# Programme

LECTURE SERIES
2012-2013

VKI-LS

- ❒ INTRODUCTION TO MEASUREMENT TECHNIQUES
  October 8-12, 2012
- ❒ INTRODUCTION TO CFD
  January 21-25, 2013
- ❒ CUBESAT TECHNOLOGY AND APPLICATIONS
  January 29 - February 1, 2013
- ❒ CFD FOR ATMOSPHERIC FLOWS AND WIND ENGINEERING
  March 11-13, 2013
- ❒ RADIAL COMPRESSOR DESIGN
  March 11-15, 2013
- ❒ ACCURATE AND EFFICIENT AEROACOUSTIC PREDICTION APPROACHES FOR AIRFRAME NOISE
  March 25-28, 2013
- ❒ AEROENGINE DESIGN: FROM STATE OF THE ART TURBOFANS TOWARDS INNOVATIVE ARCHITECTURES
  April 9-12, 2013
- ❒ FLUID DYNAMICS ASSOCIATED TO LAUNCHER DEVELOPERS (STO-AVT-VKI-206)
  April 15-17, 2013
- ❒ RADIATION AND GAS-SURFACE INTERACTION PHENOMENA IN HIGH SPEED RE-ENTRY (STO-AVT-VKI-218)
  May 6-8, 2013
- ☑ TURBULENT COMBUSTION
  May 13-17, 2013
- ❒ SOURCE TERM CHARACTERIZATION OF THE CONSEQUENCES OF STORAGE TANK AGGRESSIONS (STO-AVT-VKI-219)
  June 4-6, 2013
- ❒ TRANSITION AND TURBULENCE IN HIGH-SPEED FLOW
  June 10-14, 2013
- ❒ FLOW CHARACTERISTICS AND PERFORMANCE OF SAFETY VALVES
  September 9-11, 2013
- ❒ ACCURATE TEMPERATURE MEASUREMENTS
  September 16-20, 2013
- ❒ 37TH COMPUTATIONAL FLUID DYNAMICS: ADJOINT METHODS IN CFD
  To be determined

## VON KARMAN INSTITUTE

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.

It 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.


von Karman Institute for Fluid Dynamics
Waterloosesteenweg 72
1640 Sint-Genesius-Rode, Belgium

Phone: +32(0)2 359 96 04
Fax: +32(0)2 359 96 00
E-mail: secretariat@vki.ac.be,

Website: https://www.vki.ac.be

TVA BE 0407 185 709


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von KARMAN INSTITUTE FOR FLUID DYNAMICS

# TURBULENT COMBUSTION
## May 13-17, 2013

Flame developing inside a Trapped Vortex Combustor (Simulation SiTCom-CORIA with immersed boundaries)

## INTRODUCTION

The objective of this biannual Lecture Series on Turbulent Combustion is to present the state-of-the-art review of on-going activities in turbulent combustion and to outline current research directions. Introductory lectures on the fundamentals of combustion, and in particular of turbulent combustion, are followed by up-to-date reviews on numerical modeling and experimental results in single and two-phase flows. Gas turbine combustion, IC engines and gasification processes are treated extensively. The lecturers will also give an appraisal of the future challenges and perspectives in the domain. Participants to the lecture series are invited to present a poster of their activities related to turbulent combustion. A pdf-file of the poster should be submitted to vanbeeck@vki.ac.be (Jeroen van Beeck) before 12 April 2013.

VON KARMAN INSTITUTE FOR
FLUID DYNAMICS

The directors of the lecture series are Prof. L. Vervisch of INSA de Rouen and CNRS CORIA (France) and Dr. Veynante of CNRS and Ecole Centrale Paris (France). The local coordinator is Jeroen van Beeck of the von Karman Institute.

## SCHEDULE

### Monday 13 May 2013

09:15 Welcome Address
09:30 Introduction to turbulent combustion
*Prof. L. Vervisch, INSA de Rouen and CNRS CORIA , France & Prof. D. Veynante, CNRS & Ecole Centrale des Arts et Manufactures, France*
10:30 Coffee Break
11:00 Introduction to turbulent combustion
*Prof. L. Vervisch & Prof. D. Veynante*
12:30 Lunch Break
14:00 Introduction to turbulent combustion
*Prof. L. Vervisch & Prof. D. Veynante*
15:15 Coffee Break
15:45 Introduction to turbulent combustion
*Prof. L. Vervisch & Prof. D. Veynante*
17:00 Reception

### Tuesday 14 May 2013

9:00 Turbulent combustion modelling
*Prof. L. Vervisch & Prof. D. Veynante*
10:30 Coffee Break
11:00 Turbulent combustion modelling
*Prof. L. Vervisch & Prof. D. Veynante*
12:30 Lunch Break
14:00 Turbulent combustion modelling
*Prof. L. Vervisch & Prof. D. Veynante*
15:15 Coffee Break
15:45 Turbulent combustion modelling
*Prof. L. Vervisch & Prof. D. Veynante*

### Wednesday 15 May 2013

9:00 Spray combustion
*Dr. R. Koch, Universitaet Karlsruhe, Germany*
10:30 Coffee Break
11:00 Spray combustion
*Dr. R. Koch*
12:30 Lunch Break
14:00 Spray combustion
*Dr. R. Koch*
15:45 Modeling of coal combustion and gasification
*Prof. Ch. Hasse, TU Freiberg, Germany*

### Thursday 16 May 2013

9:00 Experiments in turbulent combustion
*Prof. A. Dreizler, TU Darmstadt, Germany*
10:30 Coffee Break
11:00 Experiments in turbulent combustion
*Prof. A. Dreizler*
12:30 Lunch Break
14:00 Experiments in turbulent combustion
*Prof. A. Dreizler*
15:45 Combustion Technologies for future gas turbines and requirements on design tools
*Dr. Werner Krebs, Siemens AG, Germany*

### Friday 17 May 2013

9:00 Applications of turbulent combustion modeling
*Prof. D. Haworth, Pennsylvania State University, USA*
10:30 Coffee Break
11:00 Applications of turbulent combustion modeling
*Prof. D. Haworth*
12:30 Lunch Break
14:00 Applications of turbulent combustion modeling
*Prof. D. Haworth*
15:45 Applications of turbulent combustion modeling
*Prof. D. Haworth*
17:00 End of lecture series

## ONLINE REGISTRATION AVAILABLE

**https://www.vki.ac.be/registration**

It is highly recommended that the registration is sent 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.

## COURSE FEE

The fee for the lecture series is 1350 euro, applicable to citizens of NATO countries contributing to the financing of the VKI (Belgium, Czech Republic, France, Germany, Hungary, Iceland, Italy, Luxemburg, Norway, Portugal, Spain and Turkey). For citizens of other NATO countries and of NATO partner countries, the fee is 1760 euro. For non-NATO citizens the fee is 1920 euro. These prices include 21% VAT. The fee includes printed notes, lunches, beverages, and administrative costs. Lectures will be given in English and printed notes will be distributed during registration.

## FELLOWSHIPS

To encourage greater participation in our Lecture Series programme by university members, the Institute has established a limited number of VKI Lecture Series fellowships for citizens of NATO countries contributing to the financing of the VKI, as well as for citizens of other NATO countries and NATO partner countries coming from a university in a VKI financing country. The recipient of such fellowship is entitled to attend the Lecture Series at a reduced fee, which will be 675 euro (VAT included) for assistants not having a Ph.D. degree and for Ph.D. candidates, and 300 euro (VAT included) for undergraduate students. For non-NATO citizens coming from a university in a VKI financing country, the fee is 960 euro (VAT included) for assistants not having a Ph.D. degree and for Ph.D. candidates, and 400 euro (VAT included) for undergraduate students.
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.