

Course Syllabus- Using Citizen Science to Fight Mosquitos

Language of Instruction: English

Professor: John Palmer

Professor's Contact and Office Hours: john.palmer@upf.edu; Tuesdays, 13:00-14:00.

Course Contact Hours: 7.5 hours

Recommended Credit: 2 ECTS credits

Weeks: 1

Course Prerequisites: None

Language Requirements: English

Course Description:

Mosquito-borne diseases like dengue and malaria place enormous burdens on individuals, families, and communities worldwide. To control these diseases, we need to know more about the mosquitos that transmit them, but traditional methods of mosquito surveillance are costly and often unable to keep up with rapidly spreading invasive species. What if we could learn about mosquitos from all of the people who they bite? This is where citizen science comes in. This course will introduce you to a growing field that is revolutionizing mosquito research and many other areas of science by bringing ordinary people into the scientific process. Through a combination of lectures and hands-on work that can be done from home, this course will use the problem of disease-vector mosquitoes to teach you how citizen science, disease ecology and statistics can be powerful tools for public health.

Learning Objectives:

By the end of the course, the student will have gained:

- an understanding of the emerging field of citizen science
- basic tools for using citizen science approaches in their own research
- an introduction to disease ecology, focused on mosquito-borne diseases
- an introduction to the statistical methods and computational tools necessary for analyzing spatial data.

Course Workload

The course is divided into (a) lectures and discussions, which will be done as a group, and (b) practical exercises that each student will carry out independently. There will be a short reading assignment for each session and students will be asked to discuss this assignment and to explain their independent work on the practical exercises. A short written project to be due at the end of the course.

Methods of Instruction:

This is an independent study course consisting of group sessions and independent practical exercises. Each day's group session of 1.5 hours will be divided between lecture and discussion of the reading assignment and the practical exercises. Students will then carry out the practical exercises independently and report back on these in each subsequent session. Students will also be given a quiz each day, to be completed after

the group session, and they will be expected to submit a short written project at the end of the course.

Method of Assessment

- Class participation (20%)
- Quizzes (30%)
- Written project (50%)

Absence Policy

Attending class is mandatory and will be monitored daily by professors. The impact of absences on the final grade is as follows:

Absences	Penalization
Up to one (1) absence	2 points subtracted from final grade (on a 10-point scale).
Two (2) absences	The student receives an INCOMPLETE for the course

The BISS attendance policy does not distinguish between justified or unjustified absences. The student is deemed responsible to manage his/her absences.

Emergency situations (hospitalization, family emergency, etc.) will be analyzed on a case-by-case basis by the Academic Director of the UPF Barcelona International Summer School.

Classroom Norms:

- No food or drink is permitted.
- There will be a ten-minute break during the class.
- Students must come to class fully prepared.

Course Contents:

Session 1: The problem

- Mosquito-borne diseases.
- Traditional research and surveillance methods and their limits

Session 2: Citizen science overview

- History and philosophy
- Technological developments and networked citizen science
- Applying citizen science to the mosquito problem

Session 3: Citizen science techniques

- System overview
- Mobile and web application development
- Servers and databases
- Ethics, privacy, and data security

Session 4: Analyzing data

- Errors, biases and corrections
- Data use scenarios
- Spatial statistics
- Cross-validation
- Computational tools

Session 5: Synthesis and future directions

- Global Mosquito Alert
- Pitfalls and limits
- Broader applications

Required Readings: The professor will assemble a course packet containing readings for each day.

Recommended bibliography:

Students may wish to consult the following sources for additional background.

1. Agresti, Alan & Barbara Finley. 2008. *Statistical methods for the social sciences*, Prentice Hall.
2. Capineri, C. et al. 2016. *European Handbook of Crowdsourced Geographic Information*, London: Ubiquity Press. Available at <https://www.ubiquitypress.com/site/books/e/10.5334/bax/>
3. Foody, G. et al. 2017. *Mapping and the Citizen Sensor*. London: Ubiquity Press.
4. Grolemond & Wickham. 2017. *R for Data Science*. Available at <http://r4ds.had.co.nz/>.
5. Irwin, Alan. 1995. *Citizen Science: A Study of People, Expertise and Sustainable Development*. Routledge.
6. Lazer, David, Ryan Kennedy, Gary King, and Alessandro Vespignani. 2014. *The Parable of Google Flu: Traps in Big Data Analysis*. *Science* 343 (6167): 1203–5. doi:10.1126/science.1248506.
7. Palmer, John R.B., Aitana Oltra, Francisco Collantes, Juan Antonio Delgado, Javier Lucientes, Sarah Delacour, Mikel Bengoa, Roger Eritja, & Frederic Bartumeus, *Citizen Science Provides a Reliable and Scalable Tool to Track Disease-Carrying Mosquitoes*, *Nature Communications*, 8, 916, doi:10.1038/s41467-017-00914-9 (2017).
8. Mukundarajan, H., Hol, F.J.H., Castillo, E.A., Newby, C. and Prakash, M., 2017. *Using mobile phones as acoustic sensors for high-throughput mosquito surveillance*. *eLife*, 6.
9. Schutt, Russell K. 2017. *Understanding the Social World: Research Methods for the 21st Century*. Sage.

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