

SEMINAR ON GENERATING FUNCTIONS - SS 2024

1. GENERAL INFORMATION

- Organizer: JProf. Dr. Luca Asselle.
- The seminar takes place on **thursday** from **10** to **12** in room **IA 1/75**.
- Seminar will be broadcasted live on zoom and recorded. Recorded versions of the talks will be uploaded on youtube. If you want to attend remotely please click here:
zoom link
- All information about the seminar (including notes, supplementary material, and youtube links) can be found at
<https://www.ruhr-uni-bochum.de/ffm/Lehrstuehle/Zehmisch/index.html>

2. SCHEDULE

1. **11.04.2024. Stefan Nemirovski - Introduction to generating functions.** This is an overview talk on the different flavours of generating functions and where to find them.
2. **18.04.2024. Paul Anton Wilke - Generating functions quadratic at infinity (gfqi), Part 1.** This is the first of three talks in which we discuss general facts about gfqi: Symplectic and Hamiltonian diffeomorphisms; Lagrangian submanifolds; coisotropic submanifolds, characteristic foliations and symplectic reduction; generating functions for Lagrangian submanifolds. Reference: [9], Sections 2-5.
3. **25.04.2024. Jonas Fritsch - Generating functions quadratic at infinity (gfqi), Part 2.** This is the second of three talks in which we discuss general facts about gfqi: Gfqi for Hamiltonian symplectomorphisms of $\mathbb{R}^{2n}$; composition formulas; equivalence of gfqi; the symplectic action. Reference: [9], Sections 7-10.
4. **2.05.2024. Michael Vogel - Generating functions quadratic at infinity (gfqi), Part 3.** This is the third of three talks in which we discuss general facts about gfqi: Spectral invariants; applications to the geometry of the Hamiltonian group; Viterbo capacity and Gromov's non-squeezing theorem. Reference: [9], Sections 11,12,14.
5. **16.05.2024. Alberto Abbondandolo - Geodesics in the Hofer norm and generating functions.** Reference: [2].
6. **13.06.2024. Lars Kelling - Existence of gfqi, Part 1.** In this talk we prove the existence of gfqi for Lagrangian submanifolds of T^*M . Reference: [1].
7. **27.06.2024. Lucas Dahinden - Existence of gfqi, Part 2.** In this talk we prove the existence of gfqi for Legendrian submanifolds of $J^1(M, \mathbb{R})$. Reference: [3].
8. **04.07.2024 Jacobus Sander de Pooter - Existence of gfqi, Part 3.** In this talk we prove the existence of gfqi for Legendrian submanifolds in spherizations of cotangent bundles. Reference: [5].
9. **11.07.2024. Pierre Alexandre Arlove - Uniqueness of gfqi.** We prove uniqueness (up to equivalence) of gfqi for Lagrangian submanifolds of T^*M resp. Legendrian submanifolds of $J^1(M, \mathbb{R})$. References: [6],[7].

10. **18.07.2024. Luca Asselle - The contact non-squeezing theorem. (possibly canceled)** We prove a contact version of the celebrated non-squeezing theorem of Gromov. References: [4],[8].

3. LITERATURE

The main references for the seminar are:

- [1] M. Brunella - On a theorem of Sikorav, *L'Ens. Mathématique* 37 (1991), 83–87.
- [2] M. Bialy, L. Polterovich - Geodesics of Hofer's metric on the group of Hamiltonian diffeomorphisms, *Duke Math. J.* 76 (1994), 273–292.
- [3] E. Ferrand - On a theorem of Chekanov, *Symplectic singularities and geometry of gauge fields*, Banach center Publications 39 (1997).
- [4] M. Fraser, S. Sandon, B. Zhang - Contact non-squeezing at large scale via generating functions (2023), <https://arxiv.org/pdf/2310.11993.pdf>
- [5] P. Pushkar - Chekanov-type theorem for spherized cotangent bundles (2021), [arXiv:1602.08743v1](https://arxiv.org/abs/1602.08743v1)
- [6] D. Théret - Utilisation des fonctions génératrices en géométrie symplectique globale, Ph.D. Thesis, Université Denis Diderot (1995).
- [7] D. Théret - A complete proof of Viterbo's uniqueness theorem on generating functions, *Topology Appl.* 96 (1999), 249–266.
- [8] S. Sandon - Contact homology, capacity and non-squeezing in $\mathbb{R}^{2n} \times S^1$ via generating functions, *Ann. Inst. Fourier (Grenoble)* 61 (2011), 145–185.
- [9] S. Sandon - Generating functions in symplectic topology (2014), <http://members.unine.ch/felix.schlenk/Santiago/cours.margherita.pdf>

Other references are:

- F. Laudenbach, and J.-C. Sikorav, Persistence d'intersection avec la section nulle au cours d'une isotopie hamiltonienne dans un fibré cotangent, *Invent. Math.* 82 (1985), 349–357.
- J.C. Sikorav - Sur les immersions lagrangiennes dans un fibré cotangent admettant une phase génératrice globale, *C.R. Acad. Sci. Paris, Sér. I Math.* 302 (1986), 119–122.
- J.C. Sikorav, Problèmes d'intersections et de points fixes en géométrie hamiltonienne, *Comment. Math. Helv.* 62 (1987), 62–73.
- C. Viterbo - Symplectic topology as the geometry of generating functions, *Math. Ann.* 292 (1992), 685–710.