European Master in Public Health
EUROPUBHEALTH+

Specialization:
Environmental and Occupational Health Sciences

2017-2021

EHESP School of Public Health

TEACHING PROGRAMME

European Master in Public Health (Europubhealth+)
SPECIALIZATION: Environmental and Occupational Health Sciences

The present document details the content of the second year specialisation of the **Europubhealth+** programme delivered in Paris by the EHESP School of Public Health. For the first year of the Europubhealth+ programme, a foundation course with the core competences in public health is delivered at the School of Health and Related Research - University of Sheffield (United Kingdom) in English or at the Andalusian School of Public Health - University of Granada (Spain) in Spanish.

I. PRESENTATION

The specialization course lasts two semesters and students get 30 ECTS for mandatory modules and 27 ECTS for the dissertation work and related placement. A mandatory integration module worth 3 ECTS is organized by the EHESP School of Public Health in Rennes (France) at the end of the academic year.

The specialisation provides students and young professionals wishing to design their career in public health with high level of qualification which enhances intellectual approach to the subject. Its offers basic and advanced schemes of study involving knowledge, skills and techniques which can variously be applied to different public health issues and in the context of health services agencies or health & environmental organizations in the public or private sector, in developed or developing countries. The specialisation is both a professional qualification and a contributor to generic skills in research. It provides traditional core courses and options with an innovative approach to developing public health agendas in different contexts including crisis situations. The international teaching staff comprises outstanding lecturers from European & North American universities and from research institutions.

In general, the EOHS programme aims to train professionals to identify risks run by the general population en large, consumers or workers exposed to nuisances and hazardous agents, and to propose measures designed to abate exposures and health impacts. It embrasses a broad range of disciplines and viewpoints (from individual vulnerability factors to public policies) in order to stimulate the students' capacity to develop a consistent and cross-cutting problem solving approach.

II. QUALIFICATIONS OF THE GRADUATE

The goal of the specialisation is to train young professionals to identify the health problems of a population, analyze the resources needed to preserve and improve population health, and progressively become a new generation of decision makers in health. To achieve this, the EHESP pedagogy stresses an inter-disciplinary approach, consisting in placing students in realistic problem contexts from which they utilize various professional skills and methodologies. The MPH encourages a degree of specialisation according to the students' career objectives

Graduates of the EOHS specialisation are able to:

- Apply analysis skills and techniques to assess and understand an environmental or occupational health problem
- Discuss the basic biological concepts that allow to identify the hazardous potency of chemical, physical or (micro)biological agents and to evaluate the exposure-response relationships
- Describe the principles of exposure and risk assessment for nuisances and hazards related to the environment or to occupational settings
- Discuss various risk management and risk communication approaches in relation to issues of environmental or occupational hazards and nuisances.

III. REQUIREMENTS FOR GRADUATION AND OBTAINING PROFESSIONAL TITLE

In order to graduate, students must get an overall average of at least 10/20 to obtain all mandatory credits of the second year specialization. Students must also pass all mandatory credits during the first year of the programme in the partner university (Sheffield or Granada) as well as both integration modules organized at EHESP in Rennes.

IV. PRACTICAL PLACEMENT

A 4-month practical placement is mandatory and linked to the Master dissertation work.

STUDY PLAN

Specialization: Environmental and Occupational Health Sciences

Ist semester

No	Name of the subject	Class form	M/F	Credit form (Mark or Pass/Fail)	Number of teaching hours	ECTS
1	Upgrading Biostatistics	Seminar	M	Mark	-	Not credited
2	Environmental and occupational health sciences Pre-requisite	Distance learning material	M	Mark	30 (teaching hours equivalent)	3
3	Advanced Core curriculum – Environmental and occupational health sciences	Seminar	M	Mark	30	3
4	Exposure Assessment	Seminar	M	Mark	30	3
5	Global environmental changes and health	Seminar	M	Mark	30	3
6	Risk assessment module	Seminar	M	Mark	30	3
7	Critical windows of exposures and vulnerability module	Seminar	M	Mark	30	3
8	Advanced Core module Epidemiology	Seminar	M	Mark	30	3
9	Advanced Core curriculum Information sciences and biostatistics	Seminar	M	Mark	30	3

IInd semester

1	Advanced Global environmental changes module	Seminar	M	Mark	30	3
2	Evaluation of public health programs	Seminar	M	Mark	30	3
3	SUPRA OPTIONAL Cross-disciplinary Module: Global and International Health, Spatial Statistical analysis, Integrated Module of Public Health, Advanced cores modules in Social & Behavioural Sciences, Advanced cores modules Management & Health policy Sciences	Seminar	F	Pass/Fail	-	Not credited
4	Dissertation and placement	-	M	Mark	-	27
5	Integration Module (at EHESP in Rennes – France)	Seminar	M	Mark	30	3

F – facultative, M – mandatory to graduate

Total number of teaching hours: 300
Total number of ECTS: 60

Module title	**Advanced Core curriculum – Environmental and occupational health sciences**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	The introductory module focuses on three methodological domains and on their applications to environmental and occupational health issues, so as to strengthen and expand the acquisitions of the first year: (i), epidemiological methods developed for the investigation of health problems resulting from air pollution in outdoor or occupational settings; (ii) various developments in the field of human exposure assessment, their respective strengths and limitations; (iii) finally, experimental models and state of knowledge in the field of carcinogenesis, neurotoxicity, respiratory and reproductive toxicology in relation with environmental and occupational exposures.
Learning outcomes	Consolidate the competencies acquired in environmental health sciences in M1 • Apply analysis skills and techniques to assess and understand an environmental or occupational health problem • Discuss the basic biological concepts that allow to evaluate the exposure-response relationships • Describe the principles of exposure and risk assessment for nuisances and hazards related to the environment or to occupational settings
Assessment methods	Group work & presentation (30%) of the final grade On table test of 2 hours (70%) of the final grade Scientific paper reading and answers to a set of questions (critical analysis of the study design, of exposure assessment, writing of the hidden summary…). Final Grade on 20 at least equal to 10 (requirement).
Type of classes / Workload	5 days of 6 hours face to face, and personal or group work (estimation 15h)
Number of ECTS	**3**
Teaching & learning methods	A group assignment whereby students will prepare and expose critical analyses of a set of papers from the scientific literature in a variety of domains will force them to draw from the different disciplinary areas in an integrative way.
Course topics	• Epidemiology (1): Methodology in occupational health • Epidemiology (2): -: methods in occupational epidemiology • Risk Assessment: An introduction, rationale, methods & application, • Exposure (1): Biomarkers; strength, limitations and applications. • Exposure (2): Construction and validation of job-exposure matrices. Examples. • Toxicology (1): Evaluation of self-training acquisition, • Toxicology (2): an introduction. • Toxicology (3): Respiratory toxicology. • Conference : Is Fertility impaired by Environmental Contaminants, • Toxicology (4): Carcinogenesis. • Toxicology (5): Neurotoxicology. • Paper analysis in environmental health (1) • Paper analysis (2): Group presentations (and exam preparation).

Module title	**Minor A « Exposure Assessment»**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	Main general objective is to identify keypoints of an exposure assessment.
Learning outcomes	• To understand the concept of exposome; • To identify methods of exposure assessment; • To choose relevant information and elaborate rough protocol in a given situation; • To analyze and integrate information on exposure associated to an agent. Globally, Minor 216 contributes to the following general competencies acquisition objectives : 1. Describe the direct and indirect human, ecological and safety effects of major environmental and occupational agents. 2. Specify current environmental health risk assessment methods. 3. Specify approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety.
Assessment methods	Group presentation of a protocol of exposure assessment.
Type of classes / Workload	Number of days: 4
Number of ECTS	**3**
Teaching & learning methods	After theoretical overview of current knowledge and practice, a large part of time will be dedicated to examples, exercises, lab visit and an integrative case study.
Course topics	○ The exposome concept, methods in exposure science ○ Environmental fate of pollutants ○ Pollutants measurement ○ Exposure modeling ○ Geographical tools ○ Aggregating exposures and handling variability ○ Case study : exposure assessment protocol (all week long)

Module title	**Minor B « Global environmental changes and health»**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	This module aims at 1/ identifying different factors that drive the global environmental changes (GEC) and understanding their interactions and 2/ understanding the impact of the GEC on health, focusing mainly on infectious diseases. 3/ understanding how interactions between different GEC impact human health. The course is structured into 4 parts: After an overview of the global environmental changes and the impact on health (PART 1), the course will present the 3 main drivers of the GEC and their impact on health, namely, Climate, Biodiversity and Population Dynamics following by the exploration of the interaction between these drivers (PART 2). To illustrate the topics of the course with specific examples, 2 classes will focus on the impact on GEC on vector-borne diseases (e.g. malaria and dengue) and direct transmitted infectious diseases (e.g. cholera and meningitis) consecutively (PART 3). Finally, the

	course intends to emphasize the transfer of expertise between the research side and policy makers (e.g. WHO, Governments) through a session with specific situations of Public Health decision-making.
Learning outcomes	At the end of the module, the students should be able to: ○ Identify the major drivers involved in global environmental changes and their interaction ○ Illustrate those drivers with examples ○ Analyze how these drivers impact on human health (with examples); ○ Critically assess scientific studies and political decisions on the subject
Assessment methods	A two hour written examination
Type of classes / Workload	Number of days: 5 Number of hours : 35
Number of ECTS	**3**
Teaching & learning methods	Students are asked for actively participating each session and share some experiences when relevant.
Course topics	○ Global Environmental changes and Health: Introduction ○ Biodiversity evolution and Health ○ Global Environmental Changes and direct/environmental transmitted diseases ○ Population Dynamics changes and Health ○ Synthesis part 1: How do the drivers interact? ○ Interactions between urban environment and infectious disease transmission and control: the example of Dengue in Asia ○ Climate changes and Infectious Diseases ○ Global Environmental Changes and vector-borne/zoonotic diseases ○ Evolutionary medicine: an introduction ○ Global Environmental change considerations and implications in Public Health

Module title	**Major A « Advanced Global environmental changes module»**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	The course covers interdisciplinary scientific issues such as environmental systems, ecology, epidemiology, population dynamics, biomathematics and biostatistics, biodiversity changes, ecosystem modifications, climate change, agriculture development and intensive farming, transcontinental air transport and international trade, established and emerging diseases. The instructors are renowned international specialists in medical sciences, ecology/evolutionary biology and biomathematics affiliated to the most famous universities and research institutes in the world. The course discusses the many different examples of disease emergence/outbreaks and their spatial spread, that are interconnected to Earth systems disruption/alteration and globalization events. It particularly focuses on the dynamics of Earth physical/biological systems and the impacts of increasing human population/consumption on these systems. The syllabus is organized around major questions including (i) the exploration of the linkages between diseases and globalization due to environmental hazards and modernization (e.g. transcontinental air transport of goods and people), (ii) the examination of the consequences of these connections on human health, and (iii) the evaluation of the risks associated with not considering the complexity of these webs of interactions. Strong emphasis will be made (i) on the consequences of nowadays vaccine strategies for disease, control and their consequences on disease agent persistence, spread and evolution, and (ii) the interactions between complex disease systems and public health economy with an emphasis on situations in developing countries, i.e., Africa. Recent applications to public

	health policies and decisions by international WHO, UNEP, UNESCO, ICSU programmes in environmental health sciences research initiatives and health perspectives will be discussed within the framework of the "emerging field" called Conservation Medicine or Darwinian Medicine
Learning outcomes	At the completion of the module, the students should be able to: ○ Identify the main determinants of (new) infectious disease risks in a changing world ○ critically assess the quality and opportunity of national and international public health policies when facing these new disease risks ○ specify environmental risk assessment methods that are applied for microbial agents ○ put new emerging infectious disease risks into perspective with other (agriculture, demography, pollution, international travel and trade,…) dimension of globalization
Assessment methods	The 2-hour final exam is designed to integrate many of the concepts & methods the students have acquired in this course.
Type of classes / Workload	Number of days: 5
Number of ECTS	**3**
Teaching & learning methods	Students are expected to attend all lectures and group works.
Course topics	Session1: Land- use change, ecosystem alteration, agriculture development, intensive farming and health. An introduction: 3H Session 2: Adaptation of disease vectors to environmental changes in the Tropics: 3H Session 3: Climate change and infectious diseases: 3H Session 4: Ecosystem dynamics, biodiversity and (emerging) infectious diseases: 3H Session 5: Agricultural practices and plant health: lessons from the past and strategies for the future: 3H Session 6: Avian influenza A viruses: from wild bird to pandemic: 3H Session 7: Ecosystem modifications and infectious disease emergence. Buruli ulcer as a case-study Session 8: Imperfect vaccines in a changing world, and their consequences for public health Sessions 9 & 10: Poverty Traps Formed by Feedback Between Economics and the Ecology of Infectious Diseases: 6H

Module title	**Major B: « Risk assessment module»**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	The goal of risk assessment is to select the best available information on hazards and exposures and organize it in a systematic way so as to provide decision makers and all stakeholders a strong scientific background on the health impact of a given environmental situation and of their possible choices for action. This specialization module, covering both methodological and applied issues, aims to train qualified professionals capable to design and conduct risk assessment studies, in particular in the framework of the implementation of the European REACh framework for hazard and risk assessment of chemical substances. This module is, by nature, inter-disciplinary, at the interface between toxicology, biomathematical modeling, epidemiology and engineering sciences. Students will be exposed to state-of-the- art presentations from leading scientists in their field, dealing with hazard dose-response modeling, cumulative exposures, and with extrapolation issues regarding short to long term exposures, hazard and risks from mature to less mature (infant and children) organisms, or from animals to humans. Illustrations will encompass chemical substances and physical stressors, along with microbial agents.

Learning outcomes	Design and conduct risk assessment studies in complex environmental pollution situations. ○ Implement analytical and technical competencies to undertake a risk assessment in a setting of chemical or microbial pollution of the environment ○ Read critically a risk assessment report in the setting of an environmental microbiological pollution ○ Use in a critical manner the data bases on hazard qualification and dose-response of chemicals so as to conduct a risk assessment study in a complex environmental pollution situation ○ Expose the results of a risk assessment study.
Assessment methods	1/3 : Grade after the group work and presentations on the course case study. 2/3: On table test of 2 hours: scientific paper reading and answers to a set of questions (critical analysis of the study design, of exposure assessment, writing of the hidden summary…). Grade on 20 at least equal to 10.
Type of classes / Workload	5 days of 6 hours face to face, and personal or group work (estimation 15h)
Number of ECTS	**3**
Teaching & learning methods	Students have to come to class prepared to discuss issues after reading the course material on the REAL facility. In class quizz will assess learning acquisition. Thorough exploration of the data base created for the course case study on a complex pollution setting (situation analysis, choice of relevant information, cumulative risk assessment). Group work (about 3-4 students per group) on specific questions raised on the case study, with oral presentation.
Course topics	○ Health Risk Assessment: concepts, utility, principles and methods. ○ Presentation of the case study and follow-up of group work. Risk assessment in a cumulative exposure setting. (3 sessions) ○ Are reference doses or MRLs transferable to childhood exposures-? State of the science. ○ Relative potency factors: a tool to tackle cumulative exposures. ○ Current -research issues on microbiological risk assessment A: ingestion route-; B-inhalation route. ○ Radiological risk assessment ○ Case study presentations.

Module title	**Major C: « Critical windows of exposures and vulnerability module»**
Faculty	-
Conducting unit	Department of environmental and occupational health and sanitary engineering
Teaching Language	English
Aim of the course	The toxicity of chemicals or of other environmental stressors is highly dependent on exposure conditions and on the particular vulnerability of the exposed individual or group of persons. The module will address these issues with some emphasis on vulnerability during development and growth and on occupational exposures. The module is essentially multidisciplinary with epidemiological, toxicological and social sciences perspectives. The following items will be discussed: importance of windows of exposure to carcinogens or reprotoxic agents during pregnancy, in early life and at the workplace; vulnerability of children to physical agents; transgenerational epigenetic effects both in experimental animals and in humans; examples of gene-environment interaction and mechanistic basis of vulnerability, notably during development.

Learning outcomes	○ Describe the hypothesis of the developmental origin of adult health and disease (DOHaD) ○ Identify the role of parental exposure at work or in the general environment in developmental toxicity ○ Describe gene-environment interactions in fetal development and disease
Assessment methods	On table test of 2 hours: scientific paper reading and answers to a set of questions. Grade on 20 at least equal to 10.
Type of classes / Workload	5 days of 6 hours face to face, and personal or group work (estimation 15h)
Number of ECTS	3
Teaching & learning methods	The courses are highly interactive; students are expected to do some reading before attending the course (required readings are posted on the site before the course).
Course topics	○ Toxicological basis of vulnerability. ○ Environmental exposure and genetic susceptibility in Parkinson Disease. ○ Epigenetics in Health and Disease. ○ Gene-environment interaction in fetal development and disease. ○ Children exposure to electromagnetic waves. ○ Social vulnerability. ○ Is adulthood fertility affected by prenatal or childhood exposure to environmental hazards? Epidemiological and toxicological evidence. ○ Reprotoxic agents at the workplace or as drugs. Paper discussion. ○ Developmental vulnerability to neurotoxicity. ○ Precautionary assessment of critical windows'. ○ "Transgenerational Epigenetic Effects and Endocrine Disruptors: Experimental approach".

Module title	**Advanced Core module – Epidemiology**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	Epidemiology is one of the pillars of public health. Epidemiologists study the distribution and determinants of disease in human populations; they also develop and test ways to prevent and control disease. The discipline covers the full range of disease occurrence, including genetic and environmental causes for both infectious and noninfectious diseases. Increasingly, epidemiologists view causation in the broadest sense, as extending from molecular factors at the one extreme, to social and cultural determinants at the other. This course introduces students to the theory, methods, and body of knowledge of epidemiology and provides an integrated approach to the disciplines of Epidemiology. The primary objective of the course is to teach the basic principles and applications of epidemiology and introduce students to the theory, methods, and body of knowledge of epidemiology. This course will cover fundamental concepts of epidemiology, causal inference, study design, confounding and bias, ethics, sample size calculation and data collection methods. If Public Health is not a simple, reactive, "take the pill three times a day" solution, but a purposeful approach to preventing disease and promoting health, then being able to document, measure and understand all the consequences becomes imperative. The methods introduced in this course begin to provide some of the tools necessary to help estimate the relationships between the smaller pieces that comprise the complex and dynamic web of systems in Public Health.

Learning outcomes	Students who successfully complete this course will be able to: • Discuss the role of epidemiology within the broader field of public health • Discuss the principles of disease prevention within populations • List and describe key terms used in the epidemiology and prevention of infectious disease • Calculate and interpret basic population measures of health and disease occurrence including incidence and prevalence • Make appropriate comparisons of disease rates within and between populations • Distinguish between basic measures of association, including rate ratio, risk ratio, incidence density ratio, odds ratio, attributable risk, and population attributable risk • Select and apply fundamental epidemiologic study designs including randomized clinical trial, cohort, case-control, and ecologic for the purpose of investigating public health problems • Identify the role of bias and confounding in epidemiologic research and apply methods appropriate to assessment of confounding and various types of bias • Differentiate between various epidemiologic study designs and compare their respective strengths and weaknesses • Critique published epidemiological studies and identify their strengths and weaknesses
Assessment methods	Student grades will be based on: 1. Readings and Class Participation (20 % of grade or points) 2. Homework Assignments (30% of grade or points) 3. Final Exam (50 % of grade or points)
Type of classes / Workload	5 days of 6 hours = 30 hours
Number of ECTS	**3**
Teaching & learning methods	Lectures: Attendance at lectures is an essential and mandatory part of the course for which there is no suitable substitute. A list of the topics and lecturers is found below. Weekly lectures are the foundation upon which the course is based. Material is covered which may not necessarily be presented elsewhere and an invaluable opportunity for questioning and interacting with expert practitioners is provided. Reading assignments should be done prior to lectures. Homework: The homework assignments are interactive exercises on the Epiville training site (epiville.ccnmtl.columbia.edu), an online learning tool developed by Columbia University faculty and students. -Epiville can be entered through the course website. After completing the online exercises, students are asked to submit answers to the first discussion question listed at the end of each exercise.
Course topics	Session 1. Introduction, Fundamental Concepts of Epidemiology Session 2 Clinical trials Session 3. Measurement, validity and reliability Session 4. Study Design Session 5. Confounding and bias

Module title	**Advanced Core curriculum – Information sciences and biostatistics**
Faculty	-
Conducting unit	Department of Quantitative Methods in Public Health
Teaching Language	English
Aim of the course	If not all MPH students decide to become “biostatisticians”, knowledge of biostatistics is required in almost every field of public health and its applications. Therefore, all students

	have to develop solid knowledge base in biostatistics. This course will present the most fundamental methods used in biostatistics including applied leaning exercises by means of computer-based live examples with STATA software® during all lectures, exercises within small working groups as well as project-based learning.
Learning outcomes	At the end of the module, the students should be able to: o Investigate a public health issue through quantitative data o Make comparisons through basic and multivariate statistical analysis from STATA software ® o Interpret and summarize statistical results, with a focus on logistic regression
Assessment methods	Group work (continuous) and Individual exam (2 hours)
Type of classes / Workload	5 days of 6 hours = 30 hours
Number of ECTS	**3**
Teaching & learning methods	All students will be asked to practice and become familiar with the use of the statistical package. Various statistical analyses with different sets of data will be conducted, from basic to advanced applications, the latter targeting students who wish to develop an in-depth knowledge of biostatistics and continuing biostatistics in further classes or internships. In all cases, public health field examples will highlight that course material is connected to real-life situations.
Course topics	Day 1: Introduction to logistic regression – Computer lab Day 2: Sample size and power calculation – Computer lab Day 3: Collinearity, interaction – Computer lab Day 4: Goodness-of-fit, choice of final model – Computer lab Day 5: Sensitivity analysis, Presentation and interpretation of results - Computer lab