

The Master program has a normal duration of 3 semesters and comprises 90 ECTS :

- 16 ECTS : Module 1 (Compulsory courses (7 ECTS) + Optional courses (9 ECTS))
- 14 ECTS : Module 2 (First Step Project)
- 15 ECTS : Module 3 (Compulsory courses (6 ECTS) + Optional courses (9 ECTS))
- 45 ECTS : Personal research project (Master Thesis)

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

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 Integrative Biology

- Mobilise multidisciplinary knowledge to design experiments that can involve the various levels of structural and functional organisation of the living.
- Interpret data resulting from multiple phenomena: from the cell to the organism as a whole, in its normal and pathological states.

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.

Condition to obtain the specialisation / Condition pour obtenir une spécialisation

Specialisation Integrative Biology :

Obtain at least 18 ECTS credits in any field of study in Modules 1 and 3.
Free choice for the First Step Project (Module 2) and the Master Thesis (Module 4).

Specialisation Bioinformatics :

Obtain 9 ECTS credits in the field of Bioinformatics (marked in dark blue) in Module 1 and 9 ECTS credits in any field of study in Module 3
Carry out the First Step Project (Module 2) and the Master Thesis (Module 4) in the field of Bioinformatics.
Produce a significant computer program, in the context of any Module.

Specialisation Microbiology :

Obtain 12 ECTS credits in the field of Microbiology (marked in yellow) and 6 ECTS credits in any field of study in Modules 1 and 3.
Free choice for the First Step Project (Module 2).
Carry out the Master Thesis (Module 4) in the field of Microbiology.

Autumn Semester (semester 1)

	Courses / Enseignements	Hours per semester			Teaching Staff	ECTS Credits	Limited nb of students	
		C	E/S	PW				
General and common activities - Compulsory / Activités générales et communes - Obligatoires								
	Retreat and BIG Seminars <i>Retraite et séminaires BIG</i>	-	-	-	Benton R., ...			
	Sequence a Genome I <i>Séquençage d'un génome I</i>	14	30	-	Engel P., tutors	3		
	Write a Review <i>Rédaction d'une revue</i>	15	-	42	Benton R., tutors	4		
	Critical Readings of Scientific Literature <i>Lectures critiques de la littérature scientifique</i>	-	-	56				
	Subtotal	29	30	98		7		
Optional (at least 9 credits) Optionnel (minimum 9 crédits)								
MODULE 1	Biotechnology <i>Biotechnologie</i>	14	-	-	Poirier Y., Resch G.	1.5		
	CRISPR-Cas9 Genome Editing <i>Edition du génome par CRISPR-Cas9</i>	4	2	8	van Leeuwen J.	1.5	12	
	Development of the Nervous System <i>Développement du système nerveux</i>	14	-	-	Braissant O.	1.5		
	Molecular Mechanisms of Evolution <i>Mécanismes moléculaires de l'évolution</i>	14	-	-	Benton R., Geldner N.	1.5		
	Plant Functional Genetics <i>Génétique fonctionnelle des plantes</i>	14	-	-	Poirier Y.	1.5		
	Proteins : from Structural Determination to Molecular Dynamic Simulations <i>Protéines : de la détermination de la structure aux simulations de dynamique moléculaire</i>	16	-	-	Santiago Cuellar J., Zoete V., Roehrig U., Cuendet M.	1.5		
	Scientific Research in all its Forms (for Biology) (Sciences2 - in French only) <i>La recherche dans tous ses états (pour biologie) (Sciences2)</i>	14	-	-	Preissmann D.	1.5		
	Introduction to R (optional support) <i>Introduction à R (mise à niveau optionnelle)</i>	-	-	-	Schütz F.	-		
	Data Analysis (compulsory for Bioinformatics specialisation) <i>Analyses de données</i>	6	-	6	Bergmann S.	2		
	Advanced Data Analysis (compulsory for Bioinformatics specialisation) <i>Analyses de données : niveau avancé</i>	6	-	6	Ciriello G., Delaneau O.	2.5		
	Theory and Practice in Gene Expression Analyses (compulsory for Bioinformatics specialisation) <i>Théorie et pratique dans l'analyse d'expression des gènes</i>	4	32	-	Gfeller D., Delaneau O.	2.5		
	Advanced Python Programming (compulsory for Bioinformatics specialisation) <i>Programmation avancée en Python</i>	7	14	-	Salamin N., Delaneau O.	2		
	Advanced Microbial Genetics <i>Génétique avancée des microbes</i>	14	-	-	Collier J., Pelet S.	1.5		
	Bacterial Genomes and Genome Evolution <i>Génomés bactériens et évolution du génome</i>	14	-	-	van der Meer J.	1.5		
	Fungal Virulence and Pathogenicity <i>Pathogénicité et virulence fongique</i>	14	-	-	Lamoth F., Coste A., Hauser P.	1.5		
	Immunology and Infectious Diseases <i>Immunologie et maladies infectieuses</i>	14	-	-	Roger T., Perreau M., Di Domizio J.	1.5		
	Plant Interactions with Microbes and Insects <i>Interactions des plantes avec les microbes et les insectes</i>	14	-	-	Keel C., Reymond P.	1.5		
	Virus-Host Interactions <i>Interactions virus-hôtes</i>	14	-	-	Gouttenoire J.	1.5		
	Total						16	
	MODULE 2	Practical Project / Travail pratique						
First Step Project <i>Travail d'initiation à la recherche</i>		-	-	250	Benton R.		14	

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- 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.

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Courses / Enseignements		Hours per semester			Teaching Staff	ECTS Credits	Limited nb of students
		C	E/S	PW			
Spring Semester (semester 2)							
General and common activities - Compulsory / Activités générales et communes - Obligatoire							
Sequence a Genome II <i>Séquençage d'un génome II</i>		14	28	-	Engel P., tutors	3	
Write a Fellowship <i>Rédaction d'une demande de bourse</i>		7	-	-	Benton R., tutors	3	
Subtotal		21	28	-		6	
Optional (choice -> 9 credits) * / Optionnel (choix -> 9 crédits) *							
Epigenetics and Cell Differentiation <i>Épigénétique et différenciation cellulaire</i>		8	6	-	Gasser S.	1.5	
Epitranscriptomics and RNA Dynamics <i>L'épitranscriptomique et la dynamique de l'ARN</i>		6	-	8	Roignant J.-Y.	1.5	
Genomics, Proteomics and Quantitative Genetics <i>Génomique, protéomique et génétique quantitative</i>		24	-	-	Franken P., Tafti M., Quadroni M., Marquis J., Gambetta M.C.	3	
Herbivory : Why is the Earth Green ? <i>Herbivorie : pourquoi la terre est verte ?</i>		24	-	-	Farmer E.	3	6
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.	1.5	
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	
Scientific Communication - Scientific Hands-on Workshop Module (in French only, MSc BEC) <i>Médiation scientifique - module atelier scientifique (MSc BEC)</i>		14	14	-	Kaufmann A., Reymond P., Ducoulombier D., Trouilloud S., Ythier M.	3	8
LTK1 Module : Training in Animal Experimentation ** <i>Module LTK1 : expérimentation animale **</i>		20	-	20	Broillet M.-C., Berthonneche C.	1.5	
Seminars Biology and Integrative Genetics (BIG) <i>Séminaires Biologie et Génétique Intégratives (BIG)</i>		-	-	-	Farmer E.	-	
Design and Build a Synthetic Biological System II (iGEM Project) <i>Concevoir et construire un système biologique synthétique II (projet iGEM)</i>		8	16	-	Schaerli Y.	-	
Advanced Population Genetics <i>Génétique des populations avancée</i>		14	6	-	Malaspinas A.-S.	3	20
Bioinformatic Algorithms <i>Algorithmes de bioinformatique</i>		15	15	-	Dessimoz C., Gfeller D.	3	
Comparative Genomics : from Thousands of Genomes to Single Cells (MSc BEC) <i>Génomique comparative : des milliers de génomes aux cellules individuelles (MSc BEC)</i>		7	7	-	Arguello R.	1.5	
Industrial Bioinformatics <i>Bioinformatique industrielle</i>		14	-	-	Xenarios I.	1.5	15
Phylogeny and Comparative Methods (MSc BEC) <i>Phylogénie et méthodes comparatives (MSc BEC)</i>		14	14	-	Salamin N.	3	
Anti-Infective Agents <i>Agents anti-infectieux</i>		14	-	-	Lamoth F. Hauser P., Croxatto A., Ciuffi A.	1.5	
Bacterial Virulence and Pathogenesis <i>Virulence bactérienne et pathogénèse</i>		12	2	-	Greub G., Hauser P., Jacquier N.	1.5	
Chromosome Organization and Dynamics <i>Organisation et dynamique des chromosomes</i>		4	10	-	Gruber S.	1.5	
Epidemiology of Human Pathogens <i>Epidémiologie de pathogènes humains</i>		14	-	-	Blanc D., Manuel O., Lamoth F., Senn L., Opota O.	1.5	
Microbes as Tools in Experimental Biology <i>Les microbes comme outils de biologie expérimentale</i>		10	4	-	Coste A., Ciuffi A.	1.5	
Microbiome Analysis <i>Analyse du microbiome</i>		8	16	-	van der Meer J.	1.5	
Microbiomes <i>Microbiomes</i>		14	-	-	van der Meer J.	1.5	10
Viral Pathogenesis and Emerging Viruses <i>Pathogénèse virale et virus émergents</i>		8	6	-	Ciuffi A., Gouttenoire J., Cagno V.	1.5	
Total						15	

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

** Only students who choose a master project with animal experimentation are allowed to select this course

Course / Enseignement		Teaching Staff	ECTS Credits
Master Thesis Travail de Master		Thesis Director	45

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