

Final Program:

Keynote Lectures, Invited Talks and Short Course

Short Course

Monday-Wednesday, Nov 07-09, 07:25am - 08:25am, Pinot Noir A

Introduction to Renewable Energies (To be delivered in Portuguese)

Prof. José Roberto Simões Moreira (University of São Paulo – Brazil)

Introduction to solar energy. Solar geometry and potential around the day and year. Types of Collectors and PV technologies. Introduction to wind energy. Wind power potential. National and international wind power. Wind turbines technology and application. Introduction to biomass. Biomass types and processing. Biomass to electricity conversion. Hydrogen and fuel cells. Production, storage and usage.

Reference: Simões-Moreira, J. R. (ed.) Energias Renováveis, Geração Distribuída e Eficiência Energética, 2nd ed., GEN-LTC, 2021.

Keynote Lectures and Invited Talks

The table below provides a list of the Keynote and Invited Speakers of ENCIT 2022. The title and abstract of the keynote lectures are presented on the next pages. A short biography of the speakers can be found on the website of the conference:

<https://eventos.abcm.org.br/encit2022/technical-program/keynote-speakers/>

<https://eventos.abcm.org.br/encit2022/technical-program/symposia-keynote-speakers/>

<https://eventos.abcm.org.br/encit2022/technical-program/invited-speakers/>

Time	Day	Speakers	Type
07:00pm - 08:00pm	Sun. Nov 06	Prof. Alvaro T. Prata	Plenary Keynote Lecture
11:00am - 12:00pm	Mon. Nov 07	Prof. Alessandro Croce	Plenary Keynote Lecture
01:40pm - 02:40pm	Mon. Nov 07	Prof. Domingos A. Rade	AERO Keynote Lecture
04:30pm - 05:30pm	Mon. Nov 07	Prof. Juliana B. R. Loureiro	OSPE/FLMR Keynote Lecture
11:00am - 12:00pm	Tue. Nov 08	Prof. Satish Kandlikar	Plenary Keynote Lecture
02:00pm - 03:00pm	Tue. Nov 08	Prof. Atef Mohany	FLMR Keynote Lecture
03:05pm - 04:05pm	Tue. Nov 08	Prof. Gherhardt Ribatski	Plenary Keynote Lecture
09:10am - 10:10am	Wed. Nov 09	Prof. Pedro T. Lacava	COMB Keynote Lecture
11:00am - 12:00pm	Wed. Nov 09	Prof. Marcia B. H. Mantelli	Plenary Keynote Lecture
01:40pm - 02:40pm	Wed. Nov 09	Navy Commander (CDR) Marcelo Raposo	NUCE Keynote Lecture
03:05pm - 04:05pm	Wed. Nov 09	Prof. Pedro J. Coelho	Plenary Keynote Lecture
05:10pm - 06:10pm	Wed. Nov 09	Prof. Thomas Pierre	HMTR Keynote Lecture
06:15pm - 07:15pm	Wed. Nov 09	Prof. Arturo A. Ayón Roger Greenwood, SOARD - USAF	Invited Talk
11:00am - 12:00pm	Thu. Nov 10	Fernanda R. Spinelli, Ph.D André M. Gasperin, M.Sc	Invited Talk

Sunday, Nov 06, 7:00pm - 8:00pm, Malbec Hall

Plenary Keynote Lecture

Brazil: Comparative Advantages, Weaknesses and Opportunities in S,T&I (To be delivered in Portuguese)

Prof. Alvaro Toubes Prata (Federal University of Santa Catarina – Brazil)

Brazil is a large, populous and economically strong country, and in most predictions we will remain among the largest economies in the world for decades to come. Our main comparative advantages are based on: i) our large territorial dimensions, which are home to six biomes and a marine ecosystem with countless natural riches; ii) the size and diversity of our economy; iii) the experience accumulated through successful achievements in some scientific, technological and public management areas. Internally, we are a country of contrasts. Although we are territorially large, we are united as a nation and do not have separatist tendencies, common in large countries. We are very populous, but there are many population gaps, as 84% of our population is urban and our cities are concentrated near the sea coast. We are very diverse regionally, but we share the same language, many customs, cultural and artistic values. We are a rich country, given the strength of our economy, but we are a poor country, given our great economic and social inequalities. Our main weaknesses as a nation are associated with education, health, infrastructure (housing, sanitation, transport, etc.) and the difficulty we have in overcoming and solving our problems and challenges. The lecture will explore some of our comparative advantages and also our main weaknesses. Actions and strategies in S,T&I will be discussed so that we can overcome our weaknesses and become more competitive as a nation.

Monday, Nov 07, 11:00am - 12:00pm, Malbec Hall

Plenary Keynote Lecture

Energy from the Wind: Land-Based but also Flying Wind Turbines

Prof. Alessandro Croce (Politecnico di Milano – Italy)

Recent years have seen an increasing focus on electricity generation from renewable sources. Among these, wind power has been the one that has had the greatest growth and attention both at the industrial and academic level. Through large investments, both public and private, it has been possible to design and manufacture very large wind turbines with a Cost of Energy (CoE) comparable to, if not lower than, other conventional sources. Such technologies include a reduction in design and development time through a multidisciplinary design that, from the initial design phase, is able to include the various engineering aspects associated with such a complex machine. But wind energy development can also continue in the coming years by going to exploit the wind resource at higher altitudes: in this area, Airborne Wind Energy (AWE) represents a new technological challenge.

Monday, Nov 07, 01:40pm - 02:40pm, Malbec Hall

AERO Keynote Lecture

The Engineering Research Center for the Aerial Mobility of the Future: a joint ITA/Embraer structuring initiative (To be delivered in Portuguese)

Prof. Domingos Alves Rade (Aeronautics Institute of Technology – Brazil)

The lecture introduces to the aerospace community the Engineering Research Center for the Aerial Mobility of the Future (ERC-AMF), which is a recent initiative gathering the Aeronautics Institute of Technology (ITA) and Embraer S.A., and co-funded by the company and the São Paulo Research Foundation (FAPESP). The initiative, which has the participation of researchers from Unicamp and EESC-USP, aims at offering to the partners and future entrants adequate research infrastructure and human resources necessary for long-term, far-reaching investigations capable of leading to innovations considered crucial for shaping of aerial mobility in the next decades. Hence, it is essentially an initiative for knowledge transfer from academia to industry by addressing problems of both scientific and technological relevance. The historical and strategical aspects that led to the conception of the ERC-AMF are first presented, followed by the description of scientific topics to be developed in the first five-year period, as well as the governance structure and procedures conceived for the efficient management of the ERC-AMF. In addition the actions conceived to promote entrepreneurship and secondary level educational benefits are highlighted.

Monday, Nov 07, 04:30pm - 05:30pm, Malbec Hall

OSPE/FLMR Keynote Lecture

From Well to Topside: Some Recent Developments on Complex Flows Based on Large-Scale Experiments

Prof. Juliana Braga Rodrigues Loureiro (Federal University of Rio de Janeiro – Brazil)

Different types of flows with variable complexity can be found in the oil industry. Major challenges are particularly found for the Pre-salt reservoirs, where the deep carbonate rocks slows down the drilling process and the high contents of CO₂ can favor inorganic scaling and complex oil/dense gas multiphase flows. For mature fields, the challenge is to enhance oil recovery with an efficient separation system. This presentation will cover different problems applied to the oil production, from the well to the topside. From measurements conducted in a well prototype, a friction equation for a screen pipe, which accounts for the injection velocity and pipe roughness, has been developed for single and two-phase flows. The phenomenon of fouling in pipes and sliding sleeve valves used to control the well production will be discussed in terms of modelling and experimental results. Considering the gas-lift technique to enhance oil production, an extensive experimental campaign using Particle Image Velocimetry and Shadow Sizer was conducted to characterize the influence of the injection angle and the size of the injection nozzle on the pressure drop and size distribution of small bubbles. The gas-liquid separation processes through centrifugal and gravitational effects are investigated separately through optical techniques and the experimental results were used to validate a numerical simulation of the problem. A thorough description of bubble break up and coalescence will be presented based on high speed imaging and particle image velocimetry across a sudden pipe contraction and expansion. In summary, the presentation will show the importance of the experimental characterization for a deeper understanding of complex industrial flows and, more importantly, for the development of new solutions for these specific challenges.

Tuesday, Nov 08, 11:00am - 12:00pm, Malbec Hall

Plenary Keynote Lecture

Next Frontier in Boiling: Nanoscale Enhancement - Techniques, Mechanisms, Future Directions

Prof. Satish Kandlikar (Rochester Institute of Technology – USA)

The stringent space requirement in a number of boiling applications, such as nuclear reactors, require the enhancement features to be below a few micrometer size on the boiling surface. The traditional techniques, such as fins, porous coatings, bubble diverters, etc. have large feature sizes which may be difficult to accommodate in these applications. Nanoscale features are able to change the intrinsic bubble dynamics by altering the bubble growth phenomenon. The contact line region, the microlayer region and bubble motion on the heater surface provide such opportunities. This talk will provide an overview of these techniques and bring out the underlying mechanisms that are responsible for the significant enhancement with these nanoscale features. The talk will further identify future areas for research to exploit this new enhancement strategy in other applications as well.

Tuesday, Nov 08, 02:00pm - 03:00pm, Malbec Hall

FLMR Keynote Lecture

Unsteady Bluff-Body Wakes and their Susceptibility to Acoustic Resonance Excitation

Prof. Atef Mohany (Ontario Tech University – Canada)

Free shear flows, such as wakes behind bluff bodies, free shear layers over cavities and side branches, and jet flows through orifices and valves, are highly unstable. The instabilities of the free shear flows generate periodic vorticity shedding with frequencies that vary linearly with the flow velocity. In turbulent flow, which is typical in many industrial applications, the vorticity shedding is weak and highly unorganized/incoherent. However, when the vorticity shedding couples with an acoustic mode a feedback mechanism occurs and the vorticity shedding becomes stronger and much more coherent. This often leads to the generation of excessive vibrations and/or acute noise problems. Therefore, a deep understanding of the flow-sound interaction mechanisms and the resulting energy transfer between the flow and sound fields is necessary in order to develop reliable guidelines that can be used to predict and avoid their occurrence. In this seminar, the unsteady wakes behind circular and square cylinders with different surface modifications will be discussed. These modifications include the addition of straight circular fins, spiral fins, and a spanwise wire. Moreover, the effect of these surface modifications on the flow-acoustic coupling and the wake susceptibility to resonance excitation will be presented with discussion of the different methodologies that can be used to determine and quantify their excitation source(s).

Tuesday, Nov 08, 03:05pm - 04:05pm, Malbec Hall

Plenary Keynote Lecture

CAPES Assessment-Engineering III: Area History, 2017-2020 Quadrennial, Future Perspectives (To be delivered in Portuguese)

Prof. Gherhardt Ribatski (São Carlos School of Engineering at USP – Brazil)

Initially, a description of the process of evolution of the graduate programs in the area of Engineering III throughout the triennial and, most recently, quadrennial assessments will be presented, focusing on the basic areas associated with the members of ABCM. Next, the assessment process during the 2017-2020 Quadrennial will be described, including the procedures adopted in the designation of consultants, the main aspects and the items of the assessment form, and the procedure for assigning grades to the graduated programs. Thus, it is expected to expand the community's understanding of the CAPES assessment process. In the description of the evaluation form, special attention will be

given to the characterization of the importance of its items for the development of graduate programs in Engineering III. At the end, a global picture of the area and perspectives for the next Quadrennial assessments and their impact on the future development of the Graduate Programs in Engineering III will be presented.

Wednesday, Nov 09, 09:10am - 10:10am, Malbec Hall

COMB Keynote Lecture

Experiments on the Internal Combustion Engine with Optical Access

Prof. Pedro Teixeira Lacava (Aeronautics Institute of Technology – Brazil)

Research engines with optical access correspond to the best way to study combustion in a similar operation to the commercial engine, which means pistons and valves displacement, swirl and tumble movement, turbulence, etc. Through optical access and non-intrusive techniques, it is possible to observe the fuel injection, mixture formation, ignition, and flame propagation. The presentation is concerned with the experience of the Laboratory of Combustion, Propulsion, and Energy - LCPE of ITA on the possibilities of experiments, limitations, optical techniques used, image processing, flame morphology, the association of combustion parameters with the engine performance and emissions, and examples of studies with different fuels.

Wednesday, Nov 09, 11:00am - 12:00pm, Malbec Hall

Plenary Keynote Lecture

Applications of Thermosyphons and Heat Pipes

Prof. Marcia Barbosa Henriques Mantelli (Federal University of Santa Catarina – Brazil)

Thermosyphons and heat pipes are highly efficient heat transfer devices that use two-phase cycles of fluids as the operating principle. Typical thermosyphons and/or heat pipes consist of an evacuated tube casing, within which a controlled amount of a working fluid is introduced. In heat pipes, capillary forces provided by a wick, are responsible for the movement of the fluid through the device. In thermosyphons, gravity forces do this job. Although heat pipes and thermosyphons may have many different geometries and configurations, they are basically composed of three main regions: evaporator, adiabatic section and condenser. In some applications, the adiabatic section may not be present. These devices can be used in applications where heat needs to be transferred with high efficiency or where uniform temperatures are required. These devices are able to manage heat in a myriad of equipment, from very small, such as electronic components, up to very large ones, such as oil storage tanks in petroleum refineries. Thermosyphons are more suitable for industrial applications because, as they do not require porous media to operate, they are easy to construct. Therefore, the fabrication costs are much reduced when compared to heat pipes. Besides, they are able to transport at least one order of magnitude more heat than heat pipes. However, as they need the gravity action to operate, the heat sources (evaporators) necessarily are positioned at below positions relative to the heat sinks (condensers). When this condition cannot be fulfilled, such as in microgravity applications or mobile computers, for instance, heat pipes are the correct technology to be applied. Some major applications of thermosyphons and heat pipes are explored in this talk.

Wednesday, Nov 09, 03:05pm - 04:05pm, Malbec Hall

Plenary Keynote Lecture

Interaction of Turbulence and Radiation in Turbulent Reactive Flows

Prof. Pedro Jorge Coelho (University of Lisbon – Portugal)

Fluctuations of temperature and concentration of species due to turbulence have an impact on the time averaged radiative emission, radiative absorption and radiation intensity that leads to values of the time-averaged radiative heat fluxes and radiative heat sources that are different from those that would be found if such fluctuations did not exist. Moreover, the solution of the radiative transfer equation based on time-averaged values of the temperature and species concentrations does not account for turbulent fluctuations on the radiative emission and absorption, and may significantly underestimate the time-averaged radiative heat fluxes and radiative heat sources. The interaction between turbulence and radiation (TRI) has been recognized for many years, but only in the last two decades serious efforts have been made to incorporate this effect in the models used in the numerical simulation of turbulent reactive flows.

Wednesday, Nov 09, 05:10pm - 06:10pm, Malbec Hall

HMTR Keynote Lecture

Aerodynamic Levitation Apparatus Dedicated to Estimation of Physical Properties of Molten Metals

Prof. Thomas Pierre (University of Southern Brittany – France)

Many industrial processes, such as welding, deal with metals and alloys, which temperature variation makes them go from solid to liquid states and even to vaporisation. The multiphysics numerical simulations used to describe these processes need to be fed with multiple physical properties, which are likely to strongly change with temperature. High temperature characterization is then a necessity. To this end, appropriate high temperature apparatuses have been developed. Among all existing methods, levitation techniques are quite versatile and allow for the determination of several properties. We present here the aerodynamic levitation apparatus developed at IRDL (France) for this purpose. This apparatus is used to measure different physical properties of metals in the temperature range of [1500-3000°C], such as density and surface tension. Further work is still under development to measure viscosity, thermal diffusivity and emission properties. The experimental difficulties are exposed and discussed and the trails to try to circumvent them are proposed.

Wednesday, Nov 09, 06:15pm - 07:15pm, Malbec Hall

Invited Talk

US DoD Basic Research Funding Opportunities

Rosa Santoni, USARMY DEVCOM AMERICAS; Kyle Gustafson, ONR GLOBAL; Roger Greenwood, SOARD - USAF

The U.S. Department of Defense has the U.S. Army, U.S. Air Force, and U.S. Navy Science and Technology (S&T) offices at the U.S. Consulate in Sao Paulo, Brazil. For the U.S. Army, the organization is called the International Technology Center (ITC) under Combat Capabilities Development Command (DEVCOM) a subordinated organization of Army Futures Command (AFC). For the U.S. Navy, the organization is called the Office of Naval Research Global (ONR-G), which falls under the Office of Naval Research. The U.S. Air Force established their Sao Paulo office in January 2022 and the organization is called the Air Force Office of Scientific Research-International Office (AFOSR-IO) under the Air Force Research Laboratory (AFRL) a subordinated organization of AF Materiel Command (AFMC). These S&T organizations have been working with Brazil universities and industry for over 10 years, being dedicated to support the discovery and transfer of technology, discover S&T alternatives, assist in evaluating technologies, and respond to request for information about technologies, companies, and foreign academic institutions. Thru grants and cooperative agreements, U.S. S&T offices can partner and collaborate with universities and industry.

Thursday, Nov 10, 11:00am – 12:00pm, Malbec Hall

Invited Talk

Enological and Analytical Engineering – Its Influences on the Wine Characteristics (To be delivered in Portuguese)

Fernanda Rodrigues Spinelli, Ph.D (Oenological Reference Laboratory/SEAPDR – Brazil)

André Miguel de Gasperin, M.Sc (President of the Brazilian Association of Enology)