## ACTUARIAL MATHEMATICS II (30 hours)

1. **Decision theory**
   - game theory
   - statistical games
   - decision criteria
2. **Bayesian statistics**
   - Bayes' theorem
   - prior and posterior distributions
   - loss functions
3. **Loss distributions**
   - properties of loss distributions
   - examples of loss distributions: exponential, gamma, Pareto, generalized Pareto, normal, lognormal, Weibull, Burr
   - moments and moment generating functions of loss distributions
   - parametar estimates of loss distributions
   - reinsurance and loss distributions
4. **Risk models**
   - models for short term insurance contracts
   - the collective risk model: moments and moment generating functions
   - the compound Poisson, binomial and negative binomial distribution
   - risk models with simple reinsurance
   - exact and approximate calculation of loss distributions of aggregate claims: Panjer's method, normal approximation, translated gamma approximation
   - the individual risk model
   - parametar variability and uncertainty
5. **Ruin theory**
   - the surplus process
   - the probability of ruin in continuous and discrete time
   - the Poisson process and the compound Poisson process
   - Lundberg's inequality
   - the effect of changing parameter values on ruin probabilities
   - reinsurance and ruin
6. **Credibility theory**
   - the credibility premium formula and the credibility factor
   - Bayesian credibility: the Poisson-gamma model and the normal-normal model
   - empirical Bayes credibility theory: model 1 (Bühlmann model), derivation of the credibility formula and parameter estimation
   - empirical Bayesian credibility theory: model 2 (Bühlmann-Straub model), derivation of the credibility formula and parameter estimation
7. **Simple experience rating systems**
   - definition of the no claims discount systems
   - steady state analysis
   - the effect of NCD systems on the propensity of claims
8. **Analysis of run-off triangles**

- run-off triangles
- projections and development factors
- the chain ladder method
- adjusting for inflation
- the average cost per claim method
- the Bornhuetter-Ferguson method

**9. Generalized linear models**

- exponential families
- linear predictors

**Literature:**


1. C. D. Daykin, T. Pentikäinen, M. Pesonen (1994), *Practical risk theory for actuaries.* Chapman & Hall, London
2. T.Rolski, H.Schmidli, V.Schmidt, J.Teugels (1998), *Stochastic Processes for Insurance and Finance,* Wiley
3. E. De Vylder *Advanced Risk Theory: A Self-Contained Introduction*,
4. H. Bühlmann (1970), *Mathematical methods in risk theory.* Springer, Heidelberg
5. N.Bowers *et al.* (1997) ***Actuarial Mathematics,*** 2nd edition, Society of Actuaries
6. R. V. Hogg, S. A. Klugmann (1984), *Loss distributions.* Wiley, NewYork
7. H.-P. Schmidli, *Risk theory.* Unpublished lecture notes
8. Faculty & Institute of Actuaries, *Core Reading Subject 106*