

ADMISSION TO DOCTORAL STUDIES

Session September 2024

Field of doctoral studies: Mathematics

Doctoral supervisor: Assoc. Prof. Dr. Nicoleta VOICU

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Finslerian geometric models of gravity*

Contents / Main aspects to be considered

- Finsler and Lorentz-Finsler geometry.
- Calculus of variations on manifolds.
- Finslerian extensions of general relativity, comparisons with general relativity.

Recommended bibliography:

1. D. Bao, S. S. Chern, and Z. Shen, An Introduction to Riemann-Finsler Geometry, Springer, New York, 2000.
2. I. Bucataru, R. Miron, Finsler-Lagrange Geometry: Applications to Dynamical Systems, Ed. Acad. Romane, 2007.
3. J. Ehlers, General-Relativistic Kinetic Theory of Gases, Springer, Berlin, Heidelberg, 2011, pp. 301–388.
4. M. Hohmann, C. Pfeifer, N. Voicu, Relativistic kinetic gases as direct sources of gravity, Physical Review D 101, 024062 (2020).

Prerequisites / Remarks:

- *Riemannian geometry*;
- *Elements of Finsler geometry*;
- *calculus of variations*;
- *general relativity*.

X Scientific Doctorate (full-time only)

X without tuition fee (state budget funded)

X with tuition fee or with funding from other sources than the state budget

TOPIC 2: *Conformal symmetries and isometries of Finsler spacetimes***Contents / Main aspects to be considered**

- Geometry of Finsler spacetimes, specific features of Lorentzian signature.
- Conformal and isometry groups.
- Cosmologically symmetric Finsler spacetimes and applications.

Recommended bibliography:

1. D. Bao, S. S. Chern, and Z. Shen, *An Introduction to Riemann-Finsler Geometry*, Springer, New York, 2000.
2. I. Bucataru, R. Miron, *Finsler-Lagrange Geometry: Applications to Dynamical Systems*, Ed. Acad. Romane, 2007.
3. A. Onishchuk, R. Sulanke, *Projective and Cayley-Klein Geometries*, Springer, Berlin/Heidelberg, Germany, 2006.
4. O. Piatella, *Lecture Notes in Cosmology*, Springer, 2018.
5. M. Hohmann, C. Pfeifer, N. Voicu, *Cosmological Finsler spacetimes*, *Universe* 6 (5), 65 (2020).

Prerequisites:

- *Riemannian geometry*;
- *elements of Finsler geometry*;
- *general relativity*.

X Scientific Doctorate (full-time only)**X without tuition fee (state budget funded)****X with tuition fee or with funding from other sources than the state budget****TOPIC 3: *Hamiltonian geometry with applications to extended gravity theories*****Contents / Main aspects to be considered**

- dual Finsler and Hamilton geometries;
- Hamiltonian formalism in mechanics and field theory, associated geometric structures;
- applications of dual Finsler geometry in quantum gravity phenomenology.

Recommended bibliography:

1. I. Bucataru, R. Miron, *Finsler-Lagrange Geometry: Applications to Dynamical Systems*, Ed. Acad. Romane, 2007.
2. R. Miron, D. Hrimiuc, H. Shimada, S. Sabau, *The Geometry of Hamilton and Lagrange Spaces*, Springer, 2002.
3. M. de Gosson, *Symplectic Geometry and Quantum Mechanics*, Birkhäuser Verlag, Basel, 2006.
4. D. Raetzl, S. Rivera, F. P. Schuller, *Geometry of physical dispersion relations*, *Physical Review D* 83:044047 (2011).

Prerequisites:

- *Riemannian geometry*;
- *elements of Finsler geometry*;
- *calculus of variations, Lagrangian and Hamiltonian mechanics*.

X Scientific Doctorate (full-time only)

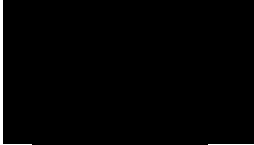
X without tuition fee (state budget funded)

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Doctoral supervisor,

Assoc. Prof. Dr. Nicoleta VOICU.

Signature



Coordinator of the field of doctoral studies,

Prof. dr. Radu PĂLTÂNEA

Signature

