

- Faculté des sciences
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## Spatial modelling and remote sensing of natural systems 2 (3BL2120)

Filières concernées	Nombre d'heures	Validation	Crédits ECTS
<b>Master en biologie</b>	<b>Cours: 28 ph</b>	Voir ci-dessous	3

ph=période hebdomadaire, pg=période globale, j=jour, dj=demi-jour, h=heure, min=minute

### Période d'enseignement:

- Semestre Printemps

### Equipe enseignante

Dr. Sébastien Boillat

### Contenu

This is the second part of the course on spatial modelling and remote sensing of natural systems. Building on the fundamental concepts of Geographic Information Systems (GIS) acquired in part 1, we will focus on spatial modelling methods especially working with remote sensing (RS) datasets and methods. The main objective of the course is to provide practical basic skills on how to access and interpret remotely sensed data for assessing ecological and social-ecological dynamics. Students will become familiar with the general principles of remote sensing and satellite image processing tools with a focus on vegetation and land use. We will work with open-source and user-friendly tools (QGIS and plugins), as well as with Google Earth Engine, a web-based application. The course consists of a mix of lectures and practical exercises and homework. Participants will develop hands-on skills in using basic RS tools including satellite images sourcing and classification, land cover change assessment and their application to ecology and conservation biology at different scales of analysis.

### Forme de l'évaluation

1. Graded exercises come at the end of the practical sessions (50%).
  2. An examination consisting of written and practical components is administered at the end of the course (50%).
- In order to pass the course, students are to submit the practical exercises within the given deadlines.

Re-examination in case of failure must be registered for next exam session of same year. The exam is to be coordinated with the professor (not in Pidex). It will be a written exam on aspects of representing spatial data discussed in class.

### Documentation

- Lectures notes and manuals for the practical exercises will be provided as pdf on Moodle
- Textbooks
- Heywood I, Cornelius S, Carver S (2011). An introduction to Geographical Information System (4th Edition). Pearson Prentice Hall.
- Cavender-Bares J, Gamon JA, Townsend PA (eds) (2020). Remote Sensing of Plant Biodiversity. Springer Open: Cham Switzerland. Download from <https://link.springer.com/content/pdf/10.1007%2F978-3-030-33157-3.pdf>
- Chuvieco E, Huete A (2016). Fundamentals of Satellite Remote Sensing CRC Press ISBN 9780415310840 - CAT# TF1686; 448 Pages
- Tool descriptions:
- Jung, M. (2016). LecoS — A python plugin for automated landscape ecology analysis. Ecological Informatics, 31: 18-21 <https://www.sciencedirect.com/science/article/pii/S1574954115001879>
- Congedo, L., (2021). Semi-Automatic Classification Plugin: A Python tool for the download and processing of remote sensing images in QGIS. Journal of Open Source Software, 6(64), 3172, <https://doi.org/10.21105/joss.03172>

### Pré-requis

Spatial modelling and remote sensing of natural systems 1 (3BL2198 – Master) (offered in Autumn Semester) OR  
Any proved basic skills in Geographic Information Systems with QGIS or ArcGIS

### Forme de l'enseignement

Lectures and computer-based practical labs

Tentative schedule (subject to change)

- 24.2.2022: Introduction to Remote Sensing
- 3.3.2022: Lab #10 Setting up SCP plugin for QGIS. Source and pre-process images
- 10.3.2022: Lab #10 Image classification with SCP-QGIS
- 17.3.2022: Lab #10 Image post-processing and accuracy assessment

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### **Spatial modelling and remote sensing of natural systems 2 (3BL2120)**

24.3.2022: Lab #11 Assess and interpret land cover change  
31.3.2022: Introduction to Google Earth Engine (GEE)  
7.4.2022: Lab #12 Import and process satellite images into GEE  
14.4.2022 (Workshop no class)  
21.4.2022 (Easter holiday).  
28.4.2022: Lab #13 Create a time series with GEE  
5.5.2022: Introduction to land cover statistics with LecoS  
12.5.2022: Lab #14 Landscape metrics with LecoS  
19.5.2022: Exam  
26.5.2022 (Ascension Thursday, Public Holiday)

#### **Objectifs d'apprentissage**

Au terme de la formation l'étudiant-e doit être capable de :

- Analyse remotely sensed data and derived products
- Present results as maps, pictures and charts
- Recognise basic remote sensing products and techniques
- Interpret remotely sensed data
- Extract land cover change information from remotely sensed data

#### **Compétences transférables**

- Analyse remotely sensed data and derived products
- Use georeferenced image processing software
- Extract information related to landscape dynamics from remotely sensed data