

Introduction to Nonlinear Physics
- COURSE SYLLABUS



1.	Course title: <i>Introduction to Nonlinear Physics</i>
2.	Lecturer: <i>Prof. Łukasz A. Turski</i>
3.	Field, type and level of studies, year of study: <i>All years of study</i>
4.	Course character: <i>GeoPlanet interdisciplinary lecture</i>
5.	Teaching method: <i>on-line</i>
6.	Language: <i>English</i>
7.	Course type and number of hours: lecture and some seminars <i>lecture</i>
8.	Estimated load of student's independent work: <i>depending on student interest about the lecture time plus home repetition 1-2h a week</i>
9.	Total workload and number of ECTS points: <i>3 ECTS</i>
10.	Short description and main focus of the course: 1) <i>General introduction</i> 2) <i>Short introduction to mathematical tools:</i> (I) <i>Classical mechanics:</i> a. <i>Symplectic dynamics</i> b. <i>Dissipative dynamics</i> c. <i>Metriplectic dynamics</i> (II) <i>Quantum generalization</i> (III) <i>Thermodynamics</i> a. <i>Laws of thermodynamics</i> b. <i>Discussion of the Second Law</i> c. <i>Thermodynamic Stability</i> 3) <i>Systems with discrete number of degrees of freedom:</i> (I) <i>Linear stability, xed points, bifurcation</i> 4) <i>Continuous systems:</i> (I) <i>Classical examples</i> (II) <i>Broken symmetries</i> (III) <i>Magnetic manifolds</i>

	5) <i>Conclusions</i>	
11. References:	<i>Textbook of main references to theoretical physics: FROM Newton to Mandelbrot. A Primer in Theoretical Physics. D. Stauffer, H.G. Stanley springer Verlag 1995. Or Polish language translation WNT 1996</i>	
12. Prerequisites:	<i>Fluent knowledge of mathematics contained in standard physics education curricula</i>	
13. Educational outcomes:	<i>Knowledge:</i> <i>of several important physical phenomena and their description</i>	<u>PQF level 8 codes:</u> <i>P8S_WG</i>
	<i>Practical Skills:</i> <i>application of theoretical physics tools to analysis of complex phenomena in nature</i>	<i>P8S_UW</i>
	<i>Social Skills:</i> <i>not get lost in contemporary civilization</i>	<i>P8S_KK</i>
14. Evaluation of the educational outcomes:	<i>depending on number of students: short seminars on suggested topic or oral exam</i>	
15. Criteria to complete the course:	<i>participation in lectures and final exam</i>	
16. Contact with the lecturer:	<i>laturski@cft.edu.pl, personal meeting on chosen date and hour</i>	