



Program of the course ‘Applied Vacuum Technology’ under auspices of the NEVAC

The course is designed especially for Master students, PhD students and Postdocs.
It covers fundamental knowledge on vacuum and practical information about operating vacuum setups in the lab.
You also have ample opportunity to discuss your own equipment with vacuum experts.

When: May 23 – 25, 2023
Duration: 3 days from 09.00 till 17.00 hours
Location: Delft University of Technology, Dept. of Applied Physics; Lecture Hall F070
Coordination: Dr. A. Dick van Langeveld
Lecturers: Dick van Langeveld*, Gesa Welker & Marc Zuiddam (*coordinator),
Registration: <https://nevac.nl/aiocursus.php>
Costs: 550 €, ex VAT, incl. book Vacuum Science & Technology, lunches.

Day	Topic	Lecturer
Tue, May 23 9.00- 12.30	1) Introduction & Fundamental Aspects Thermal Velocity of molecules Mean free path of Molecules Adsorption / Desorption (Saturated) Vapor Pressure 2) Flow of gases Turbulent Viscous Molecular Conductivities 3) Cryogenic Technology Vacuum-related cooling methods Thermal isolation Cryopumping	Gesa Welker
Tue, May 23 13.30 - 17.00	3) Total Pressure Gauges Membrane gauges Heat Conductivity gauges Hot- & cold cathode ionization gauges 4) Residual Gas analysis Magnetic Deflection Spectrometer Quadrupole Mass Spectrometer	Dick van Langeveld
Wed, May 24 9.00 - 12.30	5) Pre-Vacuum pumps Rotary vane pump Membrane pump Scroll pump Roots pump Multistage Roots pump	Marc Zuiddam
Wed May 24 12.30 - 17.00	6) (Ultra) High Vacuum pumps Turbomolecular pump Sorption pump Cryopump Ti-sublimation pump Getter pump Sputter-ion pump	Marc Zuiddam
Thu, May 25 9.00 - 12.30	7) Connections & components 8) Cleaning and working discipline	Dick van Langeveld
Thu May 25 12.30 - 17.00	9) Leak testing	Dick van Langeveld

Homework (apply to your system):

- 1) During pump down from atmosphere, at what points in time are which parts of your system in what flow regime?
- 2) What are the conductivities at various crucial positions (flanges, tubes, pipes, etc.) for gas inlets and outlets?
- 3) Identify all pressure gauges and controllers on your system and look up their specs.
- 4) Identify (if any) your RGA systems and look up all of their specs.
- 5) Identify and pre-vacuum- and (U)HV pumps on your system and their controllers.
- 6) Draw a block scheme of your system.
- 7) Briefly discuss the necessity of every type of pump in your system.
- 8) If you had to rebuild your system, would you use the same combination of pumps, chambers and flanges? Motivate your answer.