

SYLLABUS OF MATTER

IMMUNO-PHYSIO-PATHOLOGY

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: ARRAR LAKHMISSI				
Email	lekhararr@yahoo.fr	Reception day	Monday Tuesday	Hour	11-15h
Office phone N°	_____	Building	SNV	Office	_____

COURSE DESCRIPTION

Unit Teaching Type	UEF1
Objective	Provide training on the physiology of the immune response (the immune system in action) in various situations (anti-infectious immunity, tumour and transplant immunology) and on immune-system pathologies (auto-immunity, immune deficiencies, allergies), plus new diagnostic and therapeutic tools (antibodies, vaccines, gene/cell therapy, biotherapies).
Prerequisites	Immunology.
Short content	• Physiology and organisation of the immune system; molecular bases of hereditary immune-system disorders • Physiological and pathological role of the complement system • Human tumour immunology: tumour antigens and immune responses • Primary and secondary immune deficiencies • Mechanisms of immediate hypersensitivity and allergic reaction; inflammatory pathologies • Pathophysiological mechanisms of diabetes; immunology of multiple sclerosis • Auto-immunity: physiology and pathology; transplant immunity
Subject Credits	6
Matter Coefficient	3
Weekly Hourly Volume (VHH)	06h00
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 03h00 Tutorial: 01h30 Lab work: 00h00
Semester Hourly Volume (VHS)	67h30
Personal Work Hours	82h30
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE

Mode of evaluation	Written examination.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).
First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED	
Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Not applicable (no scheduled laboratory sessions).
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Not applicable.

EXPECTATIONS	
Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY	
Reference textbooks and course handouts in immunopathology (departmental collection).	

SYLLABUS OF MATTER

HOST-PATHOGEN RELATIONS

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: MESSAOUDI DALILA				
Email	messaoudidalila@yahoo.fr	Reception day		Hour	_____
Office phone N°	_____	Building	_____	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UEF1
Objective	Enable students to understand cellular interactions during immune defence against pathogens (viruses, bacteria, parasites, toxins), viral immune-escape mechanisms, and the principles of vaccination illustrated through examples.
Prerequisites	Immunology, microbiology, parasitology.
Short content	• Major classes of infectious agents and effector mechanisms; intracellular protein trafficking and its subversion by pathogens • Cytokines, cell communication/activation and their subversion by pathogens • Bacterial infections: pathogenicity mechanisms, escape mechanisms, bacterial toxins; immune response to BCG • Parasite evasion/subversion of the immune system (Plasmodium, Trypanosoma, Leishmania) • Antiviral defence: viral immune-escape mechanisms; HPV and HTLV infection • Vaccination principles
Subject Credits	6
Matter Coefficient	3
Weekly Hourly Volume (VHH)	06h00
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 03h00 Tutorial: 01h30 Lab work: 00h00
Semester Hourly Volume (VHS)	67h30
Personal Work Hours	82h30
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Written examination, oral presentations.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).
First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED	
Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Not applicable (no scheduled laboratory sessions).
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Not applicable.

EXPECTATIONS	
Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY	
• Kayser F.H., Manuel de poche de microbiologie médicale, Flammarion, 2nd ed., 2016. • Immunologie et microbiologie en soins infirmiers, 3rd ed., Éditions CEC. • Atlas de poche de microbiologie médicale, Flammarion Médecine-Sciences.	

SYLLABUS OF MATTER

IMMUNOTHERAPIES

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: DJELLILI HANIFA				
Email	hdhanifadj@gmail.com	Reception day	Tuesday	Hour	10-14h
Office phone N°	_____	Building	SNV	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UEF2
Objective	Enable students to understand the applications of cellular and molecular immunotherapy tools, and to know the different methods for producing and characterising therapeutic (monoclonal or recombinant) antibodies.
Prerequisites	Immunology.
Short content	- Cellular tools: anti-tumour vaccination principles (T, NK, NKT cells), tumour immune-escape mechanisms, regulatory T cells and cancer, tumour vaccines, dendritic-cell therapy - Molecular tools – monoclonal antibodies: production/characterisation methods, therapeutic uses (killer, protective, vaccine and recombinant antibodies, pharmacological antibodies) - Targets of immunotherapy: transplant tolerance, TCR/BCR and regulatory T cells, inflammatory cytokines, monitoring of immune responses, anti-TNF therapies, Fc receptors and phagocytes, pharmacokinetics/immunogenicity of monoclonal antibodies
Subject Credits	6
Matter Coefficient	3
Weekly Hourly Volume (VHH)	06h00
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 03h00 Tutorial: 01h30 Lab work: 00h00
Semester Hourly Volume (VHS)	67h30
Personal Work Hours	82h30
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Written examination, oral presentations.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).
First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED	
Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Not applicable (no scheduled laboratory sessions).
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Not applicable.

EXPECTATIONS	
Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY	
• Kayser F.H., Manuel de poche de microbiologie médicale, Flammarion, 2nd ed., 2016. • Immunologie fondamentale et immunopathologie (AllergoLyon university resources).	

SYLLABUS OF MATTER

MECHANISMS OF ONCOGENESIS

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: KARNOUF NASSIMA				
Email	nkarnouf@yahoo.fr	Reception day	Sunday	Hour	13-16h
Office phone N°	_____	Building	SNV	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UEM
Objective	Develop an understanding of the molecular mechanisms controlling normal cell proliferation/survival and how genetic/epigenetic changes during tumour progression alter these controls, giving students an integrated view of tumour biology based on biochemical, genetic and bioinformatic analyses.
Prerequisites	Basic notions of cell physiology and molecular biology.
Short content	- Cellular responses to signals: apoptosis, proliferation, differentiation, cell death - Cell transformation and immortalisation; molecular/cellular mechanisms of carcinogenesis - Regulation of cancer-gene expression; anti-tumour immune response - Non-immunological tumour therapies; epidemiology, prevention and screening of cancer - Directed work: article analysis and presentations on the molecular basis of major human/veterinary tumours (colorectal, breast, lung, leukaemia, lymphoma)
Subject Credits	5
Matter Coefficient	3
Weekly Hourly Volume (VHH)	03h00
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 01h30 Tutorial: 02h30 Lab work: 00h00
Semester Hourly Volume (VHS)	60h00
Personal Work Hours	65h00
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Written examination, oral presentations.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).
First knowledge check	Date / duration / type: to be announced by the teacher.

Second knowledge check	Date / duration / type: to be announced by the teacher.
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EQUIPMENT AND MATERIALS USED	
Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Not applicable (no scheduled laboratory sessions).
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Not applicable.

EXPECTATIONS	
Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY	
• "Immunothérapie du cancer : espoirs et réalités", médecine/sciences, 2006. • MSD Manuals (2024), molecular mechanisms of active specific immunotherapy. • "Immunothérapie des cancers – Succès récents et perspectives", médecine/sciences, 2011.	

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CELL AND GENE THERAPY

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: BEKKA AYOUB				
Email	ayoubbekka9@gmail.com	Reception day	Sunday	Hour	10-14h
Office phone N°	_____	Building	SNV	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UEM
Objective	Provide fundamental data on cell proliferation, enabling students to distinguish and understand cell-division mechanisms and effector actions on the cell cycle; also cover cancer genetics, apoptosis and ageing mechanisms alongside neurodegenerative diseases.
Prerequisites	Molecular biology, immunology and genetic manipulation.
Short content	- Cell therapy: dendritic cells, NK/NKT cells in oncology, allogeneic HSC transplantation and immunomodulation, regulatory T cells (GVHD, auto-immune disease, cancer), mesenchymal cells (GVHD, tissue repair) - Gene therapy: vector/virus reminders, retroviral and lentiviral vectors (GVHD control), cationic/glycosylated polymer gene transfer, cationic lipids, adenovirus vectors, AAV vectors (autoimmune uveitis), siRNA and HIV infection
Subject Credits	4
Matter Coefficient	2
Weekly Hourly Volume (VHH)	03h00
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 01h30 Tutorial: 01h30 Lab work: 00h00
Semester Hourly Volume (VHS)	45h00
Personal Work Hours	55h00
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Written examination, oral presentations.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).
First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED

Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Not applicable (no scheduled laboratory sessions).
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Not applicable.

EXPECTATIONS	
Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY	
• Kohn D.B., Kuo C.Y., Gene Therapy: Principles and Applications, 2019. • Burnett J.C., Rossi J.J., "RNA-based therapeutics", Chemistry & Biology, 2012. • Le Blanc K., Ringdén O., "Immunomodulation by mesenchymal stem cells", J. Intern. Med., 2007.	

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BIBLIOGRAPHIC RESEARCH AND RESEARCH-ANALYSIS METHODS

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: _____				
Email	_____	Reception day	_____	Hour	_____
Office phone N°	_____	Building	_____	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UED
Objective	Teach students to carry out bibliographic research and to design/write scientific articles, including bibliographic research on a cutting-edge scientific topic in preparation for the end-of-cycle dissertation.
Prerequisites	Terminology, research methods.
Short content	- Sections of a scientific work; use of online databases - Presentation of bibliographic references (ISO 690, publishing norms) - Bibliographic-research methodology; citation styles (Vancouver, Harvard) - Methodology for writing a literature review and scientific articles - Image production/processing software; critical analysis and valorisation of research work - Building a scientific document and oral presentation
Subject Credits	1
Matter Coefficient	1
Weekly Hourly Volume (VHH)	01h30
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 00h30 Tutorial: 00h00 Lab work: 01h00
Semester Hourly Volume (VHS)	22h30
Personal Work Hours	02h30
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Continuous assessment and examination.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UT units).
First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED	
Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Equipment of the Techniques d'Analyse / Biochimie / Physiologie Animale teaching laboratories (spectrophotometers, centrifuges, electrophoresis units, microscopes, etc.), as listed in the master's equipment file.
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Lab coat, gloves, safety glasses as required for practical sessions.

EXPECTATIONS	
Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY	
- Scientific databases: ScienceDirect, Springer, Elsevier, Wiley Interscience (SNDL). - Bibliographic search tools: Google Scholar, NCBI, NIST Webbook, SDBS.	

SYLLABUS OF MATTER

ARTIFICIAL INTELLIGENCE APPLIED TO SCIENCES AND TECHNOLOGY

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: _____				
Email	_____	Reception day	_____	Hour	_____
Office phone N°	_____	Building	_____	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UED
Objective	Understand the fundamental principles of AI and its role in experimental sciences, apply machine learning/deep learning to problems in biology, chemistry, physics and environment, master Python AI libraries (Scikit-learn, TensorFlow, Keras, PyTorch), and automate the analysis/interpretation of scientific data.
Prerequisites	Computer programming.
Short content	• Introduction to AI and its scientific applications; ML vs classical programming • Manipulation and preprocessing of scientific data • Machine learning applied to sciences: supervised (regression, SVM, decision trees) and unsupervised (K-Means, DBSCAN) learning • Deep learning and computer vision applied to sciences: ANN, CNN for biological/microscopic images, RNN/LSTM for time series • Case studies: species recognition, cancer-cell detection in medical images, chemical/biological process simulation • Practical work: classification/regression models, data preprocessing, clustering, CNN implementation, applied AI mini-project
Subject Credits	1
Matter Coefficient	1
Weekly Hourly Volume (VHH)	01h30
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 01h00 Tutorial: 00h00 Lab work: 00h30
Semester Hourly Volume (VHS)	22h30
Personal Work Hours	02h30
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Continuous assessment (40%) and semester examination (60%).
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).

First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED

Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Equipment of the Techniques d'Analyse / Biochimie / Physiologie Animale teaching laboratories (spectrophotometers, centrifuges, electrophoresis units, microscopes, etc.), as listed in the master's equipment file.
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Lab coat, gloves, safety glasses as required for practical sessions.

EXPECTATIONS

Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY

- Alpaydin E., Introduction to Machine Learning, MIT Press, 2020. - Goodfellow I., Bengio Y., Courville A., Deep Learning, MIT Press, 2021. - Raj S., Kumar A., Deep Learning in Biological Data Analysis, Springer, 2022.	
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SYLLABUS OF MATTER

CREATING AN ECONOMIC ENTERPRISE

MASTER COURSE	Academic Master – Applied Immunology (Biological Sciences) — Semester 3				
TEACHER	Name and surname: KAODOUNE HANENE				
Email	kaoudounehanane@gmail.com	Reception day	Wednesday	Hour	11-15h
Office phone N°	_____	Building	SNV	Office	_____

COURSE DESCRIPTION	
Unit Teaching Type	UET
Objective	Introduce students to startup creation, from idea to market launch, integrating analysis, planning and financing tools; develop entrepreneurial spirit, innovation capacity and project structuring, illustrated with concrete applications in biological sciences, biotechnology, ecology and environment.
Prerequisites	Entrepreneurship (S6, Bachelor's degree).
Short content	• Introduction to entrepreneurship and innovation; startup ecosystem • From idea to concept: identifying needs, design thinking, value proposition • Business Model Canvas: customer segments, revenue/cost structure, competitive analysis, MVP • Strategic planning and fundraising: business plan, marketing, legal structuring, financing, pitching • Launch, management and growth of the startup: team building, KPI tracking, growth strategies, pivoting • Applications and case studies in life sciences, biotechnology and ecology (biotech, green-tech, AI-in-biology startups)
Subject Credits	1
Matter Coefficient	1
Weekly Hourly Volume (VHH)	01h30
Lecture / Tutorial / Lab (Cours/TD/TP)	Lecture: 01h30 Tutorial: 00h00 Lab work: 00h00
Semester Hourly Volume (VHS)	22h30
Personal Work Hours	00h00
Targeted skills	Mastery of the concepts and techniques listed in the short content; ability to analyse, synthesise and communicate scientific results in the field of Applied Immunology.

EVALUATION OF KNOWLEDGE	
Mode of evaluation	Semester examination (100%), in-person.
Continuous assessment weighting	As defined by the teaching team at the start of the semester (typically $\geq 40\%$ for UED/UET units).

First knowledge check	Date / duration / type: to be announced by the teacher.
Second knowledge check	Date / duration / type: to be announced by the teacher.

EQUIPMENT AND MATERIALS USED

Handouts	Lecture notes (polycopiés), slide decks and scientific articles provided by the teacher.
Laboratory materials	Not applicable (no scheduled laboratory sessions).
Application names	Departmental e-learning platform / university digital workspace (as communicated by the teacher).
Protective materials	Not applicable.

EXPECTATIONS

Expected of students	Regular attendance, active participation, completion of assigned readings/exercises and punctual submission of practical-work reports.
Teacher expectations	Timely delivery of the course content, availability during reception hours, and clear communication of evaluation criteria at the start of the semester.

BIBLIOGRAPHY

- Blank S., Dorf B., The Startup Owner's Manual, 2nd ed., Wiley, 2023.
- Ries E., The Lean Startup, revised ed., Crown Business, 2024.
- Maurya A., Running Lean, 3rd ed., O'Reilly, 2023.