# *Covid-19 crisis as a model for data literacy*

## CONTACT INFORMATION

- Sorbonne University, Charles University, University of Milano, University of Heidelberg, Bachelor 1, Multidisciplinary, Semester 2
- Code du cours, **Covid-19 crisis as a model for data literacy**
- Fully Online Course on The LMS of Sorbonne University Faculty of Science
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## CONTEXT

- This course equips students with the knowledge to understand the Covid pandemic in all dimensions: better understanding the concept of “model”, manipulating the data, acting in autonomy, exercising their critical thinking and countering fake news.
- In a multidisciplinary approach, teachers of health, sciences and humanities present in short videos the researchers' answers to the issues posed by the pandemic.
- In a second phase, practical training on data and statistics is proposed to better master and understand digital representations.
- To finish with an active educational phase, the students, in small international groups, do a research project on a subject linked to themes of the short videos. For this research, the students will use statistics, data handling and collate knowledge necessary to the problem.
- Prerequisite: a good level of English as the course is taught in this language (videos are subtitled in English)

## TARGETED LEARNING OUTCOMES

After this course, the students will be able to manipulate data, visualize the data, and calculate basic statistics on them. They will be able to study a question linked to the pandemic of COVID-19 in several disciplines and address it by studying related open data.

## TEACHING & LEARNING ACTIVITIES

Présentation générale des activités pédagogiques d'enseignement qui sont prévues dans le cours afin d'accompagner et favoriser l'apprentissage de l'étudiant (exposés, production de ressources, TP, projets…), quelles parties sont les plus difficiles, etc

| Dates or period | Specific learning outcomes | Disciplinary content | Pedagogical activities | Prerequisite, preparatory lectures and exercises | Learning time |
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| Week 1 and 2, 1st of March to 14th of March | Summarise and explain the main subjects highlighted by the experts on several problematic and pending questions | 3 videos on each subject.<br>-**Sociology**: Beate Collet (SU)<br>Overview of some social consequences of lockdown due to the pandemic, especially in family and private life sphere. The pandemic did not only have an impact on health but also transforms social relations. The idea is to foster multidimensional thinking including consequences on social relations.<br>-**Geography**: Olivier Milhaud (SU)<br>Overview of some geographical dimensions of the pandemic and the manifold circulations (of virus, people, workers, goods, financial flows). It develops critical thinking by considering movements in the context of lockdowns<br>-**Philosophy**: Cédric Paternotte (SU)<br>The aim is to establish if, and if yes when, randomized controlled trials (RCTs) constitute the best method for finding efficient treatments in the context of a pandemic. We will introduce and discuss a number of philosophical arguments regarding the epistemological, ethical and pragmatic aspects of RCTs.<br>-**Political Science**: Jale Tosun (UH)<br>Explain the policy responses to the COVID-19 pandemic with a focus on the comparison of the policy measures adopted at the level of the nation-state. The policy responses to the pandemic are marked by uncertainty and changes in the level of information and knowledge related to its causes and consequences.<br>-**Psychology:** Antonella delle Fave (UM)<br>Resilience is the ability to actively rebound from disruptive life challenges. Covid-19 pandemic is a clear example of an adversarial circumstance, in which resilience represents a key asset supporting the successful functioning of persons, families and communities. Empirical evidence of Covid related resilience will be provided through results from research studies.<br>-**Pharmaceutical Science**: Giulio Vistoli (UM)<br>Overview on the opportunities and challenges proposed by the rational discovery of efficient drugs to combat SARS-CoV-2 infection.<br>-**Epidemiology**: Elia Biganzoli (UM)<br>Overview of the application of Medical Statistics and Data Science principles to the epidemiological aspects of Covid-19. The aim of the formal teaching and practical | Lectures through short videos. Quizzes during and after watching the videos<br>Asynchronous mode | None | 8 h |

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| | | trainings will be providing awareness about the quantitative aspects of epidemics with an interdisciplinary bridge.<br>-**Gynaecology**: Khaled Ismael (CU)<br>Overview on the impact of the pandemic on women's health-related clinical outcomes and service provision in high, low and middle-income healthcare settings | | | |

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| Week 3-8, 15th of March to 15th of April | Learning basic concepts in statistics and epidemiological models.<br>**Being able to calculate basic quantities in probability.**<br>**Use basic concepts in statistics.**<br>**Being able**<br>Differentiate the target and the estimator.<br>Develop a critical approach of the epidemiological models. | **Statistical Course**<br>1) Basic concepts of probability<br>a) Random variables<br>b) Expectation, variance, density<br>c) How probability concept will help to answer epidemiological questions<br><br>2) Statistics<br>a) Observation sample<br>b) Empirical statistics and why they are useful<br>c) Estimation and confidence intervals<br>d) Hypothesis testing<br><br>3) Types of data<br>a) Micro-level Vs. Macro level<br>b) Biases in the data (differences in term of reporting and so on)<br><br>4) Introduction to compartmental models<br>a) SIR, SEIR…<br>b) Reproducing number<br>c) How to fit SIR from macro data<br><br>5) Survival analysis<br>a) Hazard rate, survival function, letality<br>b) Regression models ? Cox ? AFT ?<br>c) Censoring and truncation<br><br>**PRACTICAL WORK**:<br>PW0: Familiarisation with Python<br>PW1: Simulation Random, binomial, Gaussian variablesP<br>PW2: Statistical basis<br>Handling, representation, average, median, histograms,<br>Case-fatality rate, classical laws, Estimated case-fatality rate<br>PW3 and 4: Program a representation of a SIR and SIER epidemiological models + use of a website that simulates them by playing with the parameters.<br>PW5: lethality rate, recognition of the shift between reality and modelling results. Limits of the correction attempts | 2 modules of 4 videos with a different approach for each level: beginners or non-science, and students in science.<br>6 practical classes in Python with Notebooks<br><br>Asynchronous mode | High school level in mathematics, science or non-science students | 8h course +12h PW |

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| Week 4<br>1st of April | Creation of working teams | | Online evening meeting.<br>Collaborative learning activity:<br>Creation of international groups of 4 students from the 4 universities.<br>Work on the defined research project. | Read the subjects of the projects proposed by the experts before the meeting | 2h |
| Week 4-13<br>1st of April to end of May | Produce a collaborative report on one of the main subjects<br>Being able to conduct a small research project. in group.<br>Being able to collaborate remotely.<br>Working in a multicultural environment.<br>Usage of critical thinking in basic research | Work in groups of 4 students on the disciplinary research project.<br>Elaboration of the work plan<br>Definition of the work schedule<br>Distribution of the workload among group members<br>Research phase<br>Short report's writing<br>Preparation of the oral presentation | Work in international group. | To acquire basic concept on statistics | 30h |

## EVALUATION MODALITY

- Evaluation methods:  online quizzes, submission of graphs from Practical classes, written project, oral presentation…
- Evaluation and grading criteria: Quizz from videos: 10 pts, PW :30 pts; 60 pts project: 30 content , 30 presentation and workgroup (declaration of the work of each member)
- Grading: 40 %: Videos, Statistical part and practical classes, 60 % project group
- Communication mode : Moodle Forum,  Dropbox, JupiterLab on Sorbonne platform,
- Evaluation :
    - Statistical quizzes and exercises of practical classes; From week 2 to week 8.
    - Final report Project: Week 12; end of may. Follow up and evaluation by the expert in the discipline, by 4 committee.

## COURSE OPERATION

The course will be available on Moodle at Sorbonne University:

https://

The first 2 weeks the students will watch the videos of the experts and learn the basic concepts of each subject treated. The experts will give access to their subject of the group research project after this session.

The practical labs will be operated on Notebooks on the following platform: https://jupyter.math.upmc.fr/

The students will start to reflect on the subject they want to choose for the final segment of the course. During this period they will be encouraged to discuss with the experts through the forum.

Students will have access to DropSU to work in collaboration in Word or Excel type documents

https://dropsu.sorbonne-universite.fr  (*Under work with F. Moutte at SU*)

## BIBLIOGRAPHY