

MSCA COFUND PICTUS PHD FELLOWSHIP PROGRAMME AT THE CZECH TECHNICAL UNIVERSITY

TOPIC: SUPERINTEGRABILITY IN CLASSICAL AND QUANTUM MECHANICS

Short description:

Analytical investigation of dynamical systems both in classical and quantum mechanics often employs their integrals of motion. While the notion of an integrable system can be traced back to 19th century with its original applications to celestial mechanics and played an indispensable role in the formulation of quantum mechanics in early 20th century, in the last few decades there has been a growing interest in systems with more integrals of motion than needed for integrability, the so-called superintegrable systems. Their structure often implies important properties like their exact solvability without the need to solve any differential equation or separability in several coordinate systems.

The applicant can opt for one (or several) of the following topics of current interest:

1. Superintegrability with higher order integrals of motion, e.g. construction and classification of such systems, their simplification by means of canonical transformations.
2. Integrable and superintegrable systems in curved backgrounds, in particular with magnetic fields.
3. Polynomial algebras of integrals of motion and their applications to the investigation of quantum superintegrable systems, e.g. determination of energy spectra.

Thesis supervisor: Prof. Libor Šnobl, libor.snobl@fjfi.cvut.cz <https://people.fjfi.cvut.cz/snobl/lib/>
Department of Physics, Faculty of Nuclear Sciences and Physical Engineering

Secondment: La Trobe University, Melbourne, Victoria, Australia

Topic: polynomial algebras in the study of superintegrable systems

Host: Dr. Ian Marquette, Department of Mathematics and Physical Sciences

Fellowship: approx. 55 000 CZK (2200 EUR) net salary for 48 months, travel allowances

Formalities and deadlines (both steps are necessary):

- Application for admission to the doctoral programme Mathematical Engineering
<https://fjfi.cvut.cz/en/applicants/doctoral-studies/admission-procedure-phd>
Deadline: May 21, 2026
- Application for funding from PICTUS PhD Fellowship Programme
<https://international.cvut.cz/jobs-at-ctu/pictus-phd-fellowship-programme/>
Deadline: May 31, 2026

Eligibility:

- MSc. degree or equivalent at the time of beginning of the PhD study (October 1, 2026),
- not already in possession of a doctoral degree,
- previous studies compatible with the research topic.

Applicants must not have resided or carried out their main activity in the Czech Republic for more than 12 months in the last 3 years.

Evaluation criteria:

- overall academic excellence including research output and its recognition,
- their relevance for the research topic of the PhD study.