<u>EDSD 110 Measures and Models of Demography</u>

Course instructor
- [Alyson van Raalte](#)

Course description
The course is designed for first-year doctoral students in demography who have relatively little previous experience with the subject. It aims to provide EDSD students with an introduction to demographic methods and terminology. It deals with rates and probabilities, direct and indirect standardization, the Lexis diagram, the life table, life-time indices of quantum and tempo, period and cohort indices, population trends, and basic population projections.

Organization
Instruction is given in the form of six 90-minute lectures.

Examination
Students are graded based on their active participation in class and their solutions to homework assignments. Grades have three levels: high pass, pass and fail.

Textbook
Preston, Samuel H, Patrick Heuveline and Michel Guillot. (2001). Demography: Measuring and Modeling Population Processes. Oxford: Blackwell Publishers.

Wachter, K. W. (2014). Essential demographic methods. Harvard University Press.

Complementary material is distributed during the course.

EDSD 120 Basic Mathematics for Demographers

Course instructor
- [José Manuel Aburto]

Course description
This course is designed for students who are enrolled in the EDSD and/or some other doctoral program in demography. Over a period of five weeks, basic mathematics used in demography are reviewed. For most of the students this course is an opportunity to review and practice the mathematics of college level. The main aim of this course is to bring students entering the EDSD up to a common standard in mathematics. The course is also intended to prepare students for other courses of the EDSD that will require basic mathematics. The sections covered are: Functions and models, limits and continuity, differentiation and curve sketching, calculus in several variables and partial derivatives, integration and differential equations. Applications to the study of populations are presented in each class.

Organization
The course involves a total of 24 lecture hours. Instruction is given in 12 two-hour lectures. Several tutorials are also presented. Perfect attendance is strongly encouraged for those students that have not had mathematics for more than two years. A buddy system with fellow students is recommended and collaborative work on the assignments is encouraged.

Prerequisites
The course is designed for first year doctoral students of demography, no prerequisites are required.

Examination
Students are expected to hand in assignments and solve exercises to reinforce theory and examples of class. Some readings are mandatory and discussed in class. Exams and assignments count for the final grade, which is based on the total number of points earned in the course. Final grades have three levels: high pass, pass and fail.

General readings
The course relies heavily on the book Calculus by Steward (2003).
For the demographic applications many other different sources are used which are also recommended to the students (Keyfitz (1968 and 1985) among others).
- Stewart, James. 2003. Calculus 5e. Thomson Books/Cole, Belmont CA.
- Caswell, Hal. 2001. Matrix Population Models 2e. Sinauer Associates, Sunderland Massachusetts.
- Keyfitz, Nathan. 1985. Applied Mathematical Demography. Springer-Verlag: New York.
- Keyfitz, Nathan. 1968. Applied Mathematical Demography. Addison-Wesley: Reading Massachusetts.

<u>EDSD 130 Basic Statistics for Demographers</u>

Course instructor
- [Jutta Gampe](#)

Course description
This course reiterates basic statistical models and techniques for demographers. The topics covered are:
- Statistical models and their estimation (with an emphasis on maximum likelihood), including adaptation to observation schemes
- Sampling variability, confidence intervals and testing
- Regression models (linear and generalized linear models)

Organization
The course involves twelve 90-minute lectures and three tutorials. The statistical software R is used (freely available, see http://www.r-project.org).

Prerequisites
This course covers many topics of an introductory statistics course, however, good command of basic probability theory is assumed. The course also assumes familiarity with mathematical expressions (differentiation, integral, matrix notation) covered in the "Basic Mathematics for Demographers" course.

Examination
An assignment and one exam at the end of the course count for the final grade. Final grades have three levels: high pass, pass and fail.

General readings
The topics of the course are covered, for example, in: Agresti, A. and B. Finlay: Statistical Methods for the Social Sciences. Third edition. Prentice-Hall, 1997.
Additional references are given at the beginning of the course and complementing material is distributed during the course.

<u>EDSD 140 Computer Programming for Demographers</u>

Course instructor
- Christian Dudel

Course description
This course introduces the programming language R. R is well-suited for typical demographic analyses which often require more capabilities than other packages can offer. Besides the availability of more built-in statistical procedures than any other widely used statistical package and its outstanding data visualization capabilities, R offers an easy way to extend the language by implementing new methods or modifying existing ones. Hence this introductory course for R will be aimed into two directions: On the one hand, the course will show how to perform 'standard' data manipulation and statistical methods known from other programs, focusing on modern workflows using RStudio. On the other hand, an introduction will be given on programming with R. The topics covered in the course are:
1) Basic concepts (functions, object-orientation, RStudio: script files, shortcuts, etc.)
2) Basic statistics (reading data, descriptive statistics, tables)
3) Data viz (ggplot2)
4) Data handling (pipe operator, dplyr, missing values)
5) Basic programming (loops, conditions, functions)
6) Applied programming example (cellular automata and agent-based models)
7) Applied empirical example

Organization
Instruction is given in the form of seven two-hour lectures. The instructor presents concepts and methods using R. The participants employ those methods immediately on their laptop or desktop computer.

Prerequisites
Familiarity to work in a computer environment is essential, especially being able to work with a text editor. This course requires for some parts material covered in the other preparatory courses (e.g. linear regression, probability theory).

Examination
Grading is based on take-home assignments. Final grades have two levels: pass and fail.

General readings
All general readings are freely available online:
- Wickham, Grolemund: R for Data Science. https://r4ds.had.co.nz/
- Healy: Data Visualization. https://socviz.co/