UNIL | Université de Lausanne
Ecole de biologie

Master of Science in Behaviour, Evolution and Conservation
Specialisation Computational Ecology and Evolution
2023-2024

The Master program has a normal duration of 4 semesters and comprises 120 ECTS :

Module 1 : 15 ECTS : Compulsory Courses
Module 2 : 15 ECTS : Practical Project
Module 3 : 40 ECTS : Compulsory Courses (11 ECTS) and Optional Courses (29 ECTS)
Module 4 : 50 ECTS : Personal Research Project

For specialisation Computational Ecology and Evolution (CEE), the student must :

- Obtain **30 ECTS** in the specialisation :
  - Module 1 : 9 ECTS with Computational Compulsory Courses (marked in bordeaux)
  - Module 3 : 9 ECTS with Computational Compulsory Courses (marked in bordeaux) and 12 ECTS with Computational Optional Courses (marked in bordeaux)
- Carry out the First Step Research Project (Module 2) and the Master Research Project (Module 4) in the field of Computational Ecology and Evolution, validated by the head of CEE specialisation

Training objectives are available in its programme regulations.

Specific training objectives: At the end of the course the students will be able to:
• Model population processes.
• Make advanced use of computer and statistical methods in ecology and population biology.
• Use computer programming techniques.

MODULE 1

Compulsory Courses / *Enseignements obligatoires*	Hours per semester C	E	S	PW	Teaching Staff	ECTS	Limited nb of students
Semester 1 (Autumn) / *Semestre 1 (automne)*							
Advanced Python Programming (MSc MLS) *Programmation avancée en Python (MSc MLS)*	10	18	-	-	**Salamin N.**	3	
Data Analysis (MSc MLS) *Analyses de données (MSc MLS)*	8	8	-	-	**Bergmann S.**	3	
Molecular Methods in Ecology and Evolution *Méthodes moléculaires en écologie et évolution*	18	-	-	21	**Sanders I.**, Fumagalli L. Salamin N.	3	
Concepts in Ecology *Concepts en écologie*	6	-	-	-	**Bertelsmeier C.**	2	
Concepts in Evolution *Concepts en évolution*	6	-	-	-	**Schwander T.**	2	
Introduction to Scientific Writing *Introduction à la rédaction scientifique*	7	9	-	-	**Roulin A.**	2	
Master BEC Retreat *Retraite Master BEC*	-	-	-	-	**Kawecki T.**	-	
Introduction to R (optional support) *Introduction à R (mise à niveau optionnelle)*					**Schütz F.**	-	
Total	**55**	**35**	**0**	**21**		**15**	

MODULE 2

Practical Project / *Travail pratique*							
Semester 1 (Autumn) / *Semestre 1 (automne)*							
First Step Research Project *Travail d'initiation à la recherche*	-	-	-	224	**Kawecki T.**	15	
Total						**15**	

Computational courses marked in bordeaux

Abbreviations
C = Course
E = Exercise
S = Seminar
PW = Practical Work

The pandemic has shown us that circumstances beyond our control may require us to make the following adjustments / adaptations to study plans during the semester:

- possibility to switch from one mode of teaching to another (face-to-face <-> distance, synchronous <-> asynchronous, switch to co-modal teaching where it was not initially planned).
- change / modification of evaluation modalities, without inducing derogations from the Study Regulations (oral <-> written, exam <-> validation, individual work <-> group work, practical work <-> theoretical work, face-to-face evaluation <-> online evaluation, etc.)
- alternative or time-shifted modalities for teachings, internships, practical work, fieldworks and camps that could not take place or teachings that could no longer take place in the form initially planned.

Students are invited to consult this document regularly (Study Plan & Evaluation Procedure)

UNIL | Université de Lausanne
Ecole de biologie

Master of Science in Behaviour, Evolution and Conservation
Specialisation Computational Ecology and Evolution
2023-2024

MODULE 3

Courses / *Enseignements* *	Hours per semester C	E	S	PW	Teaching Staff	ECTS	Limited nb of students
Compulsory Course / *Enseignement obligatoire*							
Semesters 2 to 4 (Spring / Autumn) / *Semestres 2 à 4 (printemps / automne)*	Hours per total						
Seminars of the Department of Ecology and Evolution *Séminaires du Département Ecologie et Evolution*	-	-	10	-	**Kawecki T.**	2	
Subtotal / *Sous-total*	0	0	10	0		2	
Computational Compulsory Courses / *Enseignements computationnels obligatoires*							
Semester 3 (Autumn) / *Semestre 3 (automne)*							
Advanced Data Analysis (MSc MLS) *Analyses de données : niveau avancé (MSc MLS)*	8	8	-	-	**Ciriello G.**	3	
Population Genetics and Dynamics *Génétique et dynamique des populations*	9	20	-	-	**Goudet J.**	4	
Spatial Analysis and GIS in Ecology *Analyses spatiales et SIG en écologie*	7	10	-	-	**Guisan A.**	2	
Subtotal / *Sous-total*	24	38	0	0		9	
Computational Optional Courses / *Enseignements computationnels optionnels* *							
Semester 2 or 4 (Spring) / *Semestre 2 ou 4 (printemps)*							
Advanced Population Genetics (MSc MLS) *Génétique des populations avancée (MSc MLS)*	14	6	-	-	**Malaspinas A.-S.**	3	20
Bioinformatic Algorithms (MSc MLS) *Algorithmes de bioinformatique (MSc MLS)*	19	20	-	-	**Dessimoz C.**, Gfeller D.	4	
Microbiome Analysis (MSc MLS) *Analyse du microbiome (MSc MLS)*	8	16	-	-	**van der Meer J.**, Bertelli Lombardo C.	2	
Phylogeny and Comparative Methods *Phylogénie et méthodes comparatives*	14	14	-	-	**Salamin N.**	4	
Sex, Ageing and Foraging Theory *Théories et modèles de l'évolution de la reproduction sexuée, la sénescence et la consommation de ressources*	9	-	-	9	**Mullon C.**	2	
Spatial Modelling of Species and Biodiversity *Modélisation spatiale des espèces et de la biodiversité*	14	14	-	-	**Guisan A.**	4	
The Evolution of Cooperation : from Genes to Learning and Culture *L'évolution de la coopération : des gènes à l'apprentissage et la culture*	22	-	-	-	**Lehmann L.**	3	
Semester 3 (Autumn) / *Semestre 3 (automne)*							
Machine Learning for Earth and Environmental Sciences (GSE) *Apprentissage automatique pour les sciences de la terre et de l'environnement (GSE)*	56 C/PW				**Beucler T.**	5	
Optional Courses / *Enseignements optionnels* *							
Semester 2 or 4 (Spring) / *Semestre 2 ou 4 (printemps)*							
Applied Ecology *Ecologie appliquée*	14	-	-	36	**Pellet J.**	4	
Behaviour, Economics and Evolution Lecture Series (HEC) *Séminaires BEE*	10	-	10	50	**Lehmann L.**, Santos-Pinto L.	6	
Co-evolution, Mutualism, Parasitism *Co-évolution, mutualisme, parasitisme*	14	-	-	-	**Sanders I.**	2	
Current Problems in Conservation Biology *Problèmes actuels en biologie de la conservation*	14	14	-	-	**Wedekind C.**	4	10
Ecology of the Fishes of Switzerland *Ecologie des poissons de Suisse*	7	-	-	10	**Rubin J.-F.**	2	
Honeybee Ecology, Evolution and Conservation *Ecologie des abeilles, évolution et conservation*	14	-	-	-	**Dietemann V.**	2	
Integrated course Mountain Ecosystems *Cours intégré écosystèmes de montagne*	28	-	-	-	**Guisan A.**	3	
Interfaculty Seminar on the Environment (most in French, GSE) *Séminaire interfacultaire en environnement*	-	-	14	-	**Guisan A.**	2	
Scientific Communication - Scientific Hands-on Workshop Module (in French only) *Médiation scientifique - module atelier scientifique*	14	14	-	-	**Kaufmann A., Reymond P.,** Ducoulombier D., Trouilloud S., Ythier M.	4	8
Semester 3 (Autumn) / *Semestre 3 (automne)*							
Animal Communication and Parasitism *Communication animale et parasitisme*	14	-	-	-	**Christe P.**, Roulin A.	2	
Anthropogenic Effects on Wild Animals : Mechanisms and Fitness Consequences *Effets anthropogènes sur les animaux sauvages : Mécanismes et conséquences sur la fitness*	14	-	-	-	**Bize P.**	2	
Biological Invasions *Invasions biologiques*	14	-	-	-	**Bertelsmeier C.**	2	
Molecular Mechanisms of Evolution (MSc MLS) *Mécanismes moléculaires de l'évolution (MSc MLS)*	3	12	-	-	**Benton R.**, Geldner N.	2	
Phylogeography *Phylogéographie*	7	10	-	-	**Fumagalli L.**	2	
Plant and Animal Domestication : from History to Molecular Mechanisms (MSc MLS) *Domestication des animaux et des plantes : de l'histoire aux mécanismes moléculaires (MSc MLS)*	12	12	-	-	**Soyk S.**	3	

Computational courses marked in bordeaux

* - Before choosing an optional course, please check the "programme requirement" (prerequisites for the course) in the course description

- Students can choose optional courses not included in this study plan for a max. of 4 ECTS. They can also obtain a maximum of 6 ECTS for a professional internship outside of Unil. Both are subject to prior approval of the head of the Master and will require a sufficient proof of completion

UNIL | Université de Lausanne
Ecole de biologie

Master of Science in Behaviour, Evolution and Conservation
Specialisation Computational Ecology and Evolution
2023-2024

MODULE 3

Courses / *Enseignements* *	Hours per semester C	E	S	PW	Teaching Staff	ECTS	Limited nb of students
Optional Courses / *Enseignements optionnels* *							
Optional Field Courses / *Etudes de terrain optionnelles* *(Financial contribution by the student required)*							
Drivers of Invertebrate Biodiversity along Altitudinal Gradients (Field course in the Alps) *Facteurs déterminant la biodiversité des invertébrés le long de gradients altitudinaux (stage de terrain dans les Alpes)*	6	-	-	80	**Schwander T.**	6	20
Ecology and Evolution of the Mediterranean Flora *Ecologie et évolution de la flore méditerranéenne*	-	-	-	48	**Pannell J.**	4	14
Integrated Practical Work Mountain Ecosystems in the Alps ** *Travaux pratiques intégrés écosystèmes de montagne dans les Alpes*	-	-	-	52	**Guisan A.**	4	
Total						**40**	

* - Before choosing an optional course, please check the "programme requirement" (prerequisites for the course) in the course description
- Students can choose optional courses not included in this study plan for a max. of 4 ECTS. They can also obtain a maximum of 6 ECTS for a professional internship outside of Unil. Both are subject to prior approval of the head of the Master and will require a sufficient proof of completion

** Taking Integrated Course Mountain Ecosystems is a prerequisite to follow Integrated Practical Work Mountain Ecosystems in the Alps

MODULE 4

Personal Research Project / *Projet de recherche personnel*	Hours per semester C	E	S	PW		ECTS
Semesters 2 to 4 (Spring / Autumn) / *Semestres 2 à 4 (printemps / automne)*						
Write a Review *Rédaction d'une revue*	4	2	-	-	Kawecki T., Director of the Master Research Project	5
Master Research Project CEE *Travail de Master CEE*					Director of the Master Research Project	45
Total						**50**