

Contact mechanics and elements of tribology

Concluding remarks

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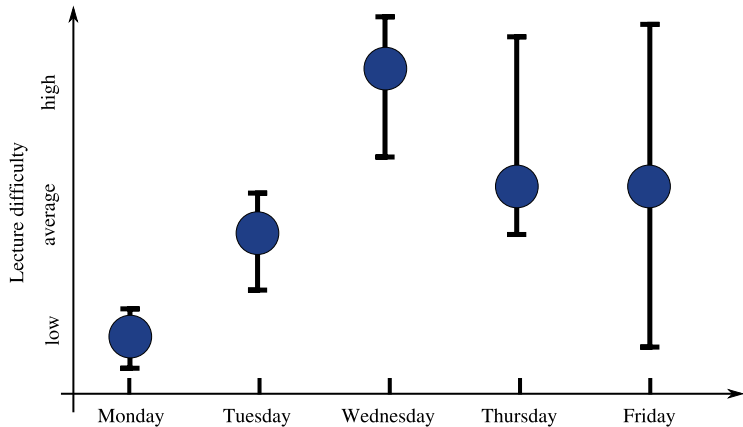
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Summary of the course

- Monday
 - Overview of applications
- Tuesday
 - Continuum contact mechanics in 2D
- Wednesday
 - Computational contact mechanics
- Thursday
 - Micromechanical contact
- Friday
 - Seminars

Summary of the course



Summary of the course

Basic notions:

- Continuum contact mechanics
- Roughness
- Friction models
- Lubrication
- Finite element analysis of contact (attention to friction).

New notions:

- Fractals
- Power spectral density (PSD)
- Nayak's parameter
- Augmented Lagrangian method
- Multi-asperity models
- Mortar and MorteX methods
- Elastodynamic friction
- Stick-slip

- Continuum contact mechanics
 - K.L. Johnson. Contact Mechanics, 1985.
 - J.R. Barber. Contact Mechanics, 2018.
- Computational contact mechanics
 - P. Wriggers. Computational Contact Mechanics, 2006.
 - T. Laursen. Computational contact and impact mechanics, 2002.
- Roughness
 - T.R. Thomas. Rough Surfaces, 1998.
 - P. Meakin. Fractals, scaling and growth far from equilibrium, 1998.
- Lubrication & Sealing
 - B.J. Hamrock et al. Fundamentals of fluid film lubrication (2004)
 - H.K. Müller, Fluid Sealing Technology: Principles and Applications (1998)
- Micromechanical contact and tribology
 - F.P. Bowden, D. Tabor. The Friction and Lubrication of solids, 1954.
 - E. Rabinowicz. Friction and Lubrication of Materials, 1964.

Conclusion

- “Practice is the father/mother of learning”
- “Devil/God is in the detail”
- Contact mechanics and tribology are very broad domain and crucial for engineering
- Friction is a rare mechanical phenomenon on which you can hope to publish in Nature/Science

Few recent examples:

[1] I Svetlizky, J Fineberg, Classical shear cracks drive the onset of dry frictional motion, *Nature* 509 (2014)

[2] M. Yifei, K.T. Turner, I. Szlufarska. Friction laws at the nanoscale. *Nature* 457 (2009)

[3] F. Yamashita et al., Scale dependence of rock friction at high work rate. *Nature* 528 (2015)

- Many interesting questions are to be addressed in the future
- Fine experiments are crucial for advancement
- Computational mechanics is important for understanding of complex interplay of different physics in the interface



Thank you for your attendance and
participation!