UNIVERSIDADE FEDERAL DE SANTA CATARINA
School of Physical and Mathematical Sciences
Graduate Program in Physics
Cx. Postal 476, 88040-900, Florianópolis (SC), Brazil
Phone: +55 48 3721-2308
E-mail: ppgfsc@contato.ufsc.br
https://ppgfsc.posgrad.ufsc.br/

Quantum Field Theories

Course code: FSC3370000

Credit hours: 4

Duration: 18 weeks

DESCRIPTION: Path integrals in quantum relativistic systems. Derivation of Feynman rules for scalar and fermionic theories. Evaluation, regularization and renormalization of Feynman diagrams. The regularization scale and the renormalization group. Effective potential and symmetry breaking. Gauge transformations and introduction to QED. Scalar and fermionic theories at finite temperatures and finite densities. Phase transitions in QCD effective models.

COURSE CONTENT:

1. Review of quantum mechanics and special relativity
2. Path integral in quantum mechanics
3. Path integral for scalar fields.
4. Feynman rules for scalar theories
5. Regularization and renormalization in scalar theories
6. Fermionic theories
7. Symmetry breaking
8. Gauge theories
9. Finite temperature applications

BIBLIOGRAPHY:

1. D. Bailin and A. Love, Introduction to Gauge Field Theory, Taylor & Francis Group, USA (1993).
2. L. H. Ryder, Quantum Field Theory, Cambridge University Press, UK (1996).
3. P. Ramond, Field Theory: a modern primer, Addison-Wesley Publishing Company (2007).
4. S. Coleman, Aspects of Symmetry, Cambridge University Press, UK (1985).