Course: Riemannian manifolds

Teacher(s): Ljubica Velimirović, Božidar Jovanović, Milan Zlatanović,

Course status: elective

ECTS: 12

Prerequisites: None

Goal: Mastering the theory of differentiable manifolds and Riemann manifolds.

Overcomes: The student is able to successfully master the theory of differentiable manifolds and Riemannian manifolds.

Contents

Theoretical lectures

DIFFERENTIABLE MANIFOLDS. Definition and examples of differentiable manifolds. Differentiable mappings and product of differentiable manifolds.

TANGENT VECTORS AND TANGENT SPACE AT A POINT OF MANIFOLDS. Tangent vectors, local base. Curves.

VECTOR FIELDS. Definition of vector field, properties, base, local coordinates. Product of vector fields.

TENSORS. Tensor as a polylinear mapping. Tensor as a component system. Tensors in tangent space. Tensor fields.

AFFINE CONNECTION AND COVARIANT DERIVATIVE. Definition of affine connection. Covariant derivative of the vector and scalar field in the direction. Covariant derivative of the covector field. Covariant derivative of the tensor field. Torsion tensor and curvature tensor.

RIEMANNIAN MANIFOLDS. Definition, condition of non-degeneracy. Tangent space. Metric connection and Levi-Civita connection. Curve tensor, Sector curve.

Recommended bibliography

5. S. Minčić, Lj. Velimirović, Diferencijalna geometrija mnogostrukosti, PMF u Nišu, 2011.
6. I.I. Karatopraklieva, Diferencijalna geometrija, Univerz. Izdatelstvo, Sofia, 1994.
7. M.P. Do Carmo, Differetnial geometry of curve and surfaces, Institutito de Matematica Pura e Aplicada, Rio de Janeiro, Brazil, 1976.
8. Dragović, V., Milinković, D., Analiza na mnogostrukostima. Primene u geometriji, mehanici, topologiji , Matematički fakultet, Beograd, 2003.

Number of classes per week	Theoretical: 4	Practical:

Methods of teaching

Theoretical lectures and independent work of students during practical hours.

Knowledge estimation (max 100 points)

50 points on pre-exam and 50 points on oral exam