Math 742: Geometric Analysis
Fall 2019

Basic information

Class meets MWF 1:00 - 1:50 pm in MTH 0103

Instructor: Karin Melnick
MTH 4412 tel. 405-5148
karin@math.umd.edu
Office hours (tentative) Mon 2 - 2:50 pm

Web page for course `http://www.math.umd.edu/~karin/geomanal19.html`

Material

All recommended texts will be on reserve in the EPSL Library.

Primary recommended text:

- *Riemannian Geometry VI* by Postnikov

Additional recommended texts:

- *Variational Problems in Geometry* by Nishikawa

Course Outline:

Week 1 (8/26–8/30) Semi-Riemannian geometry; arc length; Lagrangians and Euler-Lagrange equations

Week 2 (9/4–9/6) E-L equations for energy functional on curves; geodesics

Week 3 (9/9–9/13) properties of geodesics; Christoffel symbols and Levi-Civita connection

Week 4 (9/16–9/20) conjugate points; second variation of length for curves; introduce curvature

Week 5 (9/23–9/27) more about curvature; Jacobi fields and relation with conjugate points

Week 6 (9/30–10/4) Jacobi Theorem; Myers' Theorem and Ricci curvature; Synge's Theorem

Week 7 (10/7–10/11) Cartan-Hadamard Theorem; Laplace operator; Green formula

Week 8 (10/14–10/18) Bochner Theorem; isothermal coordinates

Week 9 (10/21–10/25) Minimal surfaces

Week 10 (10/28–11/1) energy density, action integral, tension field

Week 11 (11/4–11/8) first variation of energy density; examples; second variation

Week 12 (11/11–11/15) Eells-Sampson theorem for compact domain and compact, nonpositively curved target; Weitzenböck formulas

Week 13 (11/18–11/22) existence of local time-dependent solutions

Week 14 (11/25–11/29) existence of global time-dependent solutions

Week 15 (12/2–12/6) uniqueness with negatively curved target (Hartman's Theorem) and applications to Riemannian geometry

Homework problems will be assigned during class and compiled on the web site. They will be due every two weeks in class on Wednesday.

Policies

Collaboration: You are encouraged to work together on homework assignments, but the work you submit should be your own.

Classroom Etiquette: Please turn off all cell phones and other potentially disruptive electronic devices and keep them out of sight.