Module: Elective Advanced Lectures: Theoretical Physics

Module No.: physics70c

Course: Theory of Quantum Magnetism (T)

Course No.: physics7507

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	2+1	4	ST

Requirements for Participation:

Preparation:
Quantum mechanics, Thermodynamics and Statistics, Quantum Field Theory

Form of Testing and Examination:
(1) form of examination: written or oral
(2) requirement for participation in examination: successful participation in exercises

Length of Course:
1 semester

Aims of the Course:
The goal of the course is to introduce students to advanced concepts in the theory of magnetism.

Contents of the Course:
Phenomenological theory of magnetism, spin exchange, ferro and anti-ferro magnetism, classically frustrated systems (Kagome lattice). Representations of spin algebras: Dyson-Maleev, Holstein, Primakov, Schwinger bosons, spin coherent states, spin path integral, non-linear sigma models, quantum phase transition, Bereshinski-Kosterlitz-Thouless transition, Haldane gap, frustrated magnets, valence bond states, spin liquids, quantum Heisenberg model (two dimensional, Kagome, pyrochlore lattice) Exactly solvable models (transfer matrix) Ising model. Exactly solvable models (Bethe Ansatz): XXZ model, Kondo model. Open problems in quantum magnetism.

Recommended Literature:
Will be announced in the first lecture