

PIV Course 2013



Application of Particle Image Velocimetry Theory and Practice, March 18-22, 2013

Application of PIV

The main interest of today's research in fluid mechanics is more and more directed to problems where unsteady and separated flows are predominant. For investigations of flowfields with pronounced spatial structures and/or rapid temporal or spatial changes (transition from laminar to turbulent flow, coherent structures, pitching airfoils in transonic flows with shocks, rotors, test facilities with short run time, etc.) new experimental techniques, such as Particle Image Velocimetry (PIV) are required which allow to capture the flow velocity of large flow fields instantaneously. An important feature of PIV is that for the first time, a reliable basis of experimental flow field data is provided for direct comparison with numerical calculations and hence, for validation of computer codes. During the last years an increasing number of scientists have started to utilize the PIV technique to investigate the instantaneous structure of velocity fields in various areas of fluid mechanics. A number of different approaches for the recording and evaluation of PIV images have been described in literature. This course, which is the 21st course on PIV since 1993 organized by DLR, will mainly concentrate on those aspects of the theory of PIV relevant to applications. Besides giving lectures on the fundamental aspects, special emphasis is placed on the presentation of practical and reliable solutions of problems which are faced during the implementation of this technique in wind tunnels and other test facilities. During practice the participants will have the opportunity to carry out the recording and the evaluation of PIV images by themselves in small groups. Recent developments of the PIV technique such as 3D(t)-PIV (tomographic and holographic PIV) and Stereo PIV, Time Resolved PIV and Micro-PIV will be discussed and demonstrated.

from 8:30 to 12:00 on Monday to Thursday. Experiments and demonstrations in the laboratory (5 half days) and from 13:30 to 16:30 from Monday to Thursday, respectively. All presentations will be given in English.

Course registration

Early registration is required due to limited number of places in the laboratory. Only online registration is possible opening in September 2012 at:

<http://pivcourse.dlr.de>.

The registration fee of 1250 € includes course notes, lunches and refreshments during the course. For payments received before January 31, 2013, a reduced registration fee of 1150 € applies. The fee for participation is free of VAT as far as the German Umsatzsteuergesetz (UStG) is concerned. The organizers reserve the right to cancel the course in case of insufficient registration. A cancellation fee of 200 € will be charged from registered persons who cancel their participation after March 1, 2013.

Course materials

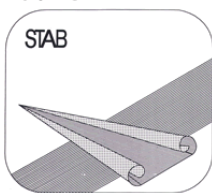
A complete set of course notes together with the book 'Particle Image Velocimetry - A Practical Guide (2nd Edition)', published by Springer (2007) and the CD-ROM of proceedings of the PIV'11 symposium will be distributed to the participants at registration.

Who should attend?

This course is mainly intended for engineers, scientists and students, who have already some basic knowledge of the PIV technique and have just started to utilize PIV for their special industrial or scientific applications or plan to do so in near future. During the course many problems arising in the recording and evaluation of PIV images will be treated - in theory as well as in practice.

Organized by:

AG STAB



JM Burgerscentrum

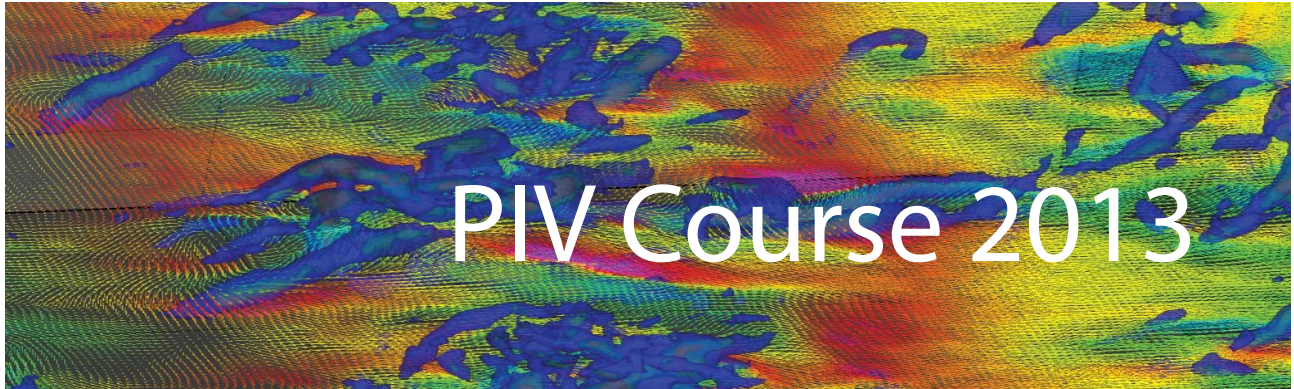


In cooperation with:

Laboratoire de Mécanique de Lille,
Delft University of Technology,
University of Oldenburg,
University BW of Munich,
DLR, Göttingen

Program Schedule

Registration will begin at 8:00 on Monday, March 18, 2013 in the Secretary Room of Building 7. Lectures (4 half days) will run



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Lecture outline

March 18, 2013, 08:00-16:30

Registration 08:00-08:30. Welcome by Dr. Lars Koop, Head of Experimental Methods. Principles of PIV: Flow tracing by particle imaging, light scattering, recording of PIV images, analysis. Application of PIV: Considerations for design of PIV-systems, PIV systems for wind tunnels. Principles: Statistics of PIV images. Welcome party 17:30.

March 19, 2013, 08:30-16:30

Application: Digital PIV, video recording, CCD/CMOS sensors. Principles: Theoretical aspects of evaluation of digital PIV recordings, cross-correlation, image deformation, peak detection, evaluation of stereoscopic PIV recordings. Application: Practical aspects of evaluation of digital PIV recordings, measurement uncertainties, Combined PIV / LIF. Practice I.

March 20, 2013, 08:30-16:30

Principles: Advanced techniques, optical principles of stereoscopic, tomo- and holographic methods, data validation. Application: Multi plane stereo-, Micro- and Time Resolved-PIV, PIV for multiphase flows, vector field operators, data analysis and presentation. Practice II.

March 21, 2013, 08:30-16:30

Practice III and Practice IV. Dinner 19:30

March 22, 2013, 08:30-12:30

Practice V. Future aspects of PIV. Final discussion.

Preliminary practice outline

I - Image capture in wind tunnel: seeding, pulse laser, illumination optics, triggering, CMOS recording, TR-/Tomo-PIV.

II - Image capture in water tunnel: imaging, CCD recording, optical distortions, 3C-PIV.

III - Evaluation and post processing: cross-correlation methods, data validation, data analysis and presentation.

IV - Optics and holography: imaging, holography.

V - PIV related techniques: video stroboscope, density measurements (BOS).

Exhibition

An exhibition of equipment from major manufacturers of PIV systems will take place from March 21 to 22, 2013.

Lecturers

Prof. Michel Stanislas, Laboratoire de Mécanique de Lille, France, is working in the field of Flow Visualization, Holography, and Particle Image Velocimetry and will present the lectures on the optical aspects. Prof. Klaus Hinsch, Carl von Ossietzky Universität, Oldenburg, Germany, who has long term experience in the field of Holography, Speckle and Particle Image Velocimetry, will present the lectures on 3D and holographic PIV.

Prof. Jerry Westerweel, Delft University of Technology (TUD), The Netherlands, will discuss the theoretical basis of the digital PIV technique.

Dr. Christian Poelma, TUD, will discuss combined PIV/LIF and Micro PIV in his lectures.

Prof. Christian Kähler, UniBw München will discuss Stereo and Multi-plane PIV aspects and the advances in Time Resolved and long range micro-PIV.

Dr. Andreas Schröder, Institute of Aerodynamics and Flow Technology, DLR, Göttingen, will organize the PIV course, which was established in 1993 by Dr. Jürgen Kompenhans. In the past Prof. Markus Raffel and Dr. Christian Willert have provided the foundations of PIV application in wind tunnels.

Together with Dr. Klaus Ehrenfried, Dr. Boleslaw Stasicki, Dr. Robert Konrath, Dr. Reinhard Geisler, Dr. Daniel Schanz, Dr. Eric Roosenboom, Dr. Arne Henning, Dr. Melanie Voges, Dipl.-Ing. Tania Kirmse, Dipl.-Ing. Janos Agocs, and Dipl.-Ing. Fritz Boden, from DLR, they will present their knowledge and experience in different areas of the PIV technique such as tracer particles, illumination, recording, evaluation, data presentation, 3D(t)-PIV and other 3C-PIV techniques.

Additional information

For additional information about the course contact:

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