

Méthodes asymptotiques en physique

Lecturers

Gregory KOZYREFF (Coordinator) and Fabian BRAU

Course mnemonic

PHYS-F427

ECTS credits

5 credits

Language(s) of instruction

French

Course period

Second term

to systematically and consistently deal with limiting cases. When successfully applied, they may provide useful approximation of solution or new mathematical models that are simpler to study numerically. Asymptotics is also useful in that it brings scaling laws and trends and allow one to build intuition on complex phenomena. A large number of examples drawn from quantum mechanics, laser physics, fluid mechanics and optic will illustrate the course.

References, bibliography and recommended reading

C.M. Bender & S.A. Orszag, Advanced Mathematical Methods for Scientists and Engineers, Springer-Verlag 1999E. J. Hinch, Perturbation Methods, Cambridge University Press 1991

Course content

- > Dimensional analysis-Asymptotic approximations-Regular vs singular perturbations-Evaluation of integrals: Laplace, Stationnary phase and Saddle point methods-WKB-Matched Asymptotic Expansions-Method of Multiple Scales

Objectives (and/or specific learning outcomes)

To acquire resolution techniques of differential problems that arise frequently in research.

Teaching method and learning activities

By nature, the course contains an exposition of methods with great emphasis on their applications. Half of the course consists in resolutions of exercices.

Contribution to the teaching profile

Mathematical problems encountered in basic science or engineering are rarely analytically soluble. However, one can often consider limiting cases which considerably ease the analysis while keeping the basic physical content that one wishes to understand. Asymptotic methods are a collection of approaches

Other information

Contact(s)

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Evaluation method(s)

written examination

Evaluation method(s) (additional information)

Written examination

Determination of the mark (including the weighting of partial marks)

The mark is entirely built from the written examination

Programmes

Programmes proposing this course at the faculty of Sciences

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