Course curriculum for EDSD 2013-2014 Modelling, Simulation and Forecasting

1. General information

1. Name: Modelling, Simulation and Forecasting
2. Level: Master level
3. ECTS Credit points: 7.5

2. Course placement within the educational system

1. Subject: Demography
2. This is a master level course and is mandatory in the Master programme in Demography.
3. The course is offered in English.

3. Learning outcomes

On a general level the student shall acquire practical knowledge of the modeling, simulation and forecasting of various populations. Specifically students will be able to:

- analyse the dynamics of age-structured and of interacting populations
- learn about new indicators of aging and how to evaluate them
- learn how to prepare initial data for population projection (life table extension, smoothing age-specific fertility and mortality rates)
- forecast population development using the cohort component approach
- learn how to define scenarios in terms of aggregate indicators and apply demographic models in order to obtain age-specific rates
- apply household projection methods
- individually simulate multi-state populations
- discuss the fundamentals of microsimulation models

4. Course content

The course is divided into three modules:

Modelling and Simulation

Students get acquainted with the matrix notation, and learn about modelling and simulation of nonlinear-interacting populations. They have to program population projections in R and learn about the stable population model through numerical simulations. The program ”Populus” is used to study the dynamics of interacting populations and in particular to study models of disease infection and immunization programs.

Population Forecasting

This is a “hands-on” module in which the students carry out, in groups of 2-3, a forecast of a chosen country, region, or sub-population. In the process the students learn to acquire jump-off data for the population of interest, and if necessary, to adjust them for undercount and to update the values to the most recent realistic jump-off time. The students learn how to generate scenarios for fertility and mortality using Brass. Relational model and Gamma fertility model as an example. They learn how to use these models in the framework of cohort-component population projections.

Based on population projection and using extension of the headship rates method, students should be able to implement household projection for the chosen population.

Students learn about new, recently introduced indicators of aging and to apply them to observed and projected populations.

Microsimulation

This module is designed as a series of lectures with special emphasize on "real life" examples and practical simulation exercises. Students acquire a basic knowledge of microsimulation and its various aspects including statistical modelling and modelling options, advantages and disadvantages compared to other approaches, model types, existing microsimulation applications, and the technical implementation of microsimulation models. The course uses the demographic teaching model RiskPaths which is implemented in the microsimulation programming language Modgen. Students explore RiskPaths from three perspectives: the underlying statistical models, the use of the microsimulation model, and the programming of the model.

5. Teaching and assessment

The course is designed as a series of lectures and seminars. Grading is based on individual performance, via written assignments, oral presentation as well as group activities.

The University views plagiarism very seriously, and will take disciplinary actions against students for any kind of attempted malpractice in examinations and assessments. Plagiarism is considered to be a very serious academic offence. The penalty that may be imposed for this, and other unfair practice in examinations or assessments, includes suspension from the University.

6. Grading scale

Grading on the programme is based upon the ECTS scale. This means that in order to pass a certain course or assignment a student has to get the mark A, B, C, D or E, where A is the highest possible mark. Students who fail an assignment will get the mark F. In very general terms, the different grades represent the following quality of work:

A	Excellent	The achievement clearly distinguishes itself and is excellent with regards to theoretical depth, practical relevance, analytical ability and independent thought.
B	Very good	Very good. The work shows a very good ability of theoretical depth, practical application, analytical skill and independent thought.
C	Good	The achievement lives up to expectations and is of a good standard when considering theoretical depth, practical relevance, analytical ability and independent thought.
D	Satisfactory	The result is satisfactory on most levels, but has some weaknesses with regards to the above mentioned aspects.
E	Sufficient	The performance satisfies the minimum requirements, but not more.
F	Fail	The result is not satisfactory enough.

7. Prerequisites

General prerequisites for the Master programme in Demography

8. Literature

See separate document.