Quantum optics

Lecturers
Stéphane CLEMMEN (Coordinator) and Serge MASSAR

Course mnemonic
PHYS-F474

ECTS credits
5 credits

Language(s) of instruction
English

Course period
Second term

Course content

1. Basic phenomena 1.1 Oscillations 1.2 Past history - method of steps 1.3 Population models - logistic equation 2. Car following models 2.1 Local and asymptotic stability 3. Hopf bifurcation 4. Physiological deseases - Mackey equation 4.2 Pupil eye reflex 4.1 Strong negative feedback 5. Mechanical systems 5.1 Method of multiple scales 5.2 Bifurcations 6. Lasers 6.1 Optical Feedback 6.2 Opto-electronical feedback

Objectives (and/or specific learning outcomes)

A delay differential equation takes into account the past to determine the evolution of a system. Any (mechanical or physiological) control exhibits a delay because time is needed to sense information and react on it. These delays are responsible for oscillations between cars in a dense traffic flow, anomalous physiological deseases, undesired instabilities in machine-tool systems, or laser pulsating intensity pulses. The main objective of this course is to introduce a selected number of applications in different areas of science and engineering. Techniques exploring the phenomena generated by a delay strongly depend on the background of the reseacher. The course will highlight these differences by specific case-studies and describe analytical tools and comparisons with experiments.

Teaching method and learning activities

Specific problems in different areas are described and analyzed in class. Exercises with solutions are proposed as homework problems.

References, bibliography and recommended reading

T. Erneux Applied Delay Differential Equations Springer, in press (2009)

Other information

Contact(s)

Email: TERNEUX@ULB.AC.BE Localisation du bureau: Campus Plaine, Bâtiment NO 6ème étage, local 2.06.105 Adresse postale: Université Libre de Bruxelles, Optique Nonlinéaire Théorique, Campus Plaine, C.P. 231, 1050 Bruxelles, Belgium

Evaluation method(s)

Oral examination

Evaluation method(s) (additional information)

Oral exam

Programmes

Programmes proposing this course at the faculty of Sciences

MA-PHYS | Master in Physics | finalité Research/unit 1 and finalité Teaching/unit 1