

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

Module 1 : 15 ECTS : Compulsory Courses

Module 2 : 25 ECTS : Practical Project

Module 3 : 30 ECTS : Optional Courses

Module 4 : 50 ECTS : Personal Research Project

Training objectives are available in its programme regulations.

Specific training objectives: At the end of the course the students will be able to:

**Specialisation in Bioinformatics :**

- Design experiments to analyse and understand genetic and genomic data.
- Mobilise in-depth knowledge of statistics and bioinformatics applied to biology.
- Use computer programming techniques.

**Specialisation in Microbiology :**

- Mobilise in-depth knowledge in microbiology, genetics and genomics covering aspects of environmental microbiology, microbial ecology, biotechnology, cell microbiology, virology, microbial pathogenesis, bacteriology, fungal biology, yeast models, epidemiology or synthetic biology.
- Propose research approaches in fundamental, medical or applied microbiology.

**For specialisation Bioinformatics, the student must :**

- Obtain **30 ECTS** in the specialisation:
  - Module 1 : 8 ECTS with Compulsory Courses in the field of Bioinformatics (marked in blue)
  - Module 3 : 17 ECTS with Optional Courses in the field of Bioinformatics (marked in blue)
  - Module 4 : 5 ECTS with "Write a Fellowship" Compulsory Course
- Carry out the Master Research Project (Module 4) in the field of Bioinformatics

**For specialisation Microbiology, the student must :**

- Obtain **30 ECTS** in the specialisation:
  - Module 1 : 5 ECTS with Compulsory Course in the field of Microbiology (marked in yellow)
  - Module 3 : 20 ECTS with Optional Courses in the field of Microbiology (marked in yellow)
  - Module 4 : 5 ECTS with "Write a Fellowship" Compulsory Course
- Carry out the Master Research Project (Module 4) in the field of Microbiology

		Compulsory Courses / Enseignements obligatoires				Hours per semester				Teaching Staff	ECTS	Limited nb of students
		C	E	S	PW	C	E	S	PW			
<b>Semester 1 (Autumn) / Semestre 1 (automne)</b>												
MODULE 1	Retreat MSc MLS <i>Retraite MSc MLS</i>	-	-	-	-	Benton R., ...				-		
	Data Analysis <i>Analyses de données</i>	8	8	-	-	Bergmann S.				3		
	Sequence a Genome I <i>Séquençage d'un génome I</i>	12	24	-	-	Engel P., tutors				2,5		
	Sequence a Genome II <i>Séquençage d'un génome II</i>	24	48	-	-	Engel P., tutors				5		
	Write a Review <i>Rédaction d'une revue</i>	15	-	-	42	Benton R., tutors				4,5		
	Critical Readings of Scientific Literature <i>Lectures critiques de la littérature scientifique</i>	-	-	-	56					-		
	Introduction to R (optional support) <i>Introduction à R (mise à niveau optionnelle)</i>	-	-	-	-	Schütz F.				-		
	<b>Total</b>	<b>59</b>	<b>80</b>	<b>0</b>	<b>98</b>					<b>15</b>		

		Practical Project / Travail pratique							
<b>Semester 2 (Spring) / Semestre 2 (printemps)</b>									
MODULE 2	First Step Research Project <i>Travail d'initiation à la recherche</i>	-	-	-	250	Benton R.		25	
	<b>Total</b>							<b>25</b>	

**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)**

	Optional Courses / Enseignements optionnels <sup>(1)</sup>	Hours per semester				Teaching Staff	ECTS	Limited nb of students
		C	E	S	PW			
MODULE 3	<b>Semesters 1 and 3 (Autumn) / Semestres 1 et 3 (automne)</b>							
	Biotechnology <i>Biotechnologie</i>	18	-	-	-	Poirier Y., Resch G., Veening J.-W., van der Meer J.	2	
	Chromosome Organisation and Dynamics <i>Organisation et dynamique des chromosomes</i>	6	3	-	8	Gruber S.	2	8
	CRISPR-Cas9 Genome Editing <i>Édition du génome par CRISPR-Cas9</i>	4	4	-	8	van Leeuwen J.	2	12
	Development of the Nervous System <i>Développement du système nerveux</i>	14	-	-	-	Braissant O.	2	
	Genomics, Proteomics and Quantitative Genetics <i>Génomique, protéomique et génétique quantitative</i>	21	3	-	-	Franken P., Quadroni M., Marquis J., Gambetta M.C.	3	
	Modeling of Plant Growth <i>Modélisation de la croissance des plantes</i>	12	12	-	-	Majda M.	3	
	Plant and Animal Domestication : from History to Molecular Mechanisms <i>Domestication des animaux et des plantes : de l'histoire aux mécanismes moléculaires</i>	12	12	-	-	Soyk S.	3	
	Plant Functional Genetics <i>Génétique fonctionnelle des plantes</i>	14	-	-	-	Poirier Y.	2	
	Proteins : from Structural Determination to Molecular Dynamic Simulations <i>Protéines : de la détermination de la structure aux simulations de dynamique moléculaire</i>	12	12	-	-	Santiago Cuellar J., Zoete V., Roehrig U., Cuendet M.	2	
	Scientific Research in all its Forms (for Biology) (Sciences2 - in French only) <i>La recherche dans tous ses états (pour biologie) (Sciences2)</i>	16	-	-	-	Preissmann D.	2	
	Social Innovation Lab (HUB) <i>Approches de l'innovation sociétale (HUB)</i>			26 C/E		Romon E., Petty J., Headon A.	3	15
	Advanced Data Analysis <i>Analyses de données : niveau avancé</i>	8	8	-	-	Ciriello G.	3	
	Advanced Python Programming <i>Programmation avancée en Python</i>	10	18	-	-	Salamin N.	3	
	Population Genetics and Dynamics (MSc BEC) <i>Génétique et dynamique des populations (MSc BEC)</i>	9	20	-	-	Goudet J.	4	
	Theory and Practice in Gene Expression Analyses <i>Théorie et pratique dans l'analyse d'expression des gènes</i>	4	32	-	-	Gfeller D., Carmona S.	3	
	Advanced Microbial Genetics <i>Génétique avancée des microbes</i>	16	-	-	-	Collier J., Pelet S.	2	
	Bacterial Genomes and Genome Evolution <i>Génomes bactériens et évolution du génome</i>	6	10	-	-	van der Meer J.	2	12
	Bacterial Virulence and Pathogenesis <i>Virulence bactérienne et pathogénèse</i>	14	2	-	-	Greub G., Jacquier N., Jacot D.	3	
	Design and Build a Synthetic Biological System II (MSc) (2) <i>Concevoir et construire un système biologique synthétique II (MSc) (2)</i>	8	16	-	-	Schaerli Y.	2	15
	Fungal Virulence and Pathogenicity <i>Pathogénicité et virulence fongique</i>	10	4	-	-	Lamoth F., Coste A., Hauser P.	2	16
	Immunology and Infectious Diseases <i>Immunologie et maladies infectieuses</i>	16	-	-	-	Roger T., Perreau M., Di Domizio J.	2	
	Mechanisms and Principles of Yeast Cell Biology <i>Mécanismes et principes de la biologie cellulaire de la levure</i>	14	-	-	-	Vjestica, A., Gasser S.	2	15
	Microbes as Tools in Experimental Biology <i>Les microbes comme outils de biologie expérimentale</i>	8	8	-	-	Coste A., Ciuffi A.	2	16
	Plant Interactions with Microbes and Insects <i>Interactions des plantes avec les microbes et les insectes</i>	14	-	-	-	Keel C., Reymond P.	2	
	Viral Pathogenesis and Emerging Viruses <i>Pathogénèse virale et virus émergents</i>	8	8	-	-	Ciuffi A., Gouttenoire J., Cagno V.	2	
	Virus-Host Interactions <i>Interactions virus-hôtes</i>	8	8	-	-	Gouttenoire J.	2	

(1) Students can choose some courses of the Master of Science (MSc) in Behaviour, Evolution and Conservation (max 3 ECTS)

(2) Student limit includes UNIL BSc students; this course is \*only\* available in Semester 3 (after students have taken "Design and Build a Synthetic Biological System I" and "Design and Build a Synthetic Biological System - Practical Project")

	Optional Courses / Enseignements optionnels <sup>(1)</sup>	Hours per semester				Teaching Staff	ECTS	Limited nb of students
		C	E	S	PW			
MODULE 3	<b>Semesters 2 and 4 (Spring) / Semestres 2 et 4 (printemps)</b>							
	Epigenetics and Cell Differentiation <i>Épigénétique et différenciation cellulaire</i>	8	6	-	-	Gasser S.	2	15
	Epitranscriptomics and RNA Dynamics <i>L'épitranscriptomique et la dynamique de l'ARN</i>	6	-	-	8	Roignant J.-Y.	2	8
	Metabolic Signaling Pathways in Health and Disease <i>Les voies de signalisation métabolique dans des conditions normales et pathologiques</i>	6	8	-	-	Fajas L., Ziegler D., Geller S.	2	
	Scientific Communication - Scientific Hands-on Workshop Module (in French only, MSc BEC) <i>Médiation scientifique - module atelier scientifique (MSc BEC)</i>	14	14	-	-	Genovese J., Ciuffi A., Ducoulombier D., Trouilloud S., Ythier M.	4	8
	Training in Animal Experimentation (RESAL Module 1) (2) <i>Expérimentation animale (RESAL module 1) (2)</i>	-	20	-	20	Broillet M.-C., Cadilhac C.	2	
	Advanced Population Genetics <i>Génétique des populations avancée</i>	11	11	-	-	Malaspinas A.-S.	3	20
	Bioinformatic Algorithms <i>Algorithmes de bioinformatique</i>	19	20	-	-	Dessimoz C., Gfeller D.	4	
	Industrial Bioinformatics <i>Bioinformatique industrielle</i>	14	-	-	-	Xenarios I.	2	15
	Phylogeny and Comparative Methods (MSc BEC) <i>Phylogénie et méthodes comparatives (MSc BEC)</i>	14	14	-	-	Salamin N.	4	
	Introduction to Mendelian Randomization <i>Introduction à la randomisation mendélienne</i>	8	6	4	-	Porcu E.	2	10
	Anti-Infective Agents <i>Agents anti-infectieux</i>	14	-	-	-	Lamoth F., Hauser P., Meylan S., Ciuffi A., Jacot D.	2	
	Design and Build a Synthetic Biological System I (MSc) (3) <i>Concevoir et construire un système biologique synthétique I (MSc) (3)</i>	8	16	-	-	Schaerli Y.	2	15
	Design and Build a Synthetic Biological System - Practical Project (3) <i>Concevoir et construire un système biologique synthétique - projet pratique (3)</i>	-	-	-	90	Schaerli Y.	3	15
	Epidemiology of Human Pathogens <i>Epidémiologie de pathogènes humains</i>	14	-	-	-	Blanc D., Manuel O., Lamoth F., Senn L., Opota O.	2	16
	Microbiome Analysis <i>Analyse du microbiome</i>	8	16	-	-	Bertelli Lombardo C., van der Meer J.	2	
Microbiomes <i>Microbiomes</i>	14	-	-	-	van der Meer J.	2	10	
Systems Microbiology: Genome-Wide (Chemical) Genetics in Bacteria <i>Microbiologie systémique : Génétique (chimique) à l'échelle du génome chez les bactéries</i>	6	12	-	30	Veening J.-W., Gruber S.	4	12	
<b>Total</b>						<b>30</b>		

- (1) Students can choose some courses of the Master of Science (MSc) in Behaviour, Evolution and Conservation (max 3 ECTS)
- (2) Only students assigned a master project involving animal experimentation may and must take this course
- (3) Student limit includes UNIL BSc students; MLS students would have to commit to taking this as well as Design and Build a Synthetic Biological System - Practical Project in the summer between Semesters 2 and 3 and Design and Build a Synthetic Biological System II in semester 3

	Personal Research Project / Projet de recherche personnel	Hours per semester				Teaching Staff	ECTS	Limited nb of students
		C	E	S	PW			
MODULE 4	<b>Semesters 3 and 4 (Autumn and Spring) / Semestres 3 et 4 (automne et printemps)</b>							
	Write a Fellowship <i>Rédaction d'une demande de bourse</i>	1	-	-	42	Benton R., Malaspinas A.-S., Fankhauser C., Bertelli Lombardo C., tutors	5	
	Master Research Project <i>Travail de Master</i>					Director of the Master Research Project	45	
<b>Total</b>						<b>50</b>		