIS and RS, and their applications to social-ecological research, management planning, and decision making. By the end of the course, students will be able to execute some important GIS tools and techniques and process RS data. They will be able to perform at least basic spatial analysis and identify some important social-ecological problems that can be supported by spatial analysis with the use of GIS and RS. Finally, they will be able to connect the outcomes of GIS/RS-based analyses to existing knowledge, management planning, and decision making.

Assessment:

Attendance and class participation	: 20%
Exercises	: 20%
Essay (exam) (July 15) and oral presentation (July 29)	: 60%

Course Outline:

Session	Outline	Date and time
1	Class introduction (lecturers, students and class requirements)	June 3, 2021 (9:30-12:30)
	Lecture: Introduction to GIS	
2	Lecture: Introduction to RS	
3	Lecture: Data sources and software packages	June 10, 2021 (9:30-12:30)
4	Lecture: Applications of GIS and RS	
5	Hands-on-training: Overview of ArcGIS (1) Georeferencing, digitizing, and editing	June 17, 2021 (9:30-12:30)
6	Hands-on-training: Overview of ArcGIS (2) Database creation and map composition and lay-out	
7	Hands-on-training: RS data processing (1) Satellite image acquisition and data processing (spectral indices)	June 24, 2021 (9:30-12:30)
8	Hands-on-training: Satellite data processing (2) Image classification	July 1, 2021 (9:30-12:30)
9	Hands-on-training: Spatial analysis (1) Vector-raster conversion, proximity, surface interpolation	
10	Hands-on-training: Spatial analysis (2) Reclassification, map algebra, cross tabulation, zonal analysis	July 8, 2021 (9:30-12:30)
11	Hands-on-training: Advanced spatial analysis and modeling with GIS and RS (1)	
12	Hands-on-training: Advanced spatial analysis and modeling with GIS and RS (2)	July 15, 2021 (9:30-12:30)
13	Lecture: GIScience and RS for the society (SDG, etc.)	
	Essay (exam)	
	Consultation about presentation (progress, issues, etc.)	
14	Oral presentation	July 22, 2021 (09:30-12:00)

Essential Reading

- https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesgis.pdf
- https://webapps.itc.utwente.nl/librarywww/papers_2009/general/PrinciplesRemoteSensing.pdf

Useful Links

- <https://learn.arcgis.com/en/>
- <https://earthdata.nasa.gov/learn/remote-sensing>

Scientific Journals

- Annals of GIS, International Journal of Geographical Information Science, Transactions in GIS, Applied Geography, GIScience & Remote Sensing, Remote Sensing of Environment, ISPRS Journal of Photogrammetry and Remote Sensing, etc.