

Course directory 2017.2018

school of biology (FBM-BIO)
master

* your selection

> Biology > Master of Science (MSc) in Medical Biology

SUMMARY

Notice	iv
Legend	v
List of courses	1

NOTICE

This course catalogue was produced using data from the *SylviaAcad* information system of the University of Lausanne. Its database contains all information about courses proposed by the different faculties and their times. This data can also be consulted online at the address :

<https://applicationspub.unil.ch/interpub/noauth/php/Ud/index.php>.

Web site of the faculty : **<http://www.unil.ch/ecoledibiologie/>**

Generated on : 25.09.2018

LEGEND

NAME OF THE COURSE

Teacher

Type of course	Status	Hours per week	Teaching language	Hours per year
Semester	Credits			

N: Levels

P: Programme requirements

O: Objective

C: Content

B: Bibliography

I: Additional information

DISCIPLINE

ABBREVIATIONS

TYPE OF COURSE

Attest.	Attestation
C	Course
C/S	Course - seminar
Cp	Camp
E	Exercises
Exc	Excursion
Lg	Guided lecture
S	Seminar
T	Fieldwork
TP	Practical work

STATUS

Fac	Facultative
Obl	Compulsory
Opt	Optional
Fac/Comp/Opt	Facultative, compulsory or optional (according to the study programme)

SEMESTER

Sp	Spring
A	Autumn

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

- 15 ECTS : Module 1 (Compulsory courses + Optional courses)
- 15 ECTS : Module 2 (First step project)
- 15 ECTS : Module 3 (Compulsory courses + Optional courses)
- 45 ECTS : Personal research project (Master thesis)

Training objectives are available in its programme regulations.

Specific training objectives are described at the top of each track in the module 3.

Autumn Semester (semester 1)

	Courses / Enseignements	Hours per semester			Teaching Staff	ECTS Credits
		C	E/S	PW		
MODULE 1	Compulsory / Obligatoire					
	Cardiovascular Diseases <i>Maladies cardiovasculaires</i>	20	4	-	Diviani D.	
	Cellular Biology <i>Biologie cellulaire</i>	12	4	-	Staub O.	
	From Memory to Memory Loss : Alzheimer's Disease <i>De la mémoire à la perte de mémoire : la maladie d'Alzheimer</i>	18	4	-	Volterra A.	
	Immunology and Cancer <i>Immunologie et cancer</i>	20	12	-	Luther S.	
	Intracellular Signalling <i>Signalisation intracellulaire</i>	12	3	-	Diviani D.	
	Metabolic Diseases <i>Maladies métaboliques</i>	16	4	-	Widmann C.	
	Microbiology <i>Microbiologie</i>	18	4	-	Kunz S.	
	Scientific Method and Communication <i>Méthode et communication scientifiques</i>	8	2	-	Broillet M.-C., Kohler S.	
	MB Poster Day				Staub O.	
	Optional / Optionnel					
	LTK1 Module : Training in Animal Experimentation * <i>Module LTK1 : expérimentation animale</i>	20	-	20	Berthonneche C.	
	Introduction to Clinical Research Module (EH) <i>Module d'introduction à la recherche clinique (EH)</i>				Tappy L.	
Total	144	37	20		15	
MODULE 2	Practical project / Travail pratique					
	First Step Project <i>Travail d'initiation à la recherche</i>	-	-	282	Staub O.	15

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

Abbreviations

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

CARDIOVASCULAR DISEASES

Dario Diviani

C	Obl	English	20
A			
S	Obl	English	4
A			

N: Master

O: Integrated overview of the respiratory and cardio-vascular systems
 Introduction to cardiac and respiratory pathophysiology, pathology, and pharmacology
 Cellular mechanisms of selected cardiovascular and respiratory diseases

C: respiratory and cardiovascular physiology
 respiratory and cardiovascular pathophysiology and pharmacology
 cellular basis of arterial hypertension
 cellular basis of heart failure
 heart conduction defectc (problem-based learning)

B: Medical Physiology. W F Boron & E L Boulpaep; Saunders 2003

CELLULAR BIOLOGY

Olivier Staub

C	Obl	English	12
A			
S	Obl	English	4
A			

N: Master

FROM MEMORY TO MEMORY LOSS: ALZHEIMER'S DISEASE

Andrea Volterra

C	Obl	English	18
A			
S	Obl	English	4
A			

N: Master

IMMUNOLOGY AND CANCER

Sanjiv Luther

C	Obl	English	20
A			
S	Obl	English	12
A			

N: Master

INTRACELLULAR SIGNALLING

Dario Diviani

C	Obl	English	12
A			
S	Obl	English	3
A			

N: Master

P: Bachelor in Biology

O: Introduction to the hormonal system. Physiological, pathophysiological and pharmacological aspects

C: 1) Signal transduction by peptide hormones (G protein-coupled receptors, second messengers, protein kinases, genetic pathologies, pharmacological targets).
 2) Receptor-mediated endocytosis (transferrin, LDL, toxins, virus, ligand-targeted therapeutics)
 3) Signal transduction by steroid hormones (mechanism of action, pathologies, pharmacological targets)

B: - Endocrinology: An Integrated Approach.
 Nussey, S.S.; Whitehead, S.A. London: Taylor & Francis; c2001
 - Molecular Biology of the Cell 4th ed.
 Alberts, Bruce; Johnson, Alexander; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter, New York and London: Garland Science; c2002

METABOLIC DISEASES

Christian Widmann

C	Obl	English	16
A			
S	Obl	English	4
A			

N: Master

P: The following metabolic pathway should be known beforehand:

- Glycolysis
- Neoglucogenesis
- Glycogen synthesis
- Fatty acids and triglyceride synthesis
- Krebs cycle

The basic regulation of receptor tyrosine kinases, G protein-coupled receptors, small GTP-binding proteins should also be known.

O: The objectives of this course is to understand the complex aetiology of diabetes by studying the environmental, genetic, and molecular factors underlying the development of the disease

- C:
1. Physiopathology, genetic and environmental factors in diabetes.
 2. Epidemiology of and complications in diabetes.
 3. Diabetes: a pancreatic beta cell disease.
 4. Diabetes: an insulin-resistance disease.
 5. Genetics of diabetes

MICROBIOLOGY

Stefan Kunz

C	Obl	English	18
A			
S	Obl	English	4
A			

N: Master

P: Course Virology B.Sc. 5th semester (Kunz) or equivalent

O: This course will provide an overview over medical microbiology at an advanced level. Introductory parts will cover the basic concepts of bacterial, viral, and fungal infections in humans. Selected pathogens will be used to highlight the principles underlying human infectious diseases from the standpoint of the pathogen and the host defense.

-
- C: Outline course Medical Microbiology
 Part I Medical Bacteriology (Gilbert Greub, 6 hours total)
 This part of the course will first present the concepts of bacterial colonization, of infection and of barriers against invading micro-organisms. The importance of clinical bacteriology for the etiological diagnosis of infectious diseases will be presented, as well as the main diagnosis approaches used. Then, the most important virulence factors implicated in bacterial pathogenesis and in the transmission of pathogenic agents will be presented. These fundamental principles will be illustrated using relevant human pathogens as examples. First, we will present the pathogenesis of some pyogenic bacteria (*Escherichia coli*, *Staphylococcus* spp., *Streptococcus* spp.), highlighting the importance of bacterial toxins and of bacteriophages. Then, we will present some specific aspects of the mode of transmission and pathogenesis of infections due to intracellular bacteria, using as examples the atypical pneumonia and the zoonotic infections. Finally, we will illustrate using mycobacteria some key principles in bacterial pathogenesis including the importance of pathogens evolution and of immune defense.
- Colonisation, infection and barriers against invading pathogens (1hour)
 Colonisation, physiological flora
 Infection and inflammation
 Chemical, mechanical, physical and biological barriers
 Diagnostic bacteriology (1 hour)
 Gram and direct examination
 Cultures approaches
 Bacterial identification
 Molecular diagnosis/serology
 Pyogenic bacterial infections and toxins (1hour)
Escherichia coli: commensal and pathogen: (ETEC/EPEC/EIEC)
Staphylococcus aureus: virulence factors
Streptococcus, superantigens and bacteriophages
 Pneumonia (1hour)
 Etiological diagnosis of pneumonia
 Pneumococques and other encapsulated pyogenic bacteria
Legionella pneumophila, water and amoebae
 Other agents of atypical pneumonia (*Chlamydia* spp., *Coxiella burnetii*)
 Zoonotic infections (1hour)
 Ticks/fleas/lice: role in the transmission
Rickettsia: pathogenesis and reductive evolution
Bartonella: red blood cells and endothelial cells
 Mycobacteria (1hour)
 Importance of immune defense mechanisms
 Pathogenomic with an evolutionary perspective
- Part II Medical Virology
 This part of the course will cover fundamental aspects of medical virology and viral diseases in humans. A short introduction will provide a survey of the landscape and outline basic principles of human viral infection and viral pathogenesis. These fundamental principles will then be illustrated using relevant human pathogens as examples. The most important families of human pathogenic viruses will be presented in a general way. From each family, we will select specific viruses that will serve as examples to illustrate fundamental aspects of virus-host interaction and viral pathogenesis in a more detailed manner. A final block will cover virus infections in the central nervous system (CNS) and re-visit the basic principles outlined before to give a synthesis of the highly complex virus-host interaction underlying viral CNS disorders.
- Introduction to medical virology (1 hour) Stefan Kunz
 Basic principles of human viral infection
 Basic principles of innate and adaptive anti-viral defense
 Virus infection of the central nervous system (1 hour) Stefan Kunz
 Mechanisms of CNS invasion by viruses
 Anti-viral immune defense in the CNS
 Acute viral infection of the CNS: meningitis and encephalitis
 Persistent viral infection in the CNS
 Infection of the developing CNS: virus infection in pediatric medicine
 Human pathogenic DNA viruses (2 hours) Stefan Kunz
 Overview human pathogenic DNA viruses
 Poxviruses
 Overview poxviruses
 Pathogenesis of smallpox
 Subversion of innate host cell immunity by poxviruses
 Adenoviruses
 Adenoviruses as human pathogens
 Herpesviruses
 Overview human pathogenic herpesviruses
 Herpes simplex virus and viral latency
 Epstein-Barr Virus: viral latency and cancer
 Human pathogenic RNA viruses I (1 hour) Stefan Kunz
 Overview human pathogenic DNA viruses
 Enteroviruses
 Overview human pathogenic enteroviruses
 Rhinoviruses and cosackievirus: viral tropism and pathogenesis
 Herpesviruses

B: Will be provided for each block.

SCIENTIFIC METHOD AND COMMUNICATION

Marie-Christine Broillet

C	Obl	English	8
A			
S	Obl	English	2
A			

N: Master

LTK1 MODULE: TRAINING IN ANIMAL EXPERIMENTATION

Corinne Berthonneche

C	Opt	English	20
A	1.50		
TP	Opt	English	20
A			

N: Master

O: Learning outcomes

To acquire the practical and theoretical skills with laboratory animals as requested by legislation (Swiss ordinance N° 455.171.2, October 1998) to get the accreditation to perform animal experimentation delivered by the Federal Veterinary Office.

This course (20h theory + 20h practical) will be recognized by the Swiss federal veterinary office to undertake animal experiments.

C: What is animal experimentation?

Any interventions in which live animals are used to :

- Test a scientific hypothesis in various fields (behavior, neurology, metabolism, immunology, cardiovascular...)
- Verify the effects of a particular procedure on an animal
- Test a substance (pharmacology, toxicology...)
- Collect or examine cells, organs or body fluids
- Education, training and continuing education

Choosing an appropriate animal model

- Before an animal model is chosen, investigators must consider alternatives to the use of live animals (3Rs)
- Investigators must consider all factors when selecting the best model for research

Who is concerned by this module?

This training module is relevant to all students working with animals during their master project.

Conditions for registration to this module:

- The host laboratory must have permission to work with animals
- Students must be announced to the cantonal veterinary office

INTRODUCTION TO CLINICAL RESEARCH MODULE (EH)

Luc Tappy

C	Opt	English	20
A			
TP	Opt	English	20
A			

N: Master

-
- O: To get acquainted with basic methods in clinical research
- o study design
 - o statistical analysis
 - o ethical considerations
 - o legal aspects
- To know the basic skills for the realization of research protocols on human beings
- o Techniques of asepsis, iv drips
 - o how to react in case of acute adverse effects
 - o basic life support
- To understand the relationships between clinical practice and research
- o cancer
 - o metabolic disorders
 - o neuro-psychiatric disorders

BIOLOGICAL SECURITY

Patrick Michaux

C	Obl	English	2
A			

N: Master

P: A basic knowledge of microbiology and vegetal science

O: To familiarise future researchers with legislation concerning genetic engineering. In addition, possible biological risks associated to different applications of this technology will be discussed with the help of examples.

C: * Legislation: article 24 of the Federal Constitution; law concerning environmental protection; law concerning epidemics; ordinance on protection against major accidents; Swiss commissions on biological security: notification and registration of projects.
 * Biological security in the laboratory: containment; security equipment; technical measures: laboratory construction; standard laboratory (microbiological) practice; classification of biological material: plasmids, microorganisms, cell lines, primary cells; security levels 1-4.
 * Release of genetically modified bacteria in the environment: monitoring, survival and dissemination, ecological impact, transfer of genes, containment systems.
 * Potential biological risks associated with the use of transgenic plants: dissemination, cross-pollination, gene transfer.
 * The problem of recombinant vaccines: vectors, DNA vaccines.
 * Somatic genetic therapy I: Illnesses accessible to treatment by somatic genetic therapy, gene transfer methods.
 * Somatic genetic therapy II: Evaluation of the biological risk for the patient and his environment.

FIRST STEP PROJECT

Christian Fankhauser, Jérôme Goudet, Laurent Lehmann, Marc Robinson-Rechavi, Olivier Staub

TP	Obl	English	224
A	15.00		
TP	Obl	English	282
A	15.00		
TP	Obl	English	250
A	14.00		
TP	Obl	English	224
A	15.00		
TP	Obl	English	224
A	15.00		

N: Master

P: Practicals performed during the bachelor (molecular biology, genetics, biochemistry, bioinformatics)

O: - An initiation to the work of a scientist
 - Conduct experimental work in research lab (wet bench or in silico)
 - Interpretation of research results
 - Implement basic principles in experimental design (e.g. include the appropriate controls, statistical significance of the results etc...)
 - Present your experimental work in a written report which will be organized like a typical research article (introduction, results, discussion, materials and methods)
 - present your work orally (seminar style)

C: Perform laboratory work for about 12 weeks during the time when the student does not follow theoretical classes. This research project will typically be performed under the guidance of a PhD student or a post-doc from the host laboratory.

Spring Semester (semester 2)

One track among the following four / Une filière au choix sur les quatre :

MODULE 3	Immunity and Cancer			Responsible: Luther S.		
	Immunologie et Cancer					
	<p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> • Mobilise theoretical and practical knowledge in immunology and oncology. • Systematically analyse fundamental and clinical problems in immunology and oncology, starting with diseases related to the immune system or cell transformation, drug development and treatments. • Apply basic research techniques in immunology and oncology to solve research questions (proteomics, peptide-based assays, flow cytometry, histology and biostatistics). 					
Courses / Enseignements		Hours per semester			Teaching Staff	ECTS Credits
		C	E/S	PW		
Introduction to Clinical Medicine <i>Introduction à la médecine clinique</i>		16	-	6	Bonny O.	
Immunology II. Advanced Concepts in Immunology : from Antigen Recognition and Signalling to Leukocyte Responses <i>Immunologie II. Concepts avancés en immunologie : de la présentation et reconnaissance d'antigène à la signalisation et aux réponses des leucocytes</i>		21	5	-	Luther S., Held W., Tacchini-Cottier F., Thome M., Ho P.-C.	
Immunology III. Immunity and Disease : Autoimmunity, Allergy and Infections <i>Immunologie III. Immunité et maladie : Autoimmunité, allergie et infections</i>		18	4	-	Acha-Orbea H., Velin D., Perreau M., Broz P., Roger T.	
Cancer II. Advanced Concepts in Cancer Biology : from Oncogenes to Angiogenesis <i>Cancer II. Concepts avancés en biologie du cancer : Des oncogènes à l'angiogenèse</i>		19	3	-	Petrova T., Fajas L., Gfeller D., Hanahan D., Joyce J., Riggi N., Missiaglia E.	
Cancer III. Examples of Tumor Types : Brain and Genital Tumors, Leukemia <i>Cancer III. Exemples de types de tumeurs : tumeurs cérébrales, génitales, leucémies</i>		7	2	-	Nardelli D., Hantschel O., Wolfer A.	
Treatments. Treatments and Prevention of Disease : Drug Development, Vaccines, Anti-Tumor Immunity, Immunotherapy <i>Traitements. Traitements et prévention de maladies : Développement de médicaments, vaccins, immunité contre tumeurs, immunothérapie</i>		11	4	-	Romero P., Collin N., Peters S., Jandus C., Vozenin M.-C.	
Proteomics and 3D Modeling. Applications to the Study of Lymphocytes and Tumor Cells. <i>Protéomiques et modélisation en 3D. Applications à l'étude des lymphocytes et cellules tumorales.</i>					Quadroni M. Servis C. Zoete V., Baumgartner P., Jandus C., Derre L.	
- Lectures on Proteomics - Cours ex-cathédra sur la protéomique - PW Proteomics : Peptide Synthesis, Peptide-based Assays and Mass Spectrometry - TP Protéomiques : Synthèse de peptides, tests basés sur peptides, spectrométrie de masse - PW 3D-Modeling - TP modélisation en 3D		17	-	31		
PW Immunology/Cancer : <i>TP Immunologie/Cancer :</i>					Luther S., Wilson A., Debard N., Nobile A.	
- Multicolor Flow Cytometric Analysis of Lymphoid Organs - Cytométrie de flux en multiples couleurs pour analyser des tissus lymphoïdes - Histological Analysis of Lymph Nodes or Cancer Tissues - Analyse histologique des ganglions et tissus cancéreux - Metabolic Switch in Cancer Cells - Métabolisme altéré dans les cellules cancéreuses - Discussion and Feedback Session		8	3	28		
E-Learning Exercises. Article- and Case-based Learning in Proteomics / Immunology / Cancer <i>Exercices de type 'e-learning'. Apprentissage par article ou problème en protéomiques / immunologie / cancer</i>		1	6	-	Luther S., Debard N., Quadroni M., Servis C., Naveiras O., Perreau M., Descatoire M.	
Write and Defend Grant Proposal, prepare Journal Club <i>Rédaction et défense d'une demande de subside, préparation d'un journal Club</i>		-	2	-	Luther S.	
Bioinformatics <i>Bioinformatique</i>		2	-	4	Gfeller D.	
Biostatistics <i>Biostatistiques</i>		2	-	13	Diviani D., Anderle P.	

15

INTRODUCTION TO CLINICAL MEDICINE

Olivier Bonny

C	Obl	English	16
S			
TP	Obl	English	6
S			

N: Master

P: Bachelor of Science

O: The main goals of this course is to have the students able to:
1) describe the basic principles underlying human clinical medicine;
2) explain the concepts and language used in clinical medicine and research

C: -

B: /

I: -

IMMUNOLOGY II

Sanjiv Luther

C	Obl	English	21
S			
S	Obl	English	5
S			

N: Master

P: The key concepts of immunology which are summarized in chapter 1 of 'Janeways Immunobiology' by Kenneth Murphy (Garland Science) 2011

O: Know dendritic cells and lymphocytes
 Know lymphoid organ structure and function
 Know the cellular migration and interaction
 Know the molecular basis of cellular interactions
 Know how antigen is recognized, sampled, processed and presented to lymphocytes
 Know how lymphocytes get activated, proliferate and differentiate into effector cells
 Know the effector function
 Know what memory cells are and do
 Know the phases of adaptive immunity
 Know the pros and cons of adaptive immune responses

C: See under goals

IMMUNOLOGY III

Hans Acha-Orbea

C	Obl	English	18
S			
S	Obl	English	4
S			

N: Master

CANCER II

Tatiana Petrova

C	Obl	English	19
S			
S	Obl	English	3
S			

N: Master

CANCER III

Denise Nardelli Haefliger

C	Obl	English	7
S			
S	Obl	English	2
S			

N: Master

TREATMENTS

Pedro Romero

C	Obl	English	11
S			
S	Obl	English	4
S			

N: Master

P: Have a basic knowledge of the principles of humoral and cellular immunology. Innate and adaptive immune responses. Basic mechanisms of cell transformation and cancer development.

O: Provide an overview of the principles of tumor immunology and the applications to cancer immunotherapy

C: Immunosurveillance of tumors
 Tumor antigens
 Approches to cancer immunotherapy
 Immunosuppression in the tumor microenvironment
 Immune checkpoint blockade with monoclonal antibodies

B: - Mellman I, Coukos G, Dranoff G. Cancer immunotherapy comes of age. *Nature*. 2011 480(7378):480-9. doi:10.1038/nature10673.
 - Schreiber RD, Old LJ, Smyth MJ. Cancer immunoediting: integrating immunity's roles in cancer suppression and promotion. *Science*. 2011 331(6024):1565-70. doi:10.1126/science.1203486.

PROTEOMICS AND 3D MODELING

Manfredo Quadroni, Ekaterini Servi, Vincent Zoete

C	Obl	English	17
S			
TP	Obl	English	31
S			

N: Master

PW IMMUNOLOGY / CANCER

Sanjiv Luther, Anne Wilson

C	Obl	English	8
S			
TP	Obl	English	28
S			
S	Obl	English	3
S			

N: Master

E-LEARNING EXERCISES

Sanjiv Luther

C	Obl	English	1
S			
E	Obl	English	6
S			

N: Master

WRITE AND DEFEND GRANT PROPOSAL, PREPARE JOURNAL CLUB

Marie-Christine Broillet, Sanjiv Luther, Andrea Volterra, Christian Widmann

E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			

N: Master

BIOINFORMATICS

David Gfeller

C	Obl	English	2
S			
TP	Obl	English	4
S			

N: Master

BIostatISTICS

Pascale Anderle

C	Obl	English	2
S			
TP	Obl	English	13
S			

N: Master

P: Basics of biostatistics and bioinformatics

O: Methodology in biostatistics and bioinformatics

C: At the end of this module, the students will have used and developed the needed biostatistics or bioinformatics tools to analyze the data obtained during their Master thesis work.

B: /

I: /

Metabolism and Human Health
Métabolisme et santé humaine

Responsible: Widmann C.

At the end of the course the students will be able to:

- Mobilise theoretical knowledge on the mechanisms regulating the metabolism and their disorders (diabetes, obesity, etc.).
- Propose research approaches using interdisciplinary approaches such as genomics, transgenic or knockout animal models, integrative physiology or clinical investigations.

MODULE 3

Courses / Enseignements	Hours per semester			Teaching Staff	ECTS Credits
	C	E/S	PW		
Introduction to Clinical Medicine <i>Introduction à la médecine clinique</i>	16	-	6	Bonny O.	15
Bioinformatics Tools for the Study of Metabolism <i>Outils bioinformatiques pour l'étude du métabolisme</i>	2	-	-	Xenarios I.	
Brain Metabolism <i>Métabolisme cérébral</i>	4	2	-	Pellerin L.	
Circadian Rhythm and Metabolism <i>Rythme circadien et métabolisme</i>	4	2	-	Gatfield D.	
Experimental Techniques : Transgenesis and Gene Knockout <i>Techniques expérimentales : transgénèse et invalidation de gène</i>	4	2	-	Hummeler E.	
G-couple Receptors and Autonomic Nervous System <i>Récepteurs couplés aux protéines G et système nerveux autonome</i>	4	2	-	Diviani D.	
Hypothalamus and the Interaction between Metabolism and Reproduction <i>Hypothalamus et l'interaction entre le métabolisme et la reproduction</i>	4	2	-	Messina A.	
Metabolic Adaptation to Fasting : Role of Metabolic Sensors <i>Adaptation métabolique à la nutrition : le rôle des senseurs métaboliques</i>	4	2	-	Canto C.	
Metabolic Phenotyping <i>Phénotypage métabolique</i>	6	2	-	Preitner F.	
Metabolic Syndrome : Epidemiology and (pre-)Clinical Implications <i>Syndrome métabolique : épidémiologie et implications (pré-)cliniques</i>	4	2	-	Puder J.	
Metabolism and Cancer <i>Métabolisme et cancer</i>	4	2	-	Fajas L.	
Metabolism and Cell Death <i>Métabolisme et mort cellulaire</i>	4	2	-	Allagnat F.	
No-Coding RNA in Metabolism <i>ARN non-codants dans le métabolisme</i>	4	2	-	Regazzi R.	
Nutritional Physiology <i>Physiologie de la nutrition</i>	4	2	-	Messina A.	
Planning, Interpreting and Presenting Science Planifier, interpréter et présenter la science - Biases and the Misuse of Statistics - <i>Biais et mauvais usage des statistiques</i> - Data Interpretation and Experimental Design - <i>Interprétation de données and design expérimental</i> - Effective Presentation in Science - <i>Présentation efficace en science</i>	6	20	-	Widmann C.	
Science and Journalism <i>Science et journalisme</i>	-	4	-	Gardier S.	
Stem Cells and Metabolism <i>Cellules souches et métabolisme</i>	6	2	-	Knobloch M.	
Technology Transfer <i>Transfert de technologie</i>	2	-	-	Kohler S.	
The Good (cholesterol), the Bad (cholesterol) and the Lipoproteins <i>Le bon (cholestérol), le mauvais (cholestérol) et les lipoprotéines</i>	4	6	-	Widmann C., Collet T.-H.	
What is a Calorie? <i>Qu'est-ce qu'une calorie</i>	2	4	-	Tappy L.	
Write and Defend Grant Proposal, prepare Journal Club <i>Rédaction et défense d'une demande de subside, préparation d'un journal Club</i>	-	2	-	Widmann C.	
Biostatistics <i>Biostatistiques</i>	2	-	13	Diviani D., Anderle P.	

INTRODUCTION TO CLINICAL MEDICINE

Olivier Bonny

C	Obl	English	16
S			
TP	Obl	English	6
S			

N: Master

P: Bachelor of Science

O: The main goals of this course is to have the students able to:
1) describe the basic principles underlying human clinical medicine;
2) explain the concepts and language used in clinical medicine and research

C: -

B: /

I: -

BIOINFORMATICS TOOLS FOR THE STUDY OF METABOLISM

Ioannis Xenarios

C	Obl	English	2
S			

N: Master

BRAIN METABOLISM

Luc Pellerin

S	Obl	English	2
S			
C	Obl	English	4
S			

N: Master

CIRCADIAN RHYTHM AND METABOLISM

David Gatfield

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

EXPERIMENTAL TECHNIQUES : TRANSGENESIS AND GENE KNOCKOUT

Edith Hummler Beermann

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

G-COUPLE RECEPTORS AND AUTONOMIC NERVOUS SYSTEM

Dario Diviani

S	Obl	English	2
S			
C	Obl	English	4
S			

N: Master

HYPOTHALAMUS AND THE INTERACTION BETWEEN METABOLISM AND REPRODUCTION

Andrea Messina

S	Obl	English	2
S			
C	Obl	English	4
S			

N: Master

METABOLIC ADAPTATION TO FASTING: ROLE OF METABOLIC SENSORS

Carles Canto

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

METABOLIC PHENOTYPING

Frédéric Preitner

C	Obl	English	6
S			
S	Obl	English	2
S			

N: Master

METABOLIC SYNDROME : EPIDEMIOLOGY AND (PRE-)CLINICAL IMPLICATIONS

Jardena Puder

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

-
- B: Kahn R et al. The metabolic syndrome: time for a critical appraisal. Joint statement from the American Diabetes Association and the European Association for the study of Diabetes. (2005) *Diabetologia*:48:1684-1699
 Expert panel on the detection, evaluation and treatment of high blood cholesterol in adults. ATP III (2001). *JAMA* 285-2486-2497

METABOLISM AND CANCER

Lluís Fajas Coll

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

METABOLISM AND CELL DEATH

Florent Allagnat

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

P: Basic understanding of the apoptosis signaling pathways What are Atherosclerosis and diabetes What are the risks factors involved in the development of metabolic diseases

O: Understand the role and mechanisms of apoptosis in the development of metabolic diseases (Atherosclerosis and Diabetes)

C: First session: theory
Apoptosis signaling pathways, central role of mitochondria, oxidative stress and ER-stress
Second session: discussion of various approaches to study the role of apoptosis in metabolic diseases, dive in the complexity and cross-talk of signaling pathways.
Third session: Presentation of the articles selected for this course

B: voir pdf disponibles via MyUnil.
Des review de référence ont été sélectionnées.

NO-CODING RNA IN METABOLISM

Romano Regazzi

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

NUTRITIONAL PHYSIOLOGY

Andrea Messina

C	Obl	English	4
S			
S	Obl	English	2
S			

N: Master

PLANNING, INTERPRETING AND PRESENTING SCIENCE

Christian Widmann

C	Obl	English	6
S			
S	Obl	English	20
S			

N: Master

SCIENCE AND JOURNALISM

Stéphany Gardier

S	Obl	English	4
S			

N: Master

STEM CELLS AND METABOLISM

Marlen Knobloch

C	Obl	English	6
S			
S	Obl	English	2
S			

N: Master

P: Knowing the major cellular metabolic pathways

O: This course will provide a general introduction to stem cells and will cover recent research work on how stem cell metabolism influences stem cell function and behaviour.

C: The course will cover the following questions: what are stem cells, what type of stem cells exist, where do they come from, where do they reside, use of stem cells in research and therapy, metabolic requirements of stem cells and metabolic regulation of stem cells. A 2h seminar will be dedicated to student presentations of 2 selected papers in the stem cell metabolism field.

B: le support du cours (Pdf) sera disponible sur myUNIL, publications et sites Web sur le thème des cellules souches et plus particulièrement sur leur métabolisme seront fournis avec le support du cours.

TECHNOLOGY TRANSFER

Stefan Kohler

C	Obl	English	2
S			

N: Master

THE GOOD (CHOLESTEROL), THE BAD (CHOLESTEROL) AND THE LIPOPROTEINS

Christian Widmann

S	Obl	English	6
S			
C	Obl	English	4
S			

N: Master

O: Understand how cholesterol is taken up and produced, how it is transported from one organ to another, and what are its functions in our organism.

C: - Cholesterol (function, origin, and synthesis)
- Lipoprotéines (chylomicrons, VLDL, LDL et HDL)

B: Endocrinol.Metab Clin.North Am. (1998) vol 27 pp. 503-519

WHAT IS A CALORIE ?

Luc Tappy

C	Obl	English	2
S			
S	Obl	English	4
S			

N: Master

WRITE AND DEFEND GRANT PROPOSAL, PREPARE JOURNAL CLUB

Marie-Christine Broillet, Sanjiv Luther, Andrea Volterra, Christian Widmann

E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			

N: Master

BIOSTATISTICS

Pascale Anderle

C	Obl	English	2
S			
TP	Obl	English	13
S			

N: Master

P: Basics of biostatistics and bioinformatics

O: Methodology in biostatistics and bioinformatics

C: At the end of this module, the students will have used and developed the needed biostatistics or bioinformatics tools to analyze the data obtained during their Master thesis work.

B: /

I: /

Neuroscience
Neurosciences

Responsibles: Volterra A.
Cardinaux J.-R.

At the end of the course the students will be able to:

- Mobilise theoretical knowledge about the physiological, pathological and medical aspects of selected domains of neuroscience such as nervous system development, sensory functions, neuron-gland interactions, synaptic functions, neuronal death and tissue repair, psychiatric neuroscience.
- Use advanced research techniques to study the physiological function of the nervous system or neuropsychiatric diseases in animal models or in humans.
- Systematically analyse fundamental and clinical problems and experimental approaches in neuroscience.

MODULE 3

Courses / Enseignements	Hours per semester			Teaching Staff	ECTS Credits
	C	E/S	PW		
Introduction to Clinical Medicine <i>Introduction à la médecine clinique</i>	16	-	6	Bonny O.	15
Brain Development <i>Développement du cerveau</i>	16	2	2	Hornung J.-P., Cardinaux J.-R., Arsenijevic Y.	
Introduction to Psychiatric Neuroscience <i>Introduction aux neurosciences psychiatriques</i>	20	-	-	Do K., Steullet P., Magara F., Marquet P., Rougemont-Buecking A., Cardinaux J.-R., Martin J.-L., Baumann P., Preissmann D.	
Modulation of Synaptic Transmission <i>Modulation de la transmission synaptique</i>	14	2	-	Fasshauer D., Lüthi A., Stoop R., Martin J.-L., Pralong E., Varoqueaux F.	
Neuron-glia Biology <i>Biologie neurones-glie</i>	18	2	-	Volterra A., Pellerin L., Bezzi P., Tschudi-Monnet F.	
Neuronal Death and Repair in the Central Nervous System <i>Mort neuronale et réparation dans le système nerveux central</i>	16	-	-	Toni N., Widmann C., Hirt L., Deglon N., Brunet J.-F.	
Sensory Functions <i>Fonctions sensorielles</i>	24	-	-	Hornung J.-P., Murray M., Decosterd I., Broillet M.-C., Croquelois A.	
Write and Defend Grant Proposal, prepare Journal Club <i>Rédaction et défense d'une demande de subside, préparation d'un journal Club</i>	-	2	-	Volterra A.	
Biostatistics <i>Biostatistiques</i>	2	-	13	Diviani D., Anderle P.	

INTRODUCTION TO CLINICAL MEDICINE

Olivier Bonny

C	Obl	English	16
S			
TP	Obl	English	6
S			

N: Master

P: Bachelor of Science

O: The main goals of this course is to have the students able to:
1) describe the basic principles underlying human clinical medicine;
2) explain the concepts and language used in clinical medicine and research

C: -

B: /

I: -

BRAIN DEVELOPMENT

Jean-Pierre Hornung

C	Obl	English	16
S			
S	Obl	English	2
S			
TP	Obl	English	2
S			

N: Master

INTRODUCTION TO PSYCHIATRIC NEUROSCIENCE

Kim Quang Do Cuenod

C	Obl	English	20
S			

N: Master

B: Quelques références :

- Kandel, EJ et al (last edition) Principles of Neural Science. Elsevier
 - Charney DS & Nestler EJ (last edition) Neurobiology of Mental Illness, Oxford University Press
 - Jeannerod M, Le Cerveau volontaire, Odile Jacob, 2009
 - Purves, D (last edition) Neurosciences. De Boeck
- une bibliographie spécifique sera distribuée pour chaque volet du cours.

MODULATION OF SYNAPTIC TRANSMISSION

Dirk Fasshauer

C	Obl	English	14
S			
S	Obl	English	2
S			

N: Master

NEURON-GLIA BIOLOGY

Andrea Volterra

C	Obl	English	18
S			
S	Obl	English	2
S			

N: Master

NEURONAL DEATH AND REPAIR IN THE CENTRAL NERVOUS SYSTEM

Nicolas Toni

C	Obl	English	16
S			

N: Master

P: Basic knowledge of neurobiology and of cell biology.

O: Understand the roles of neuronal death occurring in normal development and the factors which determine it.
Understand the various cellular mechanisms of neuronal death, active in both normal and pathological situations.
Understand the roles of neuronal death in various pathological situations including cerebral ischemia, Parkinson's disease and motoneuron diseases.

C: Cell death: introduction, history and typology
Pathways of apoptosis
Trophic influences and neuronal death
Neuronal death in development and its regulation
Excitotoxicity, its signalling pathways and neuroprotection against it
Cerebral ischemia and its treatment
Alzheimer's disease
Parkinson's disease

B: Les six enseignants impliqués dans ce module proposeront des matières de lecture.

SENSORY FUNCTIONS

Jean-Pierre Hornung

C	Obl	English	24
S			

N: Master

WRITE AND DEFEND GRANT PROPOSAL, PREPARE JOURNAL CLUB

Marie-Christine Broillet, Sanjiv Luther, Andrea Volterra, Christian Widmann

E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			

N: Master

BIostatISTICS

Pascale Anderle

C	Obl	English	2
S			
TP	Obl	English	13
S			

N: Master

P: Basics of biostatistics and bioinformatics

O: Methodology in biostatistics and bioinformatics

C: At the end of this module, the students will have used and developed the needed biostatistics or bioinformatics tools to analyze the data obtained during their Master thesis work.

B: /

I: /

Pharmacology and Toxicology
Pharmacologie et toxicologie

Responsible: Broillet M.-C.

At the end of the course the students will be able to:

- Mobilise knowledge from a physiological point of view on the functioning of five major classes of drugs (anti-infection, anti-cancer, neurological, cardiovascular and hormonal)
- Acquire a current vision of the issues of pharmacogenetics, personalised medicine and pharmacovigilance.
- Critically analyse and present the practical steps of drug development, pharmaceutical industry and the drug-market policy.
- Interact with scientists and professionals from different backgrounds to learn and practice the various steps involved in the identification of a toxic substance, from the discovery of its mechanism of action to the press release and risk management.

MODULE 3

Courses / Enseignements	Hours per semester			Teaching Staff	ECTS Credits
	C	E/S	PW		
Introduction to Clinical Medicine <i>Introduction à la médecine clinique</i>	16	-	6	Bonny O.	15
Development of Drugs : Practical Aspects <i>Développement de médicaments : aspects pratiques</i>	4	-	-	Dumont J.-M.	
Development of Therapeutics <i>Développement d'agents thérapeutiques</i>	10	-	-	Broillet M.-C.	
Drug Design <i>Conception de médicaments</i>	4	-	-	Scapozza L.	
Fundamental Principles : Pharmacokinetics / Pharmacogenomics <i>Principes fondamentaux de pharmacocinétique et pharmacogénomique</i>	10	2	-	Firsov D.	
Optimization of Drug Treatment <i>Optimisation des traitements médicamenteux</i>	6	-	-	Décosterd L.	
Pharmaceuticals as Doping Drugs <i>Les médicaments comme produits dopants</i>	4	-	-	Baume N., Leuenberger N.	
Pharmacological Treatment of Metabolic Disorders <i>Traitement pharmacologique des troubles métaboliques</i>	2	-	-	Gachon F.	
Principles of Chemotherapy : Infectious Diseases <i>Principes de la chimiothérapie : les maladies infectieuses</i>	6	2	-	Schild L.	
Principles of Chemotherapy : Cancer <i>Principes de la chimiothérapie : le cancer</i>	6	2	-	Katanaev V.	
Regulation and Regulatory Agencies <i>Réglementations et les agences de réglementations</i>	2	-	-	Schild L.	
Seminars on Drug Discovery & Development <i>Séminaires sur la découverte et le développement de médicaments</i>	-	12	-	Kellenberger S., Broillet M.-C.	
System Pharmacology : Cardiovascular Pharmacology <i>Pharmacologie des systèmes : pharmacologie cardiovasculaire</i>	6	2	-	Kellenberger S. Diviani D.	
System Pharmacology : Neuropharmacology <i>Pharmacologie des systèmes : neuropharmacologie</i>	20	2	-	Kellenberger S., Eap C., Hummeler E., Katanaev V.	
System Pharmacology : Endocrine Pharmacology <i>Pharmacologie des systèmes : pharmacologie endocrinienne</i>	8	2	-	Hummeler E.	
Toxicology <i>Toxicologie</i>	16	4	-	Broillet M.-C., Hopf N., Chèvre N.	
Toxicology : e-Learning <i>Toxicologie : formation en ligne</i>	-	8	-	Broillet M.-C.	
Visit of an Industrial Pharmaceutical Research Center <i>Visite d'un centre de recherche d'une industrie pharmaceutique</i>	-	-	8	Broillet M.-C.	
Visit of a Water Purification Plant <i>Visite d'une station d'épuration des eaux</i>	-	-	5	Broillet M.-C.	
Inflammation and Cancer : Role of Reactive Oxygen Species (optional) <i>Inflammation et cancer : rôle des dérivés réactifs de l'oxygène (cours à option)</i>	10	-	-	Felley-Bosco E.	
Some Toxic Plant and Poisonous Mushrooms in Biomedical Research (optional) <i>Plantes toxiques et champignons vénéneux : leurs rôles dans la recherche biomédicale (cours à option)</i>	12	-	-	Giroud C.	
Write and Defend Grant Proposal, prepare Journal Club <i>Rédaction et défense d'une demande de subside, préparation d'un journal Club</i>	-	2	-	Broillet M.-C.	
Biostatistics <i>Biostatistiques</i>	2	-	13	Diviani D., Anderle P.	

Total per study path / Total par filière

15

INTRODUCTION TO CLINICAL MEDICINE

Olivier Bonny

C	Obl	English	16
S			
TP	Obl	English	6
S			

N: Master

P: Bachelor of Science

O: The main goals of this course is to have the students able to:
1) describe the basic principles underlying human clinical medicine;
2) explain the concepts and language used in clinical medicine and research

C: -

B: /

I: -

DEVELOPMENT OF DRUGS: PRACTICAL ASPECTS

Jean-Maurice Dumont

C	Obl	English	4
S			

N: Master

DEVELOPMENT OF THERAPEUTICS

Marie-Christine Broillet

C	Obl	English	10
S			

N: Master

DRUG DESIGN

Leonardo Scapozza

C	Obl	English	4
S			

N: Master

P: - Basics of Biochemistry and Chemistry

O: - To give an introduction and a general overview on Drug Design.

C: - Definitions and basic principles of Drug Design (what is a drug?; Which are the protein-ligand interactions; What is drug design?
- Which are the fundamental questions in drug design?
- Ligand-based drug design: principles and examples
- Target-based drug design: principles and examples
- The whole process will be exemplified by means of case study namely the development of Glivec, a molecularly targeted anti-cancer drug.

B: - Höltje, Hans-Dieter; Sippl, Wolfgang; Rognan, Didier; Folkers, Gerd "Molecular Modeling: Basic Principles and Applications" 3., revised and expanded Edition - January 2008, Wiley-VCH, Weinheim
- Capdeville R., Buchdunger E., Zimmermann J. and Matter A. GLIVEC (STI571,IMATINIB), A RATIONALLY DEVELOPED, TARGETED ANTICANCER DRUG Nature Review Drug Discovery (2002) 1:| 493

FUNDAMENTAL PRINCIPLES: PHARMACOKINETICS / PHARMACOGENOMICS

Dmitri Firsov

C	Obl	English	10
S			
S	Obl	English	2
S			

N: Master

P: good knowledge of physiology, human anatomy and genetics

O: to provide a description of factors that influence drug action in human population

C: Pharmacokinetics: principal models and parameters
Drug Absorbtion, Distribution, Metabolism and Excretion (ADME)
Chronopharmacology: effect of circadian time on drug action
Pharmacogenetics: candidate genes for variable drug response

OPTIMIZATION OF DRUG TREATMENT

Laurent Décosterd

C	Obl	English	6
S			

N: Master

PHARMACEUTICALS AS DOPING DRUGS

Norbert Baume

C	Obl	English	4
S			

N: Master

PHARMACOLOGICAL TREATMENT OF METABOLIC DISORDERS

Frédéric Gachon

C	Obl	English	2
S			

N: Master

PRINCIPLES OF CHEMOTHERAPY: INFECTIOUS DISEASES

Laurent Schild

C	Obl	English	6
S			
S	Obl	English	2
S			

N: Master

PRINCIPLES OF CHEMOTHERAPY: CANCER

Vladimir Katanaev

C	Obl	English	6
S			
S	Obl	English	2
S			

N: Master

REGULATIONS AND REGULATORY AGENCIES

Laurent Schild

C	Obl	English	2
S			

N: Master

SEMINARS ON DRUG DISCOVERY & DEVELOPMENT

Marie-Christine Broillet, Stephan Kellenberger

S	Obl	English	12
S			

N: Master

SYSTEM PHARMACOLOGY: CARDIOVASCULAR PHARMACOLOGY

Stephan Kellenberger

C	Obl	English	6
S			
S	Obl	English	2
S			

N: Master

P: B. Sc.

O: Introduction to pharmacology of the cardiovascular system

C: - Pharmacology of blood hemostasis and thrombosis
 - Hyperlipidemia and lipid-lowering agents
 - Pharmacology of heart failure

B: - Principles of Pharmacology, by D.E. Golan et al., 4th edition, Lippincott-Williams & Wilkins, 2016
 - Pharmacology, by Rang, Dale et al., 8th edition, Elsevier Churchill Livingstone, 2016

I: -

SYSTEM PHARMACOLOGY: NEUROPHARMACOLOGY

Stephan Kellenberger

C	Obl	English	20
S			
S	Obl	English	2
S			

N: Master

P: Bachelor in Biology

O: Introduction to Neuropharmacology

C: - Pharmacology of the central and peripheral nervous system
 - Pharmacology of ion channels: Introduction, principles; pain pharmacology; targeting GABAA receptors; antiepileptic drugs; local anesthetic drugs.
 - Pharmacogenetics in Psychiatry

B: - Principles of Pharmacology, by D.E. Golan et al., 4th edition, Lippincott-Williams & Wilkins, 2016
 - Pharmacology, by Rang, Dale et al., 8th edition, Elsevier Churchill Livingstone, 2016

SYSTEM PHARMACOLOGY: ENDOCRINE PHARMACOLOGY

Edith Hummler Beermann

C	Obl	English	8
S			
S	Obl	English	2
S			

N: Master

TOXICOLOGY

Marie-Christine Broillet

C	Obl	English	16
S			
S	Obl	English	4
S			

N: Master

TOXICOLOGY: E-LEARNING

Marie-Christine Broillet

E	Obl	English	8
S			

N: Master

VISIT OF AN INDUSTRIAL PHARMACEUTICAL RESEARCH CENTER

Marie-Christine Broillet

EXC	Obl	English	8
S			

N: Master

VISIT OF A WATER PURIFICATION PLANT

Marie-Christine Broillet

EXC	Obl	English	5
S			

N: Master

INFLAMMATION AND CANCER: ROLE OF REACTIVE OXYGEN SPECIES

Emanuela Felley-Bosco

C	Opt	English	10
S			

N: Master

SOME TOXIC PLANT AND POISONOUS MUSHROOMS IN BIOMEDICAL RESEARCH
Christian Giroud

C	Opt	English	12
S			

N: Master

WRITE AND DEFEND GRANT PROPOSAL, PREPARE JOURNAL CLUB

Marie-Christine Broillet, Sanjiv Luther, Andrea Volterra, Christian Widmann

E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			
E	Obl	English	2
S			

N: Master

BIOSTATISTICS

Pascale Anderle

C	Obl	English	2
S			
TP	Obl	English	13
S			

N: Master

P: Basics of biostatistics and bioinformatics

O: Methodology in biostatistics and bioinformatics

C: At the end of this module, the students will have used and developed the needed biostatistics or bioinformatics tools to analyze the data obtained during their Master thesis work.

B: /

I: /

Spring semester (semester 2) and Autumn Semester (semester 3)

MODULE 4	Courses / Enseignements		ECTS Credits
	Master Thesis / <i>Travail de Master</i>	Thesis Director	45

TRAVAIL DE RECHERCHE PERSONNEL - SEMESTRE 8

TP	Obl/Opt	French	520
S			

N: Master