INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

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| COURSE | : | **QUANTUM FIELD THEORY I** |
| TRANSLATION | : | TEORÍA CUÁNTICA DE CAMPOS I |
| NUMBER | : | FIM3406 |
| CREDITS | : | 15 UC / 9 SCT |
| REQUISITES | : | (FIZ0221 OR FIZ0224) AND FIZ0411 AND FIZ0412 |
| RESTRICTIONS | : | 030501 |
| CHARACTER | : | OPTATIVE |
| FORMAT | : | THEORETICAL LECTURES |
| QUALIFICATION | : | STANDARD |
| FORMATIVE LEVEL | : | DOCTORATE |
| DISCIPLINE | : | PHYSICS |

**I. COURSE DESCRIPTION**

This course seeks to deepen the study of Quantum Field Theory from the point of view of path integrals. At the end of the course, the student will be able to integrate this knowledge into their doctoral research areas.

**II. LEARNING OUTCOMES**

1. Know and understand the Quantum Field Theory from the point of view of path integrals.
2. Critically analyze the applications of Quantum Field Theory in research areas in the discipline

**III. CONTENT**

1. Introduction to road integrals
2. Quantum mechanics with path integrals
3. Classical field theory
4. Noether's theorem
5. Quantum theory of a real scalar field. Green functions
6. Effective potential
7. Scattering amplitudes
8. Lambda phi theory to the fourth power
9. Feynman's rules and cross sections
10. Renormalization to a loop of lambda phi 4 theory
11. Quantum spinor field theory
12. Grassmann variables
13. Dirac propagator
14. Yukawa interactions
15. Gauge quantum field theory
16. BRST method
17. Renormalization of QED and QCD
18. Renormalization group equations
19. Background Field Method

**IV. METHODOLOGICAL STRATEGIES**

Lecture classes.

**V. EVALUATIVE STRATAGIES**

Partial test: 30%
Talk: 30%
Final exam: 40%

**VI. BIBLIOGRAPHY**

**REQUIRED**

1. B. Sakita, "Quantum Theory of Many-variable systems and Fields\", World Scientific 1985.
2. L.D. Faddeev and A.A. Slavnov, "Gauge Fields: Introduction to Quantum Theory\", Benjamin 1980.
3. S. Weinberg, "The Quantum Theory of Fields", vols. 1,2, Cambridge U. Press 1995.
4. Peskin y Schroeder. An Introduction to Quantum Field Theory, Westview Press, 1995.

**OPTIONAL**

N/A