Syllabus:

1. Introduction – missing data pervading social and behavioral research.

2. Topics covered and resources.
   - literature,
   - software.

3. The goals of a missing data analysis.
   - aims of ‘conventional’ analyses,
   - aims of statistical analyses with missing data.

4. The problem and types of missing data.
   - what is relevant to focus on when faced with missing data,
   - pattern and mechanisms of missing data,
   - missing completely at random (MCAR), observed at random (OAR),
   - sufficient and necessary conditions, and what is necessary for MCAR,
   - how to check for OAR,
   - examining MCAR in empirical research; the Benjamini-Hochberg procedure for testing lack of MCAR,
   - missing at random (MAR),
   - ignorable missingness and nonignorable missingness

5. Traditional ways of dealing with missing data.
   - listwise deletion,
   - pairwise deletion,
   - dummy variable adjustment,
   - simple imputation methods (unconditional and conditional fill-in, hot-deck imputation),
   - weighting.

6. Full information maximum likelihood (FIML) in the presence of missing data.
   - why is it meaningful;
   - likelihood function for an incomplete data set;
   - fitting models to data using FIML;
   - examples of FIML applications;
     - fitting the general linear model with missing data,
. a brief introduction to Mplus,
. longitudinal data analysis with incomplete data,
. the intercept and slope (IS) model for longitudinal data,
. individual trajectories of temporal development,
. a simple regression model for change over time,
. centering of time and intercept interpretation,
. an empirical application of the IS model,
. auxiliary variables inclusion - ‘informative’ correlates of missing values; use of informative covariates as predictors,
. robust statistical inferences in the presence of missing data;
- model choice in nationally representative longitudinal research with incomplete data sets (inclusion of design variables and accounting for clustering effects);
- testing group differences in the presence of missing data.

7. Multiple imputation
   - what is multiple imputation (MI), and how does it compare to FIML
   - how does MI work,
     . simple setting,
     . general setting,
   - illustrations of MI
     . analysis of missing data with predictors/covariates measured without error,
     . analysis of missing data using predictors/covariates measured with error,
   - integration of imputation and model fitting in single software (Mplus).

8. Practical aspects of analysis of missing data.
   - dealing with assumption violations and clustering effects,
   - path-analysis with missing data,
   - latent structure examination of a variable set in the presence of missing data,
   - regression models with latent variables, non-normality, clustering effects, and missing data,
   - growth curve analysis.

9. Conclusion and take-home messages of workshop.