

# Advanced Quantum Field Theory

## Lecturer

Glenn BARNICH (Coordinator)

## Course mnemonic

PHYS-F417

## ECTS credits

5 credits

## Language(s) of instruction

English

## Course period

First term

## Campus

Plaine

## Course content

Chapters of advanced quantum field theory. Choice from: Partition functions from canonical quantization. Path integrals in quantum statistical mechanics. Holomorphic methods. Partition function of massive scalar field. Casimir effect. Finite temperature Casimir effect and massless scalar partition function. Massless scalar in 1+1 dimensions and introduction to conformal field theory. 1-loop effective action and renormalization. Heat kernel and zeta function. Quantum gauge fields and BRST methods.

## Objectives (and/or specific learning outcomes)

To gain familiarity with quantum field theory beyond S-matrix computations. Gain experience with advanced techniques of quantum field theory through a detailed study of selected applications.

## Pre-requisites and co-requisites

### Co-requisites courses

PHYS-F410 | Quantum field theory I | 5 crédits

### Required knowledge and skills

PHYS-F410 Quantum Field Theory I  
(PHYS-F440 Quantum Field Theory II)

## Teaching method and learning activities

Ex-cathedra course + exercise sessions or personnel homework

## Contribution to the teaching profile

Acquire advanced scientific expertise in a domain of physics. Understand the laws of nature through their formulation in quantum field theory.

## References, bibliography and recommended reading

See bibliography in the course notes : <http://homepages.ulb.ac.be/~7Egbarnich/QFT.pdf>

## Course notes

Syllabus

## Other information

### Place(s) of teaching

Plaine

### Contact(s)

Glenn Barnich

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<http://homepages.ulb.ac.be/~gbarnich/>

## Evaluation method(s)

Oral examination

### Evaluation method(s) (additional information)

Oral examination on the theoretical part and the exercise session including the presentation of a question that can be freely chosen.

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

The mark is entirely determined by the performance during the oral exam.

### Main language(s) of evaluation

French and English

## Programmes

### Programmes proposing this course at the faculty of Sciences

MA-PHYS | Master in Physics | finalité Research/unit 2 and finalité Teaching/unit 2