

# Lecture Series Programme 2016-2017



INTRODUCTION TO MEASUREMENT TECHNIQUES  
OCTOBER 3-7, 2016

INTRODUCTION TO GROUND TESTING FACILITIES  
NOVEMBER 7-9, 2016

INTRODUCTION TO COMPUTATIONAL FLUID DYNAMICS  
JANUARY 23-27, 2017

RADIAL COMPRESSOR DESIGN AND OPTIMIZATION  
FEBRUARY 6-10, 2017

SUPERSONIC TRANSPORT  
FEBRUARY 20-24, 2017

INDUSTRIAL COMPUTATIONAL FLUID DYNAMICS  
MARCH 20-24, 2017

CFD FOR ATMOSPHERIC FLOWS AND WIND ENGINEERING  
MARCH 27-31, 2017

→ THERMOHYDRAULICS AND CHEMISTRY OF LIQUID METAL  
COOLED REACTORS  
APRIL 10-14, 2017

TURBULENT COMBUSTION  
APRIL 24-28, 2017

ACTIVE FLOW CONTROL: TECHNIQUES AND APPLICATIONS  
MAY 8-12, 2017

DESIGN AND OPERATION OF AEROACOUSTIC WIND  
TUNNEL TESTS FOR GROUND AND AIR TRANSPORT  
(STO-AVT-287)  
MAY 22-24, 2017

MULTIPHYSICS PHENOMENA ANALYSIS ON BOUNDARY  
LAYER STABILITY IN HYPERSONIC REGIME (STO-AVT-289)  
JUNE 12-16, 2017

LIQUID FRAGMENTATION IN GAS FLOWS (STO-AVT-288)  
SEPTEMBER 11-15, 2017

# Von Karman Institute for Fluid Dynamics



VKI is a non-profit international educational and scientific organisation, hosting three departments (aeronautics and aerospace, environmental and applied fluid dynamics, and turbomachinery & propulsion).

It provides post-graduate education in fluid dynamics (research master in fluid dynamics, former "VKI Diploma Course", doctoral program, short training program and lecture series) and encourages "training in research through research". The von Karman Institute undertakes and promotes research in the field of fluid dynamics.

VKI possesses about fifty different wind tunnels, turbomachinery and other specialized test facilities, some of which are unique or the largest in the world. Extensive research on experimental, computational and theoretical aspects of gas and liquid flows is carried out at the VKI under the direction of the faculty and research engineers, sponsored mainly by governmental and international agencies as well as industries.

The von Karman Institute organizes each year about 10 one-week Lecture Series on specialized topics in the field of aerodynamics, fluid mechanics and heat transfer with application to aeronautics, space, turbomachinery, the environment and industrial fluid dynamics. These courses have gained over the years world wide recognition for their high quality, which is the result of a careful choice of subjects of current interest and lecturers known for their excellency and willing to co-operate in building up well-structured courses.



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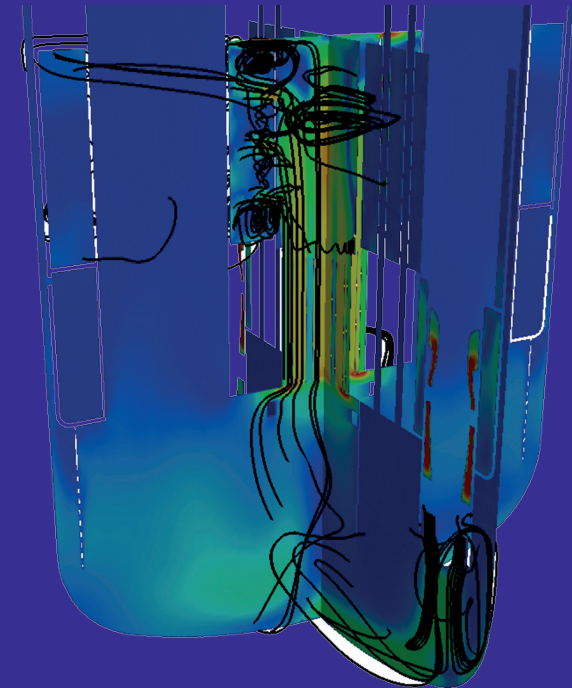
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von KARMAN INSTITUTE  
FOR FLUID DYNAMICS

## Lecture Series on Thermohydraulics and Chemistry of Liquid Metal Cooled Reactors

April 10-14, 2017



Lecture Series 06-07

The objective of the Lecture Series is to provide a state-of-the-art review of the current knowledge and future challenges in Fluid Mechanics and Chemistry of Liquid Metal Cooled Reactors. The Lectures provides general lessons on these topics as well as more specialized lectures related to current research activities. The course starts with a description of the thermo-hydraulic challenges for future Liquid Metal Cooled reactors and is then followed by a review on the chemistry challenges. The next part of the course is devoted to thermo-hydraulics challenges from modeling point of view (system codes and CFD code) and experimental point of view. The Lecture Series is intended to provide enough introductory material to welcome novices in the field but also advanced information for expert researchers.

This Lectures Series is organized in the framework of the MYRTE and SESAME Horizon 2020 projects from the European Union. Most of the lecturers are scientists actively involved in one of these two research projects. The Lecture Series co-directors are Ferry Roelofs from NRG (the Netherlands) and Philippe Planquart from the von Karman Institute.

# Schedule

## Monday 10 April 2017

- 8:30 Registration
- 9:00 Welcome and introductory remarks
- 9:15 Introduction to SESAME/MYRTE Lecture Series  
*Ir. K. van Tichelen, SCK•CEN, Belgium*
- 9:45 Explanation of SEALER design with focus on thermohydraulics challenges  
*Mr. I. Mickus, LeadCold, Sweden*
- 10:15 Coffee Break
- 10:30 Release of volatile radionuclides in liquid metal reactors and their capture  
*Dr. J. Neuhausen, Paul Scherrer Institute, Switzerland*
- 11:30 Oxygen Control  
*Dr. A. Aerts, SCK•CEN, Belgium*
- 12:30 Lunch
- 14:00 Fuel-coolant interaction  
*Prof. T. Retegan, Chalmers University, Sweden*
- 15:15 Coffee Break
- 15:45 Liquid metal flow meters  
*Dr. S. Eckert, HZDR, Germany*
- 17:00 Ice-breaker cocktail

## Tuesday 11 April 2017

- 9:00 Bundle experiments in water serving liquid metal reactors  
*Prof. M. Rohde, Technical University of Delft, the Netherlands*

- 10:00 Pool experiments in transparent fluids serving liquid metal reactors  
*Ir. Ph. Planquart, von Karman Institute, Belgium*
- 11:00 Coffee Break
- 11:15 Design of experimental liquid metal facilities  
*Dr. M. Tarantino, ENEA, Italy*
- 12:30 Lunch
- 14:00 Construction of experimental liquid metal facilities  
*Prof. T. Wetzel, KIT, Germany*
- 15:15 Coffee Break
- 15:45 Operational aspects of experimental liquid metal facilities  
*Ir. G. Kennedy, SCK•CEN, Belgium*

## Wednesday 12 April 2017

- 9:00 Sub-channel codes for liquid metals  
*Prof. X. Cheng, KIT, Germany*
- 10:15 Coffee Break
- 10:45 System thermal hydraulics for liquid metals  
*Prof. N. Forgiome, UNIFI, Italy*
- 12:00 Lunch
- 14:00 DNS Simulations for liquid metal applications  
*Prof. I. Tiselj, JSI, Slovenia and Prof. E. Stalio, UMP, Italy*
- 15:15 Coffee Break
- 15:45 LES Simulations for liquid metal applications  
*Prof. Y. Bartosiewicz, UCL, Belgium*

## Thursday 13 April 2017

- 9:00 (U)RANS: turbulence modelling  
*Dr. A. Shams, NRG, the Netherlands*
- 10:00 (U)RANS: flow induced vibrations  
*Prof. J. Degroote, University of Gent, Belgium*
- 11:00 Coffee Break
- 11:30 (U)RANS: core thermal hydraulics  
*Ir. F. Roelofs, NRG, the Netherlands*
- 12:30 Lunch
- 14:00 (U)RANS: pool thermal hydraulics  
*Dr. L. Koloszar, von Karman Institute, Belgium and Dr. V. Moreau, CRS4, Italy*
- 15:15 Coffee Break
- 15:45 Multi-scale simulations for liquid metals  
*Dr. A. Gerschenfeld, CEA, France*

## Friday 14 April 2017

- 9:00 V&V methods and UQ for nuclear liquid metal analysis  
*Prof. P. Kudinov, KTH, Sweden*
- 10:30 Coffee Break
- 11:00 Best practise guidelines for nuclear liquid metal CFD  
*Ir. F. Roelofs, NRG, the Netherlands*
- 11:30 The US NEAMS program  
*To be confirmed, USA*
- 12:30 Lunch
- 14:00 VKI Lab tour
- 15:30 Coffee Break

## Online Registration <https://www.vki.ac.be>

It is highly recommended to register at the latest 15 days before the beginning of the course. A letter of acceptance and additional information will be sent on receipt of the application form.

## Early Registration Fee (until 10 February 2017)

VAT included	Type 1*	Type 2*	Type 3*
Normal	945 €	1235 €	1345 €
Phd	475 €	475 €	675 €
Undergraduate	210 €	210 €	280 €

## Late Registration Fee

VAT included	Type 1*	Type 2*	Type 3*
Normal	1350 €	1760 €	1920 €
Phd	675 €	675 €	960 €
Undergraduate	300 €	300 €	400 €

\*Type 1: Permanent residents of NATO countries funding VKI: Belgium, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Iceland, Italy, Luxemburg, Norway, Portugal, Romania and Turkey

\*Type2: Permanent residents of NATO countries not funding VKI or NATO partner countries

\*Type 3: Permanent residents of non -NATO countries

For PhD candidate, the request to be considered for an award must accompany the application to attend the Lecture Series, and the applicant must provide a recommendation letter from his or her professor; if not done so, the request will not be taken into consideration. All possible alternative sources of funding should be investigated before aid is requested under this scheme, so that those most in need will benefit.