Short description of Minors and Majors in Information Sciences and Biostatistics (ISB)

Module ≠	Module title	Coordinator	Contents	ECTS #	Teaching Week/year
214	**Minor A of the Information Sciences and biostatistics "Data Mining"**	**Séverine Deguen**	**Minor A "Data Mining"** Data mining is a statistical method used in public health to analyze high-dimensional data sets. To analyze the quantitative, or qualitative variables, or both types, different methods are available. This technic is particularly adequate to synthetize variables highly correlated (eliminating colinearity problem in multiple regression, for example), to construct composite index (socioeconomic deprivation index, for example) or also to create homogeneous groups of statistical units, to prepare the sampling procedure of an epidemiological study. Each day is designed to alternate between theory and practice. ***Learning objectives**: at the end of the module, the students should be able to* 1. To be familiar with the most common methods: principal component analysis, cluster analysis .... 2. To use the statistical function implemented in STATA software 3. To interpret the results including the statistical tables (contribution of variable on each components, correlation, eigen values (….) and also correlation circle and dendogram. 4. To carry out PLS regression **Prerequisite** Advanced course in biostatistics	**3**	**46, 2016**
215	**Minor B of the Information Sciences and biostatistics "Introduction to R: computing, graphics & statistics"**	**Nolwen Le Meur**	**Minor B Introduction to R: computing, graphics & statistics** "R" is a language and environment for statistical computing and graphics. R is highly extensible and is a free software. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. The course assumes no prior knowledge of R and covers the following topics. ***Learning objectives**: at the end of the module, the students should be able to:* 1. To be familiar with R and use the software for data management 2. To recognize and use statistical functions 3. To apply programming methods 4. To plot data and use different types of graphs 5. To carry out different linear, logistic regression models, analysis of variance 6. To apply the statistical methods with R to a personal study case **Prerequisite** Students are assumed to be familiar with elementary statistical methods such as regression models, analysis of variance, hypothesis testing, etc.	**3**	**43, 2016**

229	**Major A of the Information Sciences and biostatistics « Modelling of infectious diseases »**	**Elisabeta Vergu**	**Major A « Modelling of infectious diseases »** Mathematical models contribute to the understanding of fundamental epidemiological processes or are used to predict disease spread at various spatial-temporal scales and its prevention and control. Alone or combined with economic cost-effectiveness studies, mathematical models and associated statistical techniques have become invaluable decision-making tools in public health in general and in planning mitigation strategies against any epidemic of a communicable di communicable disease in particular The main objective of this course is to provide students with the knowledge and skills that enable them (i) to critically read and analyze research articles featuring modelling-based epidemiological studies and also (ii) to construct and interpret simple models for describing epidemic spread and control. ***Learning objectives: at the end of the module, the students should be able to:*** *1.* Critically read and analyse research articles featuring modelling-based epidemiological studies; *2.* Provide the general ideas for constructing and analysing simple models of epidemic spread and control; *3.* Interpret models outputs as information that help guide public health decision making. The course will present the simplest models and methods used in infectious diseases modelling either conceptually or practically (through computer-based exercises and critical reading of scientific articles) and will illustrate this methodology with several developed examples.: Such as (i) main classes of epidemic models (population vs individual based, deterministic vs stochastic, spatial models), (ii) construction of SIR-like models and calculation of basic reproductive numbers (R_0); bioterrorism-related epidemics illustrated through modelling-based studies of detection and spread of smallpox, pneumonic plague, Ebola and anthrax outbreaks; control of infectious diseases illustrated with a modelling-based approach of measles vaccination in epidemic context;: last influenza a case study .	**3**	**48, 2016**
230	**Major B of the Information Sciences and biostatistics track "Multilevel Analysis"**	**Jay Kaufman**	**Major B Multilevel Analysis** "Multilevel analysis has recently emerged as a useful analytical technique in several fields, including public health and epidemiology. Multilevel analysis originally developed in the fields of education, sociology, and demography, has received increasing attention in public health and epidemiology over the past few years", especially in social epidemiology. ***Learning objectives****: at the end of the module, the students should be able to:* 1. To identify the levels of analysis 2. To identify the principles of multilevel regression techniques 3. To recognize different concepts such as: • Different levels of variation • Intra-class correlation • Fixed and random effects • Individual & contextual factors 4. To identify multilevel structures 5. To apply different methods and use basic multilevel concepts	**3**	**50, 2016**

231	**Major C of the Information Sciences and biostatistics track " Spatial Statistical analysis"**	**Séverine Deguen**	**Major C : Spatial Statistical analysis** Geographic Information Systems (GIS) has become an essential tool for understanding different public health issues: how the rate of a health event is spatially distributed? Does the proximity to environmental nuisances spatially correlated to the health event? .It is an appropriate tool for visualizing public health issues and communicating findings. The course covers theoretical and applied cartography, as well as basic thematic analyses of spatial data derived from existing databases. The software used in the course is ArcGIS. Each day is designed to alternate between theory and practice. **Learning objectives: at the end of the module, the students should be able to:** 1 – To identify the principle of a spatial statistical analysis and the major differences with a classical statistical analysis (in particular, spatial heterogeneity and autocorrelation) 2 - To be familiar with ArcGIS and use the software for mapping 3 –To map different types of variables 4 - To apply basics spatial statistical methods **Prerequisite** Advanced course in biostatistics	**3**	**03, 2017**