Fluid Dynamics

Syllabus SS2022

- Lectures: Friday, 9-11 pm, Online / Prof. Dr.-Ing. habil. Nikolai Kornev
- Exercises: Thursday, 11-13 pm, Online / Yamin Asad, M.Sc.
- **Attention:** The Lectures and exercises starts at full hour, please be on time!

No.	Date	Lecture
1	08.04.2022	Classification of flows. Navier- Stokes eq. Continuity eq. Inviscid flows. Bernoulli equation. Pitot tube. Pressure coefficient
2	22.04.2022	Potential flows I
3	29.04.2022	Potential flows II
4	30.04.2022	Potential flows III
5	06.05.2022	Added mass theory I
6	13.05.2022	Added mass theory II
7	20.05.2022	Airfoil theory I
8	27.05.2022	Airfoil theory II
9	03.06.2022	Airfoil theory III. Vortex lattice method
10	17.06.2022	Wave theory I
11	24.06.2022	Wave theory II
12	01.07.2022	Similarity criteria. Cavitation.
13	08.07.2022	Viscous resistance.
14	15.07.2022	Viscous flows

No.	Date	Exercise	Exercises from the book
1	07.04.2022	Hydrostatics	[1] Ch.2, Ex.1, 2, 3, 4, 6, 9, 10
2	14.04.2022	Bernoulli equation. Pitot tube.	[1] Ch.1, Ex.12-19, 23, 25, 26
3	21.04.2022	Potential flows	[1] Ch.1, Ex. 1, 2, 4; Ch.4, Ex. 1, 8, 9, 11
4	28.04.2022	Potential flows around cylinder with/without circulation	Just theory
5	05.05.2022	Potential flows	[1] Ch.3, Ex. 6, 7, 8; Ch.5, Ex. 2, 3, 5
6	12.05.2022	Bernoulli eq. for potential unsteady flows. Unsteady flow around cylinder	Theory from Lectures
7	19.05.2022	Added Mass	[1] Ch.6, Ex. 2- 8
8	02.06.2022	Added Mass	[1] Ch.7
9	16.06.2022	Airfoil theory	[1] Ch.8, Ex. 1 -9
10	23.06.2022	Airfoil theory	Exercise with the Autowing Code
11	30.06.2022	Wave theory	[1] Ch.9
12	07.07.2022	Similarity theory and cavitation	[1] Ch.10; Ch. 1, Ex. 9, 10
13	14.07.2022	Viscous flows	[1] Ch.11;

Literature:

1. N. Kornev, M. Dhone: Fluid dynamics. Book of exercises. 2018.
2. N. Kornev: Fluid dynamics. 2020.

Literature recommendations:

1. Potential theory (Irrotational flows): Katz J., Plotkin A., Low-Speed Aerodynamics, Cambridge University Press, 2010; Alexander J. Smith, A Physical Introduction to Fluid Mechanics ; Joseph Spurk, Fluid Mechanics.
2. Similarity theory: Alexander J. Smith, A Physical Introduction to Fluid Mechanics; Dominique Thevenin, Gabor Janiga, Fluid Dynamics for Engineers.

3. Hydrostatic theory: Alexander J. Smith, A Physical Introduction to Fluid Mechanics;

4. Added (virtual) mass: Joseph Spurk, Fluid Mechanics.

5. Airfoil theory: Katz J., Plotkin A., Low-Speed Aerodynamics, Cambridge University Press, 2010, https://en.wikipedia.org/wiki/Vortex_lattice_method and reference cited on this site.

6. Boundary Element Method: P. K. Banerjee, Prasanta Kumar Banerjee, Roy Butterfield, Boundary element methods in engineering science.

7. Wave theory: J.N. Newman, Marine Hydrodynamics, MIT Press, 1977