This deliverable is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 951963.

D6.1

Syllabuses for two Masters and PhD level courses on stable isotope applications and aquatic ecosystem modelling

Grant Agreement No:	951963
Project Acronym:	TREICLAKE
Project Title:	Towards research excellence and innovation capacity in studying lake ecosystems functional structures and climate change impact
Contractual delivery date:	31.10.2022
Actual delivery date:	31.10.2022
Contributing WP:	6. Promoting the Involvement of Early Stage Researchers
Dissemination level:	PU
Compiled by:	Estonian University of Life Sciences (EMU)

Objective of work package

The main goal of WP6 is to strengthen scientific activities of early-stage researchers by improving the long-term quality of lake ecology education at the Estonian University of Life Sciences (EMU), providing new summer/winter schools, student exchange, PhD supervision, and establishment of new courses.

In this regard, as a part of the planned objective, two new courses for Masters and PhD students have been established at EMU:

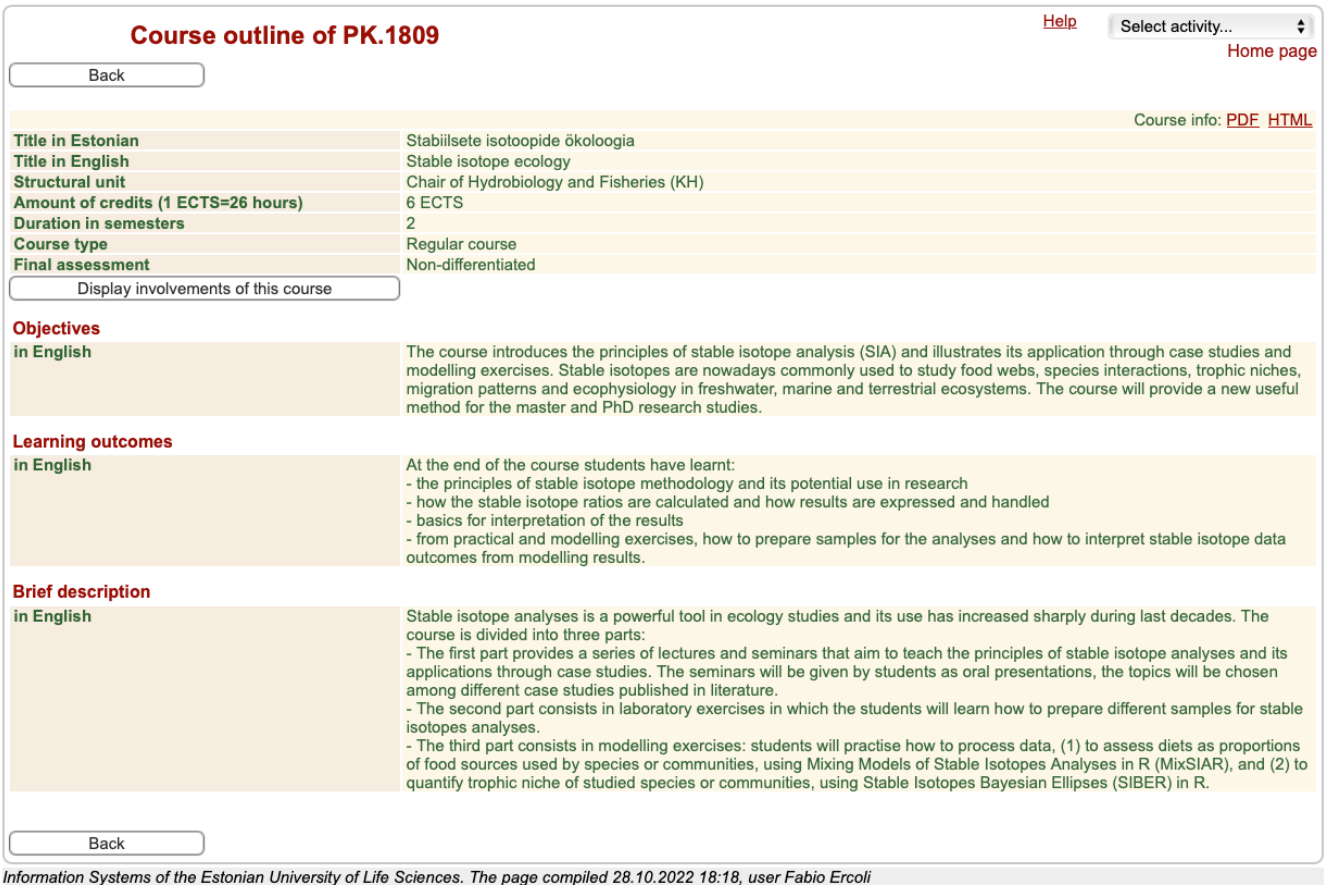
1. Stable isotope ecology (course code: PK.1809)

2. Aquatic ecosystem modelling (course code: PK.1810)

The two courses are available for Masters and PhD level students in the EMU Institute of Agricultural and Environmental Sciences, Chair of Hydrobiology and Fisheries, starting in autumn 2022.

The structure and details of the courses are as follows:

1. Stable isotope ecology (course code: PK.1809)
   Screenshot from the EMU Studies Information System,
   https://ois.emu.ee/pls/ois/!tere.tulemast



Course outline of PK.1809

Help | Select activity... | Home page

Back

Course info: PDF HTML

Title in Estonian	Stabiilsete isotoopide ökoloogia
Title in English	Stable isotope ecology
Structural unit	Chair of Hydrobiology and Fisheries (KH)
Amount of credits (1 ECTS=26 hours)	6 ECTS
Duration in semesters	2
Course type	Regular course
Final assessment	Non-differentiated

Display involvements of this course

Objectives

in English	The course introduces the principles of stable isotope analysis (SIA) and illustrates its application through case studies and modelling exercises. Stable isotopes are nowadays commonly used to study food webs, species interactions, trophic niches, migration patterns and ecophysiology in freshwater, marine and terrestrial ecosystems. The course will provide a new useful method for the master and PhD research studies.

Learning outcomes

in English	At the end of the course students have learnt: - the principles of stable isotope methodology and its potential use in research - how the stable isotope ratios are calculated and how results are expressed and handled - basics for interpretation of the results - from practical and modelling exercises, how to prepare samples for the analyses and how to interpret stable isotope data outcomes from modelling results.

Brief description

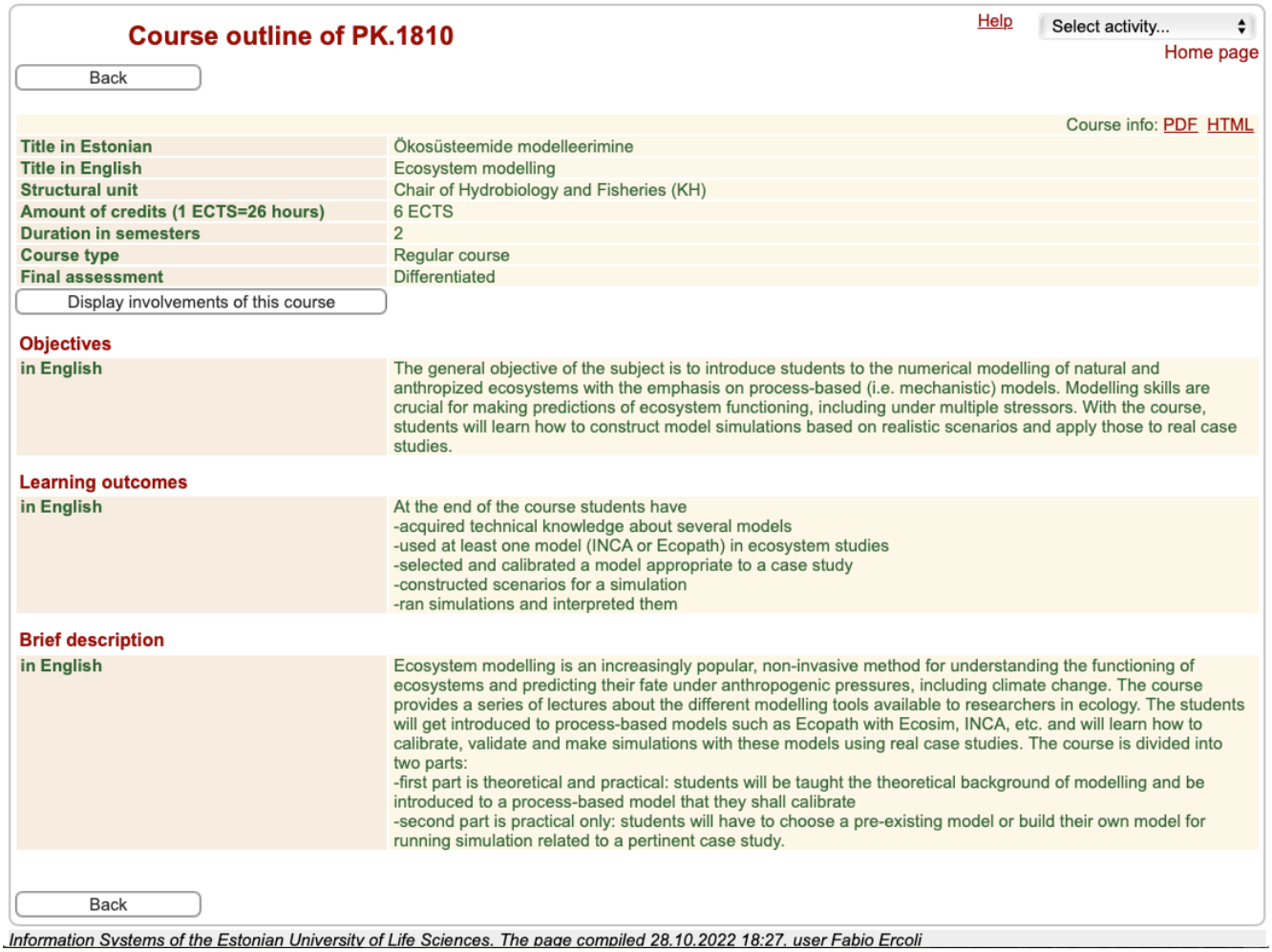
in English	Stable isotope analyses is a powerful tool in ecology studies and its use has increased sharply during last decades. The course is divided into three parts: - The first part provides a series of lectures and seminars that aim to teach the principles of stable isotope analyses and its applications through case studies. The seminars will be given by students as oral presentations, the topics will be chosen among different case studies published in literature. - The second part consists in laboratory exercises in which the students will learn how to prepare different samples for stable isotopes analyses. - The third part consists in modelling exercises: students will practise how to process data, (1) to assess diets as proportions of food sources used by species or communities, using Mixing Models of Stable Isotopes Analyses in R (MixSIAR), and (2) to quantify trophic niche of studied species or communities, using Stable Isotopes Bayesian Ellipses (SIBER) in R.

Back

Information Systems of the Estonian University of Life Sciences. The page compiled 28.10.2022 18:18, user Fabio Ercoli

2. Ecosystem modelling (course code: PK.1810)

   Screenshot from the EMU Studies Information System,
   https://ois.emu.ee/pls/ois/!tere.tulemast



Course outline of PK.1810

Help | Select activity... | Home page

Back

Course info: PDF HTML

Title in Estonian	Ökosüsteemide modelleerimine
Title in English	Ecosystem modelling
Structural unit	Chair of Hydrobiology and Fisheries (KH)
Amount of credits (1 ECTS=26 hours)	6 ECTS
Duration in semesters	2
Course type	Regular course
Final assessment	Differentiated

Display involvements of this course

Objectives

in English	The general objective of the subject is to introduce students to the numerical modelling of natural and anthropized ecosystems with the emphasis on process-based (i.e. mechanistic) models. Modelling skills are crucial for making predictions of ecosystem functioning, including under multiple stressors. With the course, students will learn how to construct model simulations based on realistic scenarios and apply those to real case studies.

Learning outcomes

in English	At the end of the course students have -acquired technical knowledge about several models -used at least one model (INCA or Ecopath) in ecosystem studies -selected and calibrated a model appropriate to a case study -constructed scenarios for a simulation -ran simulations and interpreted them

Brief description

in English	Ecosystem modelling is an increasingly popular, non-invasive method for understanding the functioning of ecosystems and predicting their fate under anthropogenic pressures, including climate change. The course provides a series of lectures about the different modelling tools available to researchers in ecology. The students will get introduced to process-based models such as Ecopath with Ecosim, INCA, etc. and will learn how to calibrate, validate and make simulations with these models using real case studies. The course is divided into two parts: -first part is theoretical and practical: students will be taught the theoretical background of modelling and be introduced to a process-based model that they shall calibrate -second part is practical only: students will have to choose a pre-existing model or build their own model for running simulation related to a pertinent case study.

Back

Information Systems of the Estonian University of Life Sciences. The page compiled 28.10.2022 18:27, user Fabio Ercoli

The two courses were developed on the basis of existing expertise and upon training that EMU staff received during the TREICLAKE project (European Union's Horizon 2020 research and innovation programme) from project partners – Aarhus University (AU; Denmark) and University of Jyväskylä (JYU; Finland).

Responsible lecturers for the stable isotope ecology and ecosystem modelling courses at EMU are Dr. Fabio Ercoli and Dr. Fabien Cremona, respectively. Both researchers received important training from AU and JYU staff for developing the syllabuses.

Dr. Ercoli gained valuable experience using stable isotopes in freshwater ecology at JYU since 2010. His research has focused on using carbon, nitrogen, hydrogen, and oxygen stable isotopes to address different ecological issues in groundwater, lake, and river ecosystems. During previous and current research, Ercoli mastered the stable isotope models SIBER (Stable Isotope Bayesian Ellipses in R) and MixSIAR (Mixing models of Stable Isotopes Analyses in R), used to study trophic relationships at species and community levels. Research outputs were published in international, peer-reviewed journals. During 2022, Ercoli has given stable isotopes seminars for Masters and PhD students in Italy (University of Pavia) and Estonia (EMU). In November 2022, Ercoli has been invited by JYU (Project partner of the TREICLAKE project) in Finland to teach in the Stable Isotope Ecology course (WETS 1049). Ercoli has supervised Masters students and currently supervises PhD students who are using stable isotopes in their research.

Dr. Fabien Cremona has been working with process-based and empirical ecological models since 2012. For his research, Cremona has constructed new models and adapted existing models to specific ecosystems of study. He has supervised several PhD students on the topic of modelling and published research outputs as lead author in high-impact, international, peer-reviewed journals. Cremona has led, or participated as an active member, work packages related to modelling in several Pan-European collaborative projects.

Ercoli and Cremona are also currently the responsible lecturers for the stable isotopes analyses and ecosystem modelling portions, respectively, within the course “Research methods in fisheries and applied ecology. Theory and field practice” (PK.1723), for EMU undergraduate students. Establishment of the two new courses (Stable isotope ecology, PK.1809; and Ecosystem modelling, PK.1810), will improve the long-term quality of freshwater ecology education and provide the courses at each study level for EMU students, including the visiting students, e.g., within Erasmus programme.