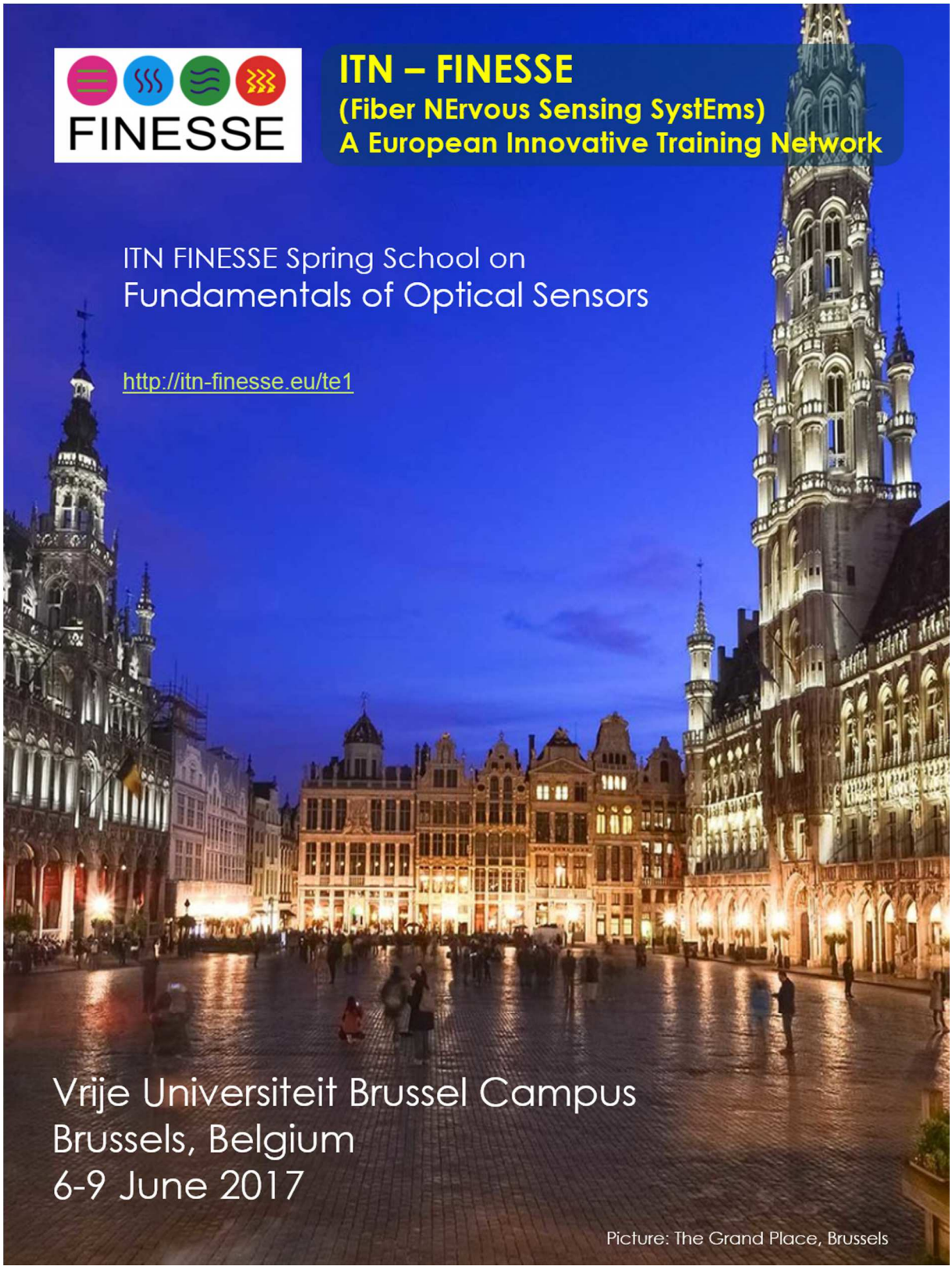

FINESSE
ITN – FINESSE
(Fiber NErvous Sensing SystEms)
A European Innovative Training Network
ITN FINESSE Spring School on
Fundamentals of Optical Sensors
http://itn-finesse.eu/te1
Vrije Universiteit Brussel Campus
Brussels, Belgium
6-9 June 2017
Picture: The Grand Place, Brussels

FINESSE consortium

Contributing partners to this PhD school

ITN FINESSE Training Event 1: Fundamentals of Optical Fibre Sensors

Overview of FINESSE Training Event 1

Innovative Training Network FINESSE Training event 1: 'Fundamentals on Optical Sensors' is a spring school addressing early career PhD students and professionals that are interested in learning about the basic techniques that enable the measurement of many different physical quantities by exploiting the unique properties of light. The academic lectures deal with the basic properties of light and optical signals, review the main light-matter interaction mechanisms, discuss most important optical devices such as lasers, photodetectors, and optical fibers, and explain how these can be used to construct optical sensor systems. The industrial lectures and laboratory sessions include examples of sensor systems targeting the measurement of important parameters such as temperature, distance and displacement, force and pressure and industrial applications thereof. Additional lectures deal with the importance and impact of Photonics – the science and technology of light – on our economy and society, and with entrepreneurship-related topics such as the basics of intellectual property right protection. All lectures will be delivered by established academics and invited industry experts.

Attendees will be requested to present a poster about their research or professional activity and they will receive a certificate of attendance, which can be changed into ECTS credits, as well as on-line access to all course material. This course lasts for 4 entire days, and will also include 2 social events and one poster reception.

TE1 progamme at a glance

General Schedule of FINESSE Training Event 1

Tuesday 06/06	Wednesday 07/06	Thursday 08/06	Friday 09/06
FINESSE activity / Free time	T. Geernaert (VUB) - POLARIZATION/BIREFRINGENCE	S. Sales (UPVLC) - BRAGG REFLECTION IN OPTICAL FIBRES	S. Vanlanduit (University of Antwerp) - VIBRATIONS/DEFORMATIONS
F. Berghmans (VUB) - PHOTONICS	H. Ottevaere (VUB) - INTERFERENCE/INTERFEROMETRY	M. Rothhardt (IPHT) - FIBER GRATING FABRICATION	J. Zepp (POLYTEC) - INDUSTRIAL VIBROMETRY/VELOCIMETRY
Coffee break	Coffee break	Coffee break	Coffee break
M. Gonzalez (UAH) - LIGHT & CHARACTERISTICS OF OPTICAL SIGNALS	W. Meulebroeck (VUB) - SPECTROSCOPY	J. Vlekken (FBGS) - INDUSTRIAL FBGs	FINESSE activity / Free time
Lunch	Lunch	Lunch	Lunch
M. Gonzalez (UAH) - LIGHT MODULATION	N. Vermeulen (VUB) - GENERATION OF LIGHT/LASERS	T. Crispeels (VUB) - IP & ENTREPRENEURSHIP	FINESSE activity / Free time
F. Berghmans (VUB) - DETECTING LIGHT/PHOTODIODES	L. Thévenaz (EPFL) - PRINCIPLES OF DISTRIBUTED SENSORS		
Coffee break	Coffee break	Coffee break	Coffee break
M. Tur (TAU) - BASICS OF FIBER-OPTICS	F. Berghmans (VUB) - LIGHT AND TEMPERATURE	T. Geernaert (VUB) - DISTANCE/DISPLACEMENT	FINESSE activity / Free time
T. Geernaert (VUB) - BASICS OF PHOTONIC CRYSTAL FIBERS	B. Ribbens (THERMAL FOCUS) - INDUSTRIAL THERMOGRAPHY	W. Van der Tempel (SOFTKINETIC) - SOLID STATE 3D TIME OF FLIGHT TECHNOLOGY	
Free Time		Free Time	Closing Session & Free Time
Social event: Welcome reception		Social event: Poster session	Social event: Goodbye party + poster award

Detailed programme of TE1

Day 1: Tuesday 06/06

09.00 – 09.45 FINESSE activity for FINESSE ESRs/ Free time for other participants

09.50 – 10.40: Photonics
Francis Berghmans – Vrije University of Brussels
Abstract: PHOTONICS – the Science and Technology of Light – has been recognised as a Key Enabling Technologies (KETs), together with nanotechnology, micro- and nanoelectronics, advanced materials and biotechnology. Key Enabling Technologies are those technologies which are increasingly driving innovation today and will continue to drive innovation in the future. In this lecture you will learn about the importance of PHOTONICS, not only for our economy, but also about how it will help us solving the challenges that our society is facing in the next decades. The largest parts of this lecture is inspired from material provided by The European Technology Platform Photonics21 (http://www.photonics21.org), which unites the majority of the leading photonics industries and relevant Research & Innovation stakeholders along the whole economic value chain throughout Europe. Today Photonics21 has more than 2500 members. It aims to establish Europe as a leader in the development and deployment of photonics technologies within the various applications fields such as ICT, lighting, industrial manufacturing, life science, safety as well as in education and training.

10.40 – 11.00 Coffee Break

11.00 – 11.50: Light & characteristics of optical signals
Miguel Gonzalez-Herraez – Universidad de Alcalá
Abstract: This lecture will review the fundamental properties of light from several points of view (ray, wave, particle) and the main aspects of light propagation and interaction with matter in different relevant media. Basic concepts such as amplitude, phase, intensity, polarization, phase and group velocity, dispersion and light scattering will be reviewed, with the particular focus on the applications of these properties to the development of measurement systems.

11.50 – 13.30 Lunch Break

13.30 – 14.20: Light modulation
Miguel Gonzalez-Herraez – Universidad de Alcalá
Abstract: This lecture will provide the basics on how to provide amplitude, phase or polarization modulation in optical signals, particularly in the context of optical fiber instrumentation. Particular emphasis will be given to the creation of modulated optical waveforms of strong interest in sensing experiments (e.g. high extinction ratio pulses, linear frequency sweeps, etc).

14.20 – 15.10: Detecting light/photodiodes
Francis Berghmans – Vrije University of Brussels
Abstract: The most well-known device used to detect light is called a 'photodiode'. It is a crucial element in almost every optical system, as it allows converting an optical signal in an electrical signal, the latter being very easy to handle and process. In this lecture we will review the basics of the operation of photodiodes, starting from the operation of a semiconductor p-n junction. We will look at the most important characteristics of a photodiode, including the quantum efficiency, responsivity, dark current and response time, and we will make a distinction between photovoltaic and photoconductive modes of operation. We will also briefly look at different types of photodiodes made from different semiconductor materials.

15.10 – 15.40 Coffee Break

15.40 – 16.30: Basics of fibre optics
Moshe Tur – Tel Aviv University
Abstract: Optical fibers are not only the waveguides of the present, if not also of the near future, they are also excellent sensors, being able to intrinsically sense temperature, strain, electric and magnetic fields, rotation (the fiber-optic gyroscope), and more. Efficient sensor design and implementation requires full understanding of the characteristics of optical fiber, to be described in detail in this lecture. Starting with the guiding properties in multimode and single mode fibers, we'll then discuss the properties of fiber modes and their categorization into HE, EH, LP and OAM modes. Continuing with the unique low loss and dispersion properties of silica based fibers we'll then explore relevant nonlinear optical effects, some of which form the basis of excellent sensors, while others limit the performance these same sensors. Polarization issues in optical fibers and the basic specifications of polarization maintaining fibers will be also discussed.

16.30 – 17.20: Basics of photonic crystal fibres
Thomas Geernaert - Vrije University of Brussels
Abstract: Photonic crystal fibers succeed in confining and guiding light in a central core region without making use of the conventional step-index geometries encountered in standard fibres. They succeed in doing so by relying on either modified total internal reflection (effective index fibres) or a photonic bandgap (photonic bandgap fibres) to prevent the guided modes from escaping the fibre's core region. We will see what a photonic bandgap is and how it can be realized. We will explain why PCFs offer unusual waveguide properties such and endlessly single-mode guidance, hollow-core guidance, extreme dispersion control and ultra-small effective mode areas. We will also show how a PCF can be simulated and what their fabrication process typically entails. We will end with highlighting applications for which PCFs have allowed leapfrogging the performance of conventional fibre technology with a focus on optical fibre sensor applications.

19.00 – 22.00 Social event: TE1 welcome reception

Day 2: Wednesday 07/06

09.00 – 09.50: Polarisation/birefringence
Thomas Geernaert - Vrije University of Brussels
Abstract: In an optical fibre, light can be considered as an electromagnetic plane wave with an electric and magnetic field perpendicular to each other as well as to the propagation axis. The polarization of that wave is defined as the pattern described by the electric field vector during its propagation. To classify different polarization states we will introduce the concept of the polarization ellipse, with linear and circular polarization as special cases, the degree of polarization and the mathematical description of polarization via the Jones and Stokes formalism. We will see examples of Mueller matrices to represent polarizers and quarter-wave plates and explain the concept of the Pointcarré sphere. Finally we will link the polarization with the concept of birefringence for optical fibres that do not exhibit circular symmetry and show examples of waveguide and material birefringence.

09.50 – 10.40: Interference/interferometry
Heidi Ottevaere - Vrije University of Brussels
Abstract: In this course we will start from the basics of interferometry and discuss various interferometers that are widely used in science and industry for the measurement of small displacements, refractive index changes and surface irregularities. We will first introduce Young's double slit experiment and explain coherence (spatial and temporal) and fringe contrast. In a next step we will give an overview of the different types of interferometers that exist and discuss in more detail the basic interferometers for optical testing. For each of these interferometers we will demonstrate the working principle using a spherical surface as optical component under test. We will also describe the main methods of fringe analysis and introduce phase shifting interferometry. To conclude, we will give guidelines on choosing and setting up an interferometer.

10.40 – 11.00 Coffee Break

11.00 – 11.50: Spectroscopy
Wendy Meulebroeck - Vrije University of Brussels
Abstract: Optical spectroscopy encompasses a wide variety of techniques used to study how matter interacts with light. Optical spectroscopy techniques are used in different research fields such as astronomy, biology, chemistry and physics with the goal to detect, identify and quantify information about the atoms and molecules. In this course we will classify the types of spectroscopy by the nature of the light-matter interaction focusing on 4 types of interaction: absorption (absorption spectroscopy), emission (fluorescence spectroscopy), elastic scattering (reflection spectroscopy) and inelastic scattering (Raman spectroscopy). We will describe the different phenomena and discuss what type of equipment is needed to measure an optical spectrum. Finally we will show how spectroscopic research impacts our daily life by highlighting several real-case illustrations.

11.50 – 13.30 Lunch Break

13.30 – 14.20: Basics in laser physics
Nathalie Vermeulen - Vrije University of Brussels
Abstract: In this course we will start from the basics of spontaneous light emission and look at different examples that can be found in daily life. In a next step, we introduce the concept of stimulated emission which lasing action relies on, and explain that the latter can only be obtained when having so-called population inversion in an optical material. We will study the basic properties of laser light, have a closer look at the building blocks in typical laser systems, and derive the rate equations that govern their operation both in the continuous-wave and pulsed regimes. We also address the properties of different laser categories (in particular those based on gaseous and solid-state optical materials) and highlight their practical applications. To conclude, we will look into important laser safety guidelines and end with an overview of do's and don'ts when entering a laser lab.

14.20 – 15.10: Principles of distributed sensors
Luc Thévenaz – Ecole Polytechnique Fédérale de Lausanne
Abstract: Optical fibres offer the possibility to realize distributed sensing, which means that each point along the fibre can separately and selectively sense quantities such as temperature, strain, acoustics, and pressure, in total similarity to a real organic nerve. The fibre can therefore distinctively inform on the position of the stimulus and on its magnitude. This unique feature makes the optical fibre actually play two essential roles: linear sensing element transducing the quantity value into an optical modulation and transmission line to convey this optical information to the processing unit at the fibre end. We shall review the principles underlying the different distributed fibre sensing configurations, in particular how to code the light and exploit natural optical effects to obtain a distributed information and to discriminate local events. The factors limiting the distance range, the spatial resolution and the accuracy on the quantity to be measured will be presented. Focus will be placed on the fundamentals and the concepts, rather than on the technical solutions.

15.10 – 15.40 Coffee Break

15:40 – 16:30: Light and temperature
Francis Berghmans – Vrije University of Brussels
Abstract: This lecture brings us back to the birth of quantum mechanics and Planck's blackbody radiation law. We will start from the mysterious laws that govern the electromagnetic radiation emitted by a so-called blackbody in thermal equilibrium with its environment and we will describe how this 'thermal' infrared radiation can be used to measure the body's temperature. We will review Planck's law, Wien's displacement law and Stefan-Boltzmann's law. From there we will see how we can build effective infrared thermometers that can measure the temperature of objects without contacting the object and that are used across a variety of industrial sectors. These principles are also the basis for operation of thermal imaging and night-vision cameras. The latter will be introduced in the following lecture delivered by Thermal Focus.

16.30 – 17.20: Industrial thermography
Bart Ribbens – Thermal Focus
Abstract: Thermography has a wide variety of applications because it can visualize the energy coming from an object. Researchers all over the world benefit from very sensitive to very fast thermal imaging systems to understand the needs of their products. Because thermography becomes more and more accepted by the automation industry as a reliable inspection tool, thermographers are challenged to adapt the knowledge in a less stable environment. There is a lot to learn about how an infrared camera can be an added value in the production chains. During this session you will have a more clear view what thermal imaging cameras are capable of. What couldn't be done with other techniques, could maybe be solved with an IR camera.

Day 3: Thursday 08/06

09.00 – 09.50: Bragg reflection in optical fibres
Salvador Sales – Universitat Politècnica de València
Abstract: Fibre Bragg Grating (FBG) is a periodic perturbation of the refractive index along the fiber length. It is constructed in a short segment of optical fiber and it reflects particular wavelengths of light and transmits all others. FBGs have attracted a considerable attention because their fabrication process is quite mature and they can be advantageously employed for telecom, sensor and metrology applications. Concerning the sensor applications, FBGs are wavelength-encoded sensors that convert the variations of the target measurand into wavelength shifts in the spectral response of the devices. Another added value of FBGs is that they can be easily wavelength multiplexed, which makes them particularly attractive for many applications ranging from structural health monitoring of constructions, automobiles and space vehicles to biomedical monitoring systems. During our lecture, we will deal with the main principles of FBGs and their use in the sensor field.

09.50 – 10.40: Fiber grating fabrication
Manfred Rothhardt – Leibniz Institute of Photonic Technology
Abstract: In this lecture, we will review the following: 1) Technology of FBG inscription in optical fibers 1.1. Point to point inscription 1.2. Phase mask technology 1.3. Phase mask interferometer 1.4. Draw tower technology 2) Laser Systems useful for FBG inscription 2.1. Argon ion Laser 2.2. Excimerlaser 2.3. Fs-Laser 3) Some application examples of special types of FBG 3.1. In Telecommunication 3.2. Sensing applications 3.3. Fibre laser resonators

10.40 – 11.00 Coffee Break

11.00 – 11.50: Industrial FBGs
Johan Vlekken – FBGS Intl.
Abstract: This presentation will give an overview about the industrial usage of Fibre Brag Gratings in real world applications, which is the core business of the company FBGS. FBGS is a producer and manufacture high strength Fiber Bragg Gratings produced during the drawing process. The 'Draw Tower Gratings' - DTG® - are offered by FBGS as an OEM component into the Fibre Optic (FO) sensing industry and are mainly used for strain, temperature, pressure and force measurements. Besides the DTG®s, FBGS also develops advanced sensing concepts and offers complete sensors and measurement devices to the market. After a short introduction about FBGS, this presentation will focus on product and application examples of FBG's in different industries such as medical, oil & gas, civil engineering, aerospace and process industry. Finally, some insights will be given into new ongoing developments for specific industry needs.

11.50 – 13.30 Lunch Break

13.30 – 15.10: IP & Entrepreneurship
Thomas Crispeels – Vrije University of Brussels
Abstract: Researchers in photonics will, sooner or later, generate interesting research results. These research results can lay the foundations of new applications, companies, markets or even industry. But results are only valuable if they are commercialized or transferred to society. And transferring technology means more than publishing papers! It means spotting valuable results, protecting them and effectively bringing them to the market. In this session, we will investigate the technology transfer process and discuss some key questions about protecting results and being an academic entrepreneur: Should I protect my results? Why? How? And When… We explore some key concepts you can use to quickly check the value of your research results and we end the session with some practical guidelines you can immediately apply to your research activities.

15.10 – 15.40 Coffee Break

15.40 – 16.30: Distance/displacement
Thomas Geernaert - Vrije University of Brussels
Abstract: Optical measurements of distance and displacement are typically classified in function of their maximum working range and resolution: First time-of-flight based measurements offer working distances between tens of centimeters up to several kilometres when considering they can work in a pulsed or modulated regime. We will use them to form the basis of LIDARs and show that they can be combined with a variety of light-matter interaction mechanisms such as (linear and nonlinear) scattering and absorption to enter the domain of remote sensing and distributed measurements. Second, triangulation techniques rely on position sensitive devices and are able to reach mm-resolutions over several meters at a relatively low cost. Finally the highest spatial resolution is offered by interferometric techniques that can detect displacements on the order of the wavelength of the laser used or of the coherence length in case of a white light source.

16.30 – 17.20: Solid state 3D time of flight technology
Ward Van der Tempel - Softkinetic
Abstract: Solid state 3D Time-of-Flight (ToF) technology made its research entrance in the 90's and is now slowly starting to be adopted in a number of applications. Mobile platforms such as 'Google Tango'-enabled smartphones or VR/AR headset are today equipped with ToF technology for 3D sensing. In the industrial world, ToF technology is today mainly linked with robotics and safety/security vision systems, competing with established distance sensor solution based on structured light and stereo-vision. This talk aims to give a brief update on the different ToF technologies and to discuss distance sensors system requirements for different industrial applications. We'll discuss where ToF technologies can currently be positioned and the technical challenges ahead.

19.00 – 22.00 Social event: Poster Session for TE1 students

A jury will judge the posters during the poster session of Thursday 08 June and an award for the best poster will be issued during the goodbye party on Friday 09 June.

Day 4: Friday 09/06

09.00 – 09.50: Vibrations/deformations
Steve Vanlanduit – University of Antwerp
Abstract: Mechanical vibrations can lead to failure of structures. Think of the occurrence of metal fatigue on airplanes which cause many fatal accidents in the nineteen seventies. In addition, it is also important to characterize vibrations of products because they very often relate to the comfort that a user of these products experiences (for example because the vibrations could lead to noise radiation). Although traditional contact vibration transducers are still used in industry for vibration measurements, non-contact optical vibration measurement techniques are more and more used in practice. In this presentation we will give an overview of different measurement principles that can be used to measure deformations and vibrations (digital image correlation, interferometry, shearography, laser vibrometry, etc.). We will compare the different techniques and indicate in which circumstances they are primarily used. Furthermore, we give practical examples of applications where these methods are commonly used (ranging from small-scale measurements in human hearing systems to measurements on large infrastructure like wind turbines).

09.50 – 10.40: Industrial vibrometry/velocimetry
Jan Zepp - Polytec
Abstract: LDV (Laser Doppler Vibrometry) is a non-contact method of vibration measurement. The measurement principle is based on a superposition of two laser beams only one of which was sent to the object under test and therefore frequency shifted due to the Doppler effect. When interfering with the second beam (reference beam), information about the dynamic behaviour of the object under test can be obtained. Founded in 1967, Polytec GmbH is market leader for LDV products. With single point, scanning and special purpose vibrometers, a huge range of applications can be covered. These reach from MEMS sensors to wind turbines as well as from low vibration frequencies to MHz applications. This talk aims to give an overview over different measurement devices and applications of today's and future applications.

10.40 – 11.00 Coffee Break

11.00 – 11.50 FINESSE Q&A Session (FINESSE ESRs only + Executive Board members) 11.50 – 13.30 Lunch Break 13.30 – 15.10 FINESSE activity 15.10 – 15.40 Coffee Break 15.40 – 17.20 FINESSE activity	Free Time for non-FINESSE ESRs

19.00 – 22.00 Social event: Goodbye party and poster session award

Aux Armes de Bruxelles

Beenhouwersstraat 13, 1000 Brussel, Belgium

Lecturer's biography (by alphabetical order)

Francis Berghmans – Vrije University of Brussels

F. Berghmans was born in Ukkel (Belgium) in 1969. He received his Ph.D. in Applied Sciences in 1998 from the VUB (Vrije Universiteit Brussel, Brussels, Belgium). In 1993 he joined the Belgian nuclear research center SCK·CEN, where he served as head of the Instrumentation Department and as leader of the Expert Group on Advanced Reactor Instrumentation. At SCK·CEN he supervised research in the field of radiation effects on photonic devices and optical fiber sensors. In 2007 he joined Vrije Universiteit Brussel. He holds a full professor position and is a member of the Applied Physics and Photonics Department and of the Brussels Photonics Team B-PHOT (www.b-phot.org), where he supervises research activities in the field of micro-optical sensors and photonic crystal fibers and teaches physics to bachelor students in engineering sciences as well as photonics to master students in photonics engineering. He has been involved in many collaborative research projects financed by various instances including the European Commission, the Research Foundation Flanders (FWO) and the Agency for Innovation by Science and Technology – Flanders (IWT). He currently serves as vice-coordinator of the Integrated Project 'Access Center for Photonics Innovation Solutions and Technology Support – ACTPHAST' (www.actphast.eu) and is partnering in the Marie Sklodowska Curie Action - European Training Network 'Fibre Nervous Sensing Systems – FINESSE' (www.itn-finesse.eu), both funded by the European Union. F. Berghmans is (co-)author of 106 journal papers and 165 publications in international conference proceedings indexed by the Web of Science Core Collection. He is general co-chair of SPIE Photonics Europe and fellow of SPIE.

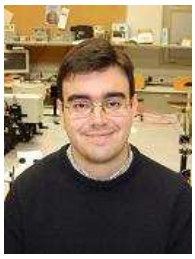
Thomas Crispeels – Vrije University of Brussels

.Prof. Dr. Thomas Crispeels is Assistant Professor Technology & Innovation at the department of Business Technology and Operations of the Vrije Universiteit Brussel. His research is situated in the field of Technology & Innovation, with a special focus on international technology transfer, academic entrepreneurship and collaborative R&D in high technology industries such as the biotechnology, photonics and electric vehicle technology. Thomas teaches several courses on technology entrepreneurship and the business economics of high-technology industries to business and engineering students. He teaches the course "Business Aspects of Micro-Electronics and Photonics" at VUB and was a guest lecturer in the "Entrepreneurship in Photonics" trainings organized in the framework of Photonics4Life (EU FP7). Thomas also organized workshops on life sciences entrepreneurship for academics and professionals in collaboration with VIB and Flandersbio. Within FINESSE, Thomas is responsible for Science and Industry Relations, organizes the complementary skills training on Entrepreneurship in Photonics" and he co-supervises one ESR in the domain of "Technology Transfer and Academic Entrepreneurship in Distributed Optical Fiber Sensors".

Thomas Geernaert – Vrije University of Brussels

Thomas Geernaert (Dendermonde, Belgium, 15/11/1983) is professor at the Faculty of Engineering of the Vrije Universiteit Brussel (VUB). He is member of the Applied Physics and Photonics Department and of the photonics research group B-PHOT (Brussels Photonics, www.b-phot.org), which counts about 60 scientists, engineers, and administrative and technical staff. He graduated as an Electrotechnical Engineer with majors in Photonics in 2006 and received his PhD in Engineering in 2011, both summa cum laude at the VUB. His research focuses on novel optical fiber sensors based on specialty and micro-structured optical fibres with applications in the oil- and gas industry, in civil engineering, in aerospace and even biorobotics. T. Geernaert has authored/co-authored 27 Web of Science Core Collection indexed journal publications and 62 Web of Science Core Collection indexed publications in international conference proceedings. He is a member of SPIE and OSA.

Miguel Gonzalez-Herraez – Universidad de Alcalá



Miguel Gonzalez-Herraez received the M.Eng. and D.Eng. degrees from the Universidad Politecnica de Madrid, Madrid, Spain, in 2000 and 2004, respectively. In October 2004, he became an Assistant Professor at the Department of Electronics, Universidad de Alcala, Madrid, Spain, where he became an Associate Professor in June 2006. He is the author or coauthor of more than 100 papers in international refereed journals and more than 110 conference contributions. He has given several invited/plenary talks at international conferences. His research interests cover several aspects across photonics, mainly distributed optical fiber sensors and optical fiber-based light sources. He has received several important recognitions to his research career, including the European Research Council Starting Grant, the "Miguel Catalan" Prize for Young Scientists given by the Comunidad de Madrid, and the "Agustin de Betancourt" prize of the Spanish Royal Academy of Engineering. https://scholar.google.com/citations?user=c6SIO8sAAAAJ&hl=es

Wendy Meulebroeck – Vrije University of Brussels

Wendy Meulebroeck (16-06-1975) is a professor at the Faculty of Engineering of the Vrije Universiteit Brussel (VUB). She is member of the Brussels Photonics group (B-PHOT) chaired by Prof. Hugo Thienpont. She is coordinating and working on multiple research and applied projects focusing on the spectroscopic characterization of different types of materials in 3 main research fields: (1) food safety, (2) archaeometry and (3) biophotonics for a better health care and for the replacement of animal models. She graduated as an Electrotechnical Engineer with majors in Photonics in 1998 and received her PhD in Applied Sciences in 2004, both at the VUB. Her spectroscopic food research has ensured that today foreign bodies, lower quality and unsafe (carcinogenic) solid products can be easily identified in food streams via optical means. Together with her team she has proven the advantages of applying absorption spectroscopy as a first-line analytical technique for archaeometric glass research. Recently she extended her research field to the 'biophotonics' domain where she expects to obtain future breakthroughs in the design of miniaturized optical detection units for medical purposes. She authored 36 Web of Science Core Collection cited papers.

Heidi Ottevaere – Vrije University of Brussels

Heidi Ottevaere is a professor at the Faculty of Engineering of the Vrije Universiteit Brussel (VUB) since October 1st 2009. She is responsible for the Instrumentation and Metrology platform at the Photonics Innovation Center and for the research unit 'biophotonics' of the Brussels Photonics Team B-PHOT chaired by Prof. Hugo Thienpont. She is coordinating and working on multiple research and industrial projects focusing on the design, fabrication and characterization of different types of photonic components and systems in the field of biophotonics, interferometry, holography and imaging. She graduated from the Vrije Universiteit Brussel in 1997 as an electrotechnical engineer with majors in Photonics and received her PhD degree in Applied Sciences in 2003 from the same university for her work entitled: "Refractive microlenses and micro-optical structures for multi-parameter sensing: a touch of micro-photonics". She authored 163 Web of Science Core Collection cited papers of which 69 high-impact journal papers and 94 papers in international conference proceedings.

Bart Ribbens – Thermal Focus

Bart Ribbens finished his master in applied electromechanical engineering in Antwerp in 2006. After conducting research on the cleaning of artworks using a pulsed laser, he started a PhD in engineering at the VUB in 2008. He developed new fringe projection techniques for scanning objects in three dimensions. Since his PhD graduation he worked as a postdoc researcher on multi-camera applications using both thermal, 3D and RGB cameras. At this moment Bart works on the development and implementation of new excitation signals for active thermography.

Manfred Rothhardt – Leibniz Institute of Photonic Technology

Manfred Rothhardt received his diploma degree from the Physics faculty of the Friedrich-Schiller-University, Jena, Germany in 1984. From 1984 to 1991 he was a scientific assistant in the research center of Carl-Zeiss-Jena GmbH. From 1991 to 1995 he was with Jenoptik AG leading a R&D group developing interferometric measurement systems. Since 1995 he is with Institute of Photonic Technology, Jena. His research interest includes technology and applications of fibre Bragg gratings and planar light wave circuits in sensors, biophotonics, fibre lasers and optical telecommunication.

Salvador Sales – Universitat Politècnica de València

Telecommunications engineering degree (1992) and Ph.D. degree in optical communications (1995) both from the Universitat Politècnica de València (Extraordinary Doctoral Award from the Spanish Telecommunication Society, 1996). He has been working since 1992 in research projects related with optical communications and optical fibre sensors. I have been leading several European Union and national research projects in the field of optical communications and fibre sensors. Over 200 papers in SCI ranked journals and conference, including more than 10 invited in major international conferences, 7 patents, and cofounder the spin-off company CalSens SL in 2013. His main research interests include optoelectronic signal processing for optronic and microwave systems, optical fibre sensors, fibre Bragg gratings, WDM and SCM lightwave systems and semiconductor optical amplifiers.

Luc Thévenaz – Ecole Polytechnique Fédérale de Lausanne

Luc Thévenaz received the M.Sc. degree and the Ph.D. degree in physics from the University of Geneva, Switzerland. In 1988 he joined the Swiss Federal Institute of Technology of Lausanne (EPFL) where he currently leads a research group involved in photonics, namely fibre optics and optical sensing. Research topics include fibre sensors, slow & fast light, nonlinear fibre optics and laser spectroscopy in gases. His expertise covers all applications of stimulated Brillouin scattering in optical fibres and he is known for his innovative concepts related to distributed fibre sensing. During his career he stayed at Stanford University, at the Korea Advanced Institute of Science and Technology (KAIST), at Tel Aviv University, at the University of Sydney and at the Polytechnic University of Valencia. In 2000 he co-founded the company Omnisens that is developing and commercializing advanced photonic instrumentation based on distributed fibre sensing. He is Fellow of both the IEEE and the Optical Society of America and Associate Editor of 3 major scientific journals.

Moshe Tur – Tel Aviv University

Moshe Tur received the B.Sc. in Mathematics and Physics, from the Hebrew University, Jerusalem, Israel (1969), the M.Sc. degree in Applied Physics from the Weizmann Institute of Science, Rehovot, Israel (1973), and his Ph.D. from Tel-Aviv University, Tel-Aviv, Israel (1981). He is presently the Gordon Professor of Electrical Engineering at the School of Electrical Engineering of Tel-Aviv University, Tel-Aviv, Israel, where he has established an advanced research laboratory, emphasizing fiber-optic sensing using fiber Bragg gratings and the Brillouin and Rayleigh effects, advanced fiber-optic communication systems, as well as microwave photonics. Prof. Tur has been involved in many international collaborations, including the EU-funded SENARIO, SARISTU and two COST actions. He is a Fellow of both the IEEE and the Optical Society of America.

Steve Vanlanduit – University of Antwerp

Steve Vanlanduit is currently the head of the department of Electromechanical Engineering at the University of Antwerp in Belgium. In addition, he is also a part-time professor at the department of Mechanical Engineering of the Vrije Universiteit Brussel. He is an expert in the field of vibration engineering and optical measurement techniques for deformation and fluid flow measurement. In the last fifteen years he has contributed to more than one hundred forty scientific papers, most of them related to optical measurement techniques. He is actively involved in many national and European research projects on measurement and modelling of vibrations. Furthermore, he was the initiator of the OPTIMESS network on optical measurement techniques. Steve Vanlanduit is the organizer of several international conferences (as for instance the 'Measuring by Light' conference series).

Johan Vlekken – FBGS Intl.

Johan Vlekken graduated as a Master in Physics in 1993 and received his PhD in Applied Sciences in 1998. After his PhD, he continued his academic research carreer for 2 more years and obtained a post-graduate degree in Business Management in 2001. In March 2001, Johan joined I.D. FOS Research as project manager where he was involved in different industrial projects related to fiber optic sensing applications. When in 2003 the activities of I.D. FOS Research where transferred to FOS&S, he became Chief Technology Officer of FOS&S and became responsible for all R&D activities, the execution of the commercial projects and the production activities. On the R&D level, he has been involved in different R&D projects funded by the European commission, IWT and Federal Government (Belgium). He has also experience as project manager of 2 European Space Agency (ESA) projects. On the business level, he strongly contributed to the start-up of FBGS Technologies GmbH in 2005. Furthermore, he has been in charge of different business development activities in different industries like medical, energy, aerospace, process and civil engineering. In 2011 Johan joined FBGS International as CTO. Johan is author/co-author of over +50 publications and co-inventor of 5 patent (applications).

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Ward Van der Tempel received the MScEng degree and the Ph.D. degrees in electrical engineering from the Vrije Universiteit Brussel, Belgium in 2004 and 2011 respectively. In 2009 he co-founded Optrima to bring to market the Time-of-Flight technology he co-developed at the Vrije Universiteit Brussel. He is currently continuing the development of ToF technology as Member of Technical Staff at Softkinetic, a Sony group company.

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Nathalie Vermeulen (12/12/1981) is a professor teaching Laser Physics at the Faculty of Engineering of the Vrije Universiteit Brussel (VUB). She is member of the Applied Physics and Photonics Department and of the photonics research group B-PHOT (Brussels Photonics), which counts about 60 scientists, engineers, and administrative and technical staff. N. Vermeulen obtained the degree of Master in Electrotechnical Engineering - Photonics at VUB with greatest distinction in July 2004, became Doctor in Engineering summa cum laude in May 2008, and acquired a Tenure Track professor position at VUB in October 2013. Her research activities are focused on mid-infrared solid-state laser sources and on nonlinear optical effects like wave mixing in novel materials such as graphene. Nathalie has authored/co-authored 35 Web of Science Core Collection indexed journal publications and 35 Web of Science Core Collection indexed publications in international conference proceedings.

Jan Zepp – Polytec

Jan Zepp (1989) works as an application engineer at Polytec, where he deals with vibrometer applications (laser Doppler vibrometry) as well as with topography measurements (white-light-interferometry). His job is to carry out measurements in-house and at customer's site. Furthermore, he acts as technical contact person and gives training and support to customers from industry and universities. Before working for Polytec, he received his M. Sc. in mechanical engineering at the University of Applied Sciences in Karlsruhe.