1. **Name of Course**: Bayesian Econometrics

2. **Lecturer**: András Fülöp (Room: CEU Business School, 317)

3. **No. of Credits (no. of ECTS credits)**: 2 CEU credits (4 ECTS)

4. **Semester or Time Period of the course**: Winter Term

5. **Pre-requisites**: Intermediate Econometrics

6. **Course Level**: Doctoral

7. **Course Outline**: This course aims to provide an introduction to Bayesian econometrics at the graduate level, with a strong emphasis on simulation-based computational methods.

8. **The goals of the course**: The objective of the course is to provide an introduction to the Bayesian paradigm and its practical implementation.

9. **The learning outcomes of the course**: i.) To introduce the basic elements of Bayesian statistics to the students; ii.) To familiarize students with the main simulation algorithms used to perform Bayesian inference; iii.) Implement these methods on a PC (We will use the MATLAB programming language throughout the class)

10. **Assessment**: 2 sets of homework exercises to be completed in groups of 2 (20% each); a term project containing a Bayesian application in economics or finance (60%)

11. **Contact Information**: e-mail, fulop@essec.fr

12. **More detailed display of contents**:
The textbook for the class is


A good reference book on the second half of the class that focuses on the Bayesian treatment of state space models is


Preliminary Breakdown

- Introduction to Bayesian Statistics
  - Topics: Normal Model, Conditional distributions, priors, posteriors, improper priors, conjugate priors, exponential families, tests, Bayes factors, decision theory, importance sampling
  - Readings: Chapter 2 of BC
- Bayesian Regression
  - Topics: Regression and variable selection, G-priors, noninformative priors, Gibbs sampling, variable selection
  - Readings: Chapter 3 of BC
- Generalised linear models
  - Topics: Probit, logit and log-linear models, Metropolis Hastings algorithms, model choice
  - Readings: Chapter 4 of BC
- Dynamic models
  - Topics: AR, MA and ARMA models, state-space representation, hidden Markov models, forward-backward algorithm
  - Readings: Chapter 7 of BC
- Sequential state inference in state-space models (Bayesian Filtering)
  - Topics: Sequential Monte Carlo (Particle filtering)
  - Readings:
    - M.K. Pitt and N. Shephard, Filtering via Simulation: Auxiliary Particle Filter, JASA, 1999
    - "Filtering Methods" In Handbook of Computational Finance Edited by Jin-Chuan Duan, James E. Gentle, Wolfgang Haerdle Berlin: Springer, 2011
- SMC within MCMC
  - Topics: Particle MCMC
  - Readings:
    - C. Andrieu, A.D. & R. Holenstein, Particle Markov chain Monte Carlo methods (with discussion), JRSS B, 2010
- SMC as an alternative/complement to MCMC
  - Readings
    - N. Chopin, A Sequential Particle Filter Method for Static Models, Biometrika, 2002
- SMC for sequential joint and state inference
  - Readings
- H.F. Lopes & R. S. Tsay, Particle Filters and Bayesian Inference in Financial Econometrics, J. Forecasting, 2010