Frailty models have become very popular during the last two decades and their applications are numerous. The focus of the first part of this course is on univariate frailty models meaning random effects models applied to independent event times. Univariate frailty models can be used to adjust Cox regression analysis for unobserved heterogeneity (unobserved covariates). It turns out that unobserved heterogeneity can imply unexpected and surprising results in the analysis of time to event data. Different frailty distributions and their consequences are discussed in detail.

The second part of the course is devoted to multivariate frailty models. Such multivariate frailty models explain correlations between event times within clusters (here, a cluster can consist of individuals from the same group, say a family, litter, clinic, community; or of multiple or recurrent events from the same individual). The most important model here is the shared frailty model. However, it does have some limitations. To avoid these limitations, correlated frailty models have been developed for the analysis of multivariate failure time data. The similarities and differences between frailty models and copulas are considered in detail. The course discusses advantages and limitations of different frailty models and is illustrated by different real data applications. Most of the presented material is based on the book “Frailty Models in Survival Analysis” by Andreas Wienke, Chapman and Hall/CRC.