Advanced statistical methods and bayesian inference in scientific research

- ***COURSE SYLLABUS***

1.	**Course title:**	
	Advanced statistical methods and bayesian inference in scientific research	
.	**Lecturer:**	
	Prof. dr hab. Wojciech Dębski	
3.	**Field, type and level of studies, year of study:**	
	Physics and similar physics-based fields, experimental physics, data analysis year , 2-4	
4.	**Course character:**	
	Lecture and tutorials	
5.	**Teaching method:**	
	traditional, eventually on-line if convenient for participants	
6.	**Language:**	*english*
7.	**Course type and number of hours:**	
	Lecture 22h, tutorials 24h, together 46 hours	
8.	**Estimated load of student's independent work:**	*eg., 20-30 h*
9.	**Total workload and number of ECTS points:**	*3 ECTS*
10.	**Short description and main focus of the course:**	
	1. Introduction: Basic concepts of the probability theory: random processes and their description, random sample, population, probability concept, bayesian and frequentiests interpretation. 2.Random variable and their managing: cumulative, marginal and conditional . distribution function, probability density function, empirical and theoretical characteristics of a random variable, statistical estimators, statistical moments, discrete, continuous and mixed distributions, estimation of distribution parameters 3. Monte Carlo techniques and selected sampling methods: evolutionary algorithms, Metropolis-Hasting algorithm and its generalization (MCMC) , Hamiltonian Monte Carlo 4. Statistical (Bayesian) inference, hypothesis testing,	

	5. Practical skill in programing statistical tasks using R,Python or similar programing languages	
11.	**References:**	
	To be announced latter	
12.	**Prerequisites:**	
	basic knowledge of probability methods	
13.	**Educational outcomes:**	**PQF level 8 codes:**
	Knowledge:	*P8S_WG*
	Practical Skills:	*P8S_UW*
	Social Skills:	*P8S_KK*
14.	**Evaluation of the educational outcomes:**	
	final report	
15.	**Criteria to complete the course:**	
	preparing the final report. the grade depends on the evaluation of the report	
16.	**Contact with the lecturer:**	
	debski@igf.edu.pl	