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# Phase transitions and critical phenomena

Course code: FSC410101

Credit hours: 4

Duration: 18 weeks

**DESCRIPTION:** Thermodynamics. Mean field theory. Landau theory. Fluctuations. Scaling theories. Exactly solvable models. Renormalization group. Series expansions. Phase transition dynamics.

**COURSE CONTENT**:

1. Thermodynamics of phase transitions.
2. Symmetries, order parameters and models.
3. Mean field approximation and Landau theory.
4. Fluctuations.
5. Critical exponents, universality and scaling theories.
6. Exactly solvable models.
7. Renormalization group.
8. Series expansions.
9. Phase transition dynamics.
10. Advanced topics in phase transitions.

**BIBLIOGRAPHY:**


1. Kardar, M. - Statistical physics of fields (Cambridge University Press, 2007).
2. Pathria, R. K. and Beale, P. D. - Statistical Mechanics (Academic Press, 2011).
3. Chaikin, P. M. and Lubensky, T. C. - Principles of Condensed Matter Physics (Cambridge University Press, 2000).
4. Salinas, S. R. A. - Introduction to Statistical Physics (Springer, 2001).


**Complementary bibliography:**


1. Plischke, M. and Bergersen, B. - Equilibrium Statistical Physics (World-Scientific, 2006).
2. Yeomans, J. - Statistical Mechanics of Phase Transitions (Oxford University Press, 1992).
3. Baxter, R. J. - Exactly Solved Models in Statistical Mechanics (Academic Press, 1989).
4. Herbut, I. - A modern approach to critical phenomena (Cambridge University Press, 2007).