GRADUATE SCHOOL SOLAR ACADEMY

SOLAR ACADEMY • SUN2C SCIENTIFIC SCHOOL

SUN-2C SCIENTIFIC SCHOOL

Solar energy for buildings: from components, to cities and territories

2–6 November

Saint Gervais, France

The SUN2C scientific school addresses solar energy applications from a technical point of view. A massive deployment of the use of solar energy is inevitable in order to decarbonate the energy sector. This implies to multiply by 5 to 10 the actual capacity in coming years. This can only be achieved through a holistic planning of the deployment of the solar energy.

SUN2C aims to participate both in the dissemination of knowledge and the state of the art, but also in the popularization of advances in the following themes:

- Development of materials, components and systems for collecting and converting solar energy (Photovoltaic, Solar Thermal, etc.)
- Innovative technologies for the integration of solar energy in different environments: water area (floating), mountain (high altitude), farming (AgriPV), city (BIPV), etc.
- Analysis and design of integrated solar buildings in cities (solar urban development)

INVESTIR L'AVENIR · UNIVERSITÉ SAVOIE MONT BLANC · cnrs · cea · ines INSTITUT NATIONAL DE L'ENERGIE SOLAIRE

Organization



Christophe Ménézo

Université Savoie Mont Blanc – Polytech Annecy Chambéry/ LOCIE – ERMES

Le Bourget-du-Lac, France

Current position:

Deputy head of Solar Academy Graduate School

Christophe Ménézo is Full Professor at Université Savoie Mont Blanc (France), Director of the LOCIE Laboratory and of the CNRS–USMB ERMES research team, and Deputy Director of the Solar Academy Graduate School. With over 25 years of research experience, his work focuses on the integration of renewable energy technologies into buildings and the built environment. Initially centred on solar thermal and hybrid photovoltaic-thermal (PVT) systems, his research has expanded towards building-integrated photovoltaics, multifunctional and bio-inspired materials, energy storage, adaptive buildings and urban energy systems. His current work explores the feedbacks between solar technologies, their surrounding microclimates and the environments in which they are integrated.

For the SUN-2C BIP / Scientific School, he was in charge of the scientific programme and of the selection of the speakers.



Claire Hazard

Université Savoie Mont Blanc /

Solar Academy graduate School

Le Bourget-du-Lac, France

Current position:

Events manager @Solar Academy Graduate School

Claire Hazard is Events Manager at the Solar Academy Graduate School, Université Savoie Mont Blanc where she contributes to the organisation and development of projects for the Solar Academy and its Research Center.

With a background in event management and communication, she has developed extensive experience in coordinating large-scale events, managing partnerships and engaging with a wide range of stakeholders. Prior to joining USMB, she worked on major international sporting events, including the Paris 2024 Olympic and Paralympic Games, where she coordinated operational activities and collaborated with local authorities and international delegations. Her professional interests lie at the intersection of event management, communication and partnership development, with a particular focus on bringing people and organisations together to support collaborative initiatives.

For the SUN-2C BIP / Scientific School, she was in charge of all organizational, communication and logistical aspects for both the speakers and the students.

Speakers



Jordi Badosa

Ecole Polytechnique / Laboratoire de Météorologie Dynamique

Palaiseau, France

Current position: Research engineer

SHORT BIOGRAPHY

After a degree in physics and a thesis in measurement and modeling of solar radiation, Jordi Badosa joined the Dynamic Meteorology Laboratory in 2010 to do research in solar forecasting for photovoltaic applications.

In 2015, he took the role of station scientist of the Palaiseau (PAL) station of the Baseline Surface Radiation Center https://bsrn.awi.de/

In 2019 he was appointed technical director of the new Interdisciplinary Center Energy4Climate (https://e4c.ip-paris.fr/). He oversees the development of photovoltaic test platforms as well as demonstrators for energy management at the building and Campus scales, all within the framework of interdisciplinary projects and with strong industrial collaboration.

SUN2C LECTURE

Characterization of the resource

Monday – Nov 2 | 14:00 – 16:00

The solar radiation reaching the ground surface is affected by different types of factors related to the Sun-Earth geometry, the atmospheric absorption and scattering mechanisms (from gazes, aerosols and clouds) and the environment conditions (tilt, orientation, shading…). Solar irradiance is sum of the direct and diffuse irradiance components and these react differently to those factors.

In this lecture we will go through all the factors and definitions related to solar resource and we will use an online tool (PVGIS) to do practical exercises.

Variability and solar forecasting

Monday – Nov 2 | 16:30 – 18:30

The solar resource is intrinsically variable and strongly influenced by the presence of clouds, which can evolve on different temporal and spatial scales. With the growth of photovoltaic energy in the energy mix, the importance of more reliable and informative forecasts for decision-making is becoming crucial.

The lecture will go through the solar variability scales, will motivate the need and use of solar forecasting and list the main techniques used depending on the time horizons and spatial scales of interest.



A. Augusto

Dalarna University/ SERC

Borlange, Sweden

Current position: Full professor

SHORT BIOGRAPHY

André Augusto is Professor of Energy Engineering at Dalarna University (Sweden). Originally from Lisbon, he earned his PhD in sustainable energy systems at the University of Lisbon, in collaboration with MIT, and previously taught and led a research team on high-performance solar cells and module technologies at Arizona State University. He leads the Energy and Built Environment research group and directs the Sustainable Energy Research Centre (SERC) at Dalarna. His research focuses on solar energy in the built environment, sustainable cities and energy justice, with the aim of enabling an inclusive and sustainable energy transition

SUN2C LECTURE

Solar PV

Tuesday – Nov 3 | 08:00 – 10:00

Prof. André Augusto (Dalarna University, Sweden) will give a course introducing the fundamentals of solar photovoltaic energy. The course will provide a solid foundation on how solar PV works, from the basic principles of converting sunlight into electricity to the main technologies and their practical use. Drawing on his experience in high-performance solar cells and modules at Arizona State University and in PV integration in the built environment at Dalarna University, Prof. Augusto will give students the key concepts needed to approach more advanced topics in solar energy.

KEYWORDS

[Photoconversion] • [Solar cells] • [Voltage generation] • [Solar PV technologies]



Johannes Koke

Osnabrueck University of Applied Sciences Energy systems and Process Technology

Lingen, Germany

Current position: Professor of Mechanical Engineering, especially Process Engineering

Vice Dean of Faculty Management, Culture and Technology

SHORT BIOGRAPHY

Prof. Dr.-Ing. Johannes Koke is Professor of Process Engineering and Vice Dean at Osnabrück University of Applied Sciences (Campus Lingen). He holds a doctoral degree from RWTH Aachen University and brings 13 years of industrial R&D experience from Robert Bosch GmbH. His research focuses on energy-efficient process engineering, thermal storage, solar thermal systems, and process simulation. With extensive experience supervising industry-partnered projects and teaching internationally, his work centers on bridging academic research and sustainable industrial practice

SUN2C LECTURE

Solar thermal

Tuesday – Nov 3 | 10:30 – 12:30

This introductory lecture provides a comprehensive overview of solar thermal technology and its practical applications. It covers the fundamental physical principles of converting solar radiation into heat, the operating mechanisms of different collector types, and the integration of thermal energy storage systems. Through illustrative real-world examples, ranging from domestic hot water heating and space heating to industrial process heat, participants will learn the core principles of system design and performance evaluation. Attendees will gain a clear understanding of thermal processes, system modeling, and the potential of solar thermal technology in sustainable energy systems.

KEYWORDS

Solar Thermal Energy • Thermal Storage • Solar Collectors • Process Heat • Solar Applications



Ya Brigitte Assoa

CEA INES / LITEN

Le Bourget du Lac, France

Current position: Research engineer, PhD, HDR

SHORT BIOGRAPHY

Dr. Ya Brigitte ASSOA obtained her master degree in civil engineering in 2004 and her PhD in 2008 at INSA of Lyon in France, working on the experimental and numerical performance analysis of BIPV/T hybrid bi-fluid solar collectors. After a first experience in the design of PV installations in a design office, she joined CEA INES in 2009 to study different PV applications (BIPV, BIPV/T, agriPV systems...). She organized and chaired various international events (workshops, conference sessions and webinars). She produced papers in international conferences, journals and book. In 2024, she obtained her Habilitation to Supervise Research.

SUN2C LECTURE

AgriPV

Wednesday – Nov 4 | 08:00 – 10:00

Agrivoltaism allows the production of crops (or livestock) and electricity, in synergy while limiting the consumption of agricultural land, in Europe. These productions are influenced by different specific and variable criteria, sometimes in conflict related to PV systems, crops, agricultural activities and regulations, to be identified and considered to optimize them. Thus, digital management tools are needed. What are the main design criteria to consider? What are the main agriPV configurations existing? Through an overview of the state of art and a feedback on research activities of the CEA INES on agriPV, EcoPV and BIPV on farms, this lecture will give you some basic knowledge required for the assessment of agriPV systems from the PV point of view.

KEYWORDS

Agrivoltaism • Design criteria • Configurations • Challenges • Sites



Giuseppe Marco Tina

University of Catania / DIEEI

Catania, Italy

Current position: Power system professor

SHORT BIOGRAPHY

Giuseppe Marco Tina is Full Professor of Electrical Power Systems at the University of Catania, Italy. His research focuses on renewable energy integration, smart grids, floating and agrivoltaic photovoltaic systems, electro-thermal modelling of PV and PV/T technologies, and artificial intelligence for energy applications. He has published more than 260 scientific papers and two books on floating photovoltaics, receiving over 12,000 citations. He is ranked among the World's Top 2% Scientists, ScholarGPS Top 0.05% Scholars, and Top Italian Scientists in Engineering. His work supports the transition toward sustainable and resilient energy systems.

SUN2C LECTURE

Floating PV

Wednesday – Nov 4 | 10:30 – 12:30

Floating photovoltaic (FPV) systems are emerging as a promising solution to expand solar power generation while reducing land use conflicts and enabling new synergies with existing water infrastructures. This lecture provides an overview of FPV technologies, their current deployment worldwide, and the main technical, environmental, and economic challenges associated with their development. Particular attention will be given to the impact of the aquatic environment on PV module operating temperature and energy yield. Experimental evidence from pilot FPV installations will be presented and discussed, highlighting the potential performance advantages of floating systems compared with conventional ground-mounted photovoltaic plants.

KEYWORDS

Floating Photovoltaics • Solar Energy • Energy Yield • PV Module Temperature • Renewable Energy Systems



Lara Perrin

University Savoie Mont Blanc / Laboratory LEPMI

Le Bourget du Lac, France

Current position: Associate professor (MCF HC)

SHORT BIOGRAPHY

Lara Perrin is Associate Professor at University Savoie Mont Blanc since 2006, in the GUIDE team (Genesis, Usage of Durable Interfaces for Energy) of the LEPMI laboratory (Laboratory of Electrochemistry and Physical chemistry of Materials and Interfaces). This team is part of the National Institute of Solar Energy. Lara is a specialist in the chemistry of materials with specific properties, and her work combines chemistry, physical chemistry and physics. Her current research activities are mainly focused on materials for energy (third generation solar cells: organic and perovskite, electric cables, ...). Her work focuses on both the Genesis and the Sustainability of these different systems.

SUN2C LECTURE

Material PV & LCA

Thursday – Nov 5 | 08:00 – 10:00

This lecture examines the interplay between photovoltaic materials, device performance, and environmental sustainability. It covers dominant PV technologies—crystalline silicon, thin films, and emerging materials—focusing on material requirements, manufacturing processes, and environmental challenges. The session addresses critical questions: How do material choice and fabrication alter the PV footprint? How can LCA accurately quantify impacts like carbon emissions and resource depletion? Through concrete case studies, participants will explore the impacts of energy efficiency, lifetime, and end-of-life recycling on performance. By the end, they will be equipped to critically evaluate PV technologies.

KEYWORDS

Photovoltaic Materials • Life Cycle Assessment • Sustainability and Circular Economy



Anne Migan-Dubois

Université Paris-Saclay / GeePs

Paris, France

Current position: Professor

SHORT BIOGRAPHY

Anne Migan Dubois received the M.Sc. and Ph.D. degrees in High frequency and optical telecommunications from Limoges University, France, in 1998 and 2001, respectively. She is currently a Full Professor at Paris-Saclay University. She also develops her research activities within the Group of Electrical Engineering Paris (GeePs). She is at the head of the activities “Advanced photovoltaics characterizations in real outdoor conditions”. Her field of interest includes soft integration of photovoltaics in smart-grid and smart-buildings and PV fault detection and diagnosis. She has supervised 18 Ph.D. thesis and several Master's thesis. She is an author/co-author of more than 150 papers and international communications, co-owner of 3 patents in PV.

SUN2C LECTURE

Durability & Ageing

Thursday – Nov 5 | 10:30 – 12:30

Photovoltaic (PV) systems are expected to operate outdoors for 25–30 years, yet their real-world performance and lifetime depend on many interacting factors. This lecture introduces PV modules and systems from a reliability perspective. It addresses how irradiance, temperature, spectrum, shading and soiling shape energy yield; how performance is quantified through monitoring metrics such as the performance ratio and performance loss rate; and which failure modes and degradation mechanisms affect modules and inverters. Examples drawn from field data illustrate data processing and diagnostic approaches, including electroluminescence, thermography and I–V curve analysis combined with machine learning, and highlight emerging trends in AI-assisted fault detection.

KEYWORDS

PV systems • Reliability • Performance loss rate • Failure and degradation • Fault detection and diagnosis



Jingchun Shen

School of Information and Engineering

Sustainable Energy Research Centre

Dalarna University

Borlänge, Sweden

Current position: Senior Lecturer

SHORT BIOGRAPHY

With around 20 years of international experience in sustainable architecture, engineering, and construction (AEC), she bridges academic research and industry innovation. Her expertise spans solar engineering, urban-scale integrated assessment modelling and the digital transformation of infrastructure systems.

From 2022, her work focuses on positive energy district, data centres, variable renewable energy integration, grid stability, electricity-system flexibility, demand response, and sector coupling, applying a system-of-systems perspective to support resilient, low-carbon, and ESG-oriented infrastructure planning and digital asset development.

SUN2C LECTURE

Urban morphology and distributed production

Friday – Nov 6 | 08:00 – 10:00

Urban morphology and distributed production examines how the shape, uses, and infrastructure of neighborhoods influence energy demand and the potential for local generation. The lecture asks how urban form changes building loads, how energy moves from resources through conversion to end use, and how planners can size networks and capacity as demand varies over time and climate. Using urban energy-system modeling (cloud based City Energy Analyst), it connects georeferenced building data, typologies, weather scenarios, and energy-system pathways to examples such as rooftop solar, district heating, heat pumps, storage, and demand flexibility. Participants are expected to be able to see districts as coupled spatial-energy systems and evaluate where distributed production can serve them.

KEYWORDS

City Energy Analyst • Renewable Energy Integration • Distributed Energy Production • Building Typologies • Urban Energy Modeling



Samuele Memme

Department of Mechanical, Energy, Management and Transportation Engineering, University of Genoa, Italy

Genoa, Italy

Current position: Researcher

SHORT BIOGRAPHY

Samuele Memme is a researcher at the Department of Mechanical, Energy, Management and Transportation Engineering (DIME) at the University of Genoa, Italy. He received his Ph.D. in Mechanical, Energy and Management Engineering (Applied Thermodynamics track) from the University of Genoa in 2024. He has conducted research abroad at Université Savoie Mont Blanc (France), École de Technologie Supérieure (Montréal, Canada), and IRESEN (Morocco). He currently teaches Solar Energy, Applied Thermodynamics, Renewable Energies, and Nuclear Energetics in several master's degree programmes at the University of Genoa. His research focuses on monofacial and bifacial solar PV technologies, with particular interest in albedo analysis, urban solar potential assessment, and floating PV. He has also been involved in activities including ray tracing for CSP applications (linear Fresnel collectors), energy storage systems, and the modeling of renewable energy communities.

SUN2C LECTURE

Solar potential

Friday – Nov 6 | 14:00 – 15:00

This presentation explores the huge untapped potential of Urban Photovoltaics and addresses how cities can accurately estimate their decentralized rooftop solar capacity. Using the city of Genoa, Italy, as a comprehensive case study, it demonstrates an advanced methodology combining 3D Digital Surface Models, GIS, and ray-tracing calculations. By integrating statistical weather data and evaluating mutual shading at a high-resolution 50-centimeter scale, the model successfully maps the annual insolation and optimal layout for 4 million potential panels across 190000 roofs. Participants will discover how high-resolution urban solar mapping and precise PV yield calculations can optimize building energy design, empowering planners and engineers to accelerate the global transition toward sustainable, smart energy systems.

KEYWORDS Urban Photovoltaics • Solar Mapping • Digital Surface Models (DSM) • Ray Tracing • Geographic Information Systems (GIS)



Mattia Parenti

Department of Mechanical, Energy, Management and Transportation Engineering, University of Genoa, Italy

Genoa, Italy

Current position: Post-doctoral researcher

SHORT BIOGRAPHY

Mattia Parenti is a postdoctoral researcher at the Department of Mechanical, Energy, Management and Transportation Engineering (DIME) at the University of Genoa, Italy. He holds an MSc in Mechanical Engineering and received his PhD in Mechanical, Energy and Management Engineering (Applied Thermodynamics) from the University of Genoa in 2025.

He has conducted research at Université Savoie Mont Blanc, France, and collaborated with industry partners on heat transfer and renewable energy projects. His research focuses on monofacial and bifacial solar PV systems in urban and agricultural environments, with particular emphasis on solar radiation modelling, tracking and orientation optimization, and thermographic inspections. His research activities also included the modelling of heat pumps and two-phase heat exchangers.

SUN2C LECTURE

Solar Potential in Urban and Agricultural Areas

Friday – Nov 6 | 15:00 – 16:00

This session addresses shading issues in photovoltaic systems in urban and agricultural environments. It examines how PV systems behave under partial shading, where electrical mismatch between modules or cells reduces performance, and presents technologies designed to mitigate these losses. It also covers radiation models for PV systems and shows how shading and mismatch influence the optimal orientation of installations at different latitudes. A final focus is placed on partial shading in balcony PV systems.

KEYWORDS

partial shading • electrical mismatch • optimal orientation • Urban PV• AgriPhotovoltaics (greenhouse)



Antonio Notholt

Reutlingen University / Control Engineering and innovative Energy Systems

Reutlingen, Germany

Current position: Full Professor, Speaker Reseach group: DLT-Lab

SHORT BIOGRAPHY

Antonio Notholt received the Graduate degree in mechanical engineering from the Monterrey Institute of Technology—ITESM, Mexico, in 2002, the EUREC master's degree in renewable energies from Loughborough University, U.K., in 2004, and the Ph.D. degree in electrical engineering from the University of Kassel, Kassel, Germany, in 2008., For many years, he was system architect for the business unit in industrial hybrid and storage solutions with SMA Solar Technology AG. He is currently a Professor in control engineering and innovative energy systems with Reutlingen University, Germany. He is also the spokesperson of the Laboratory for Distributed Ledger Technologies (DLT-Laboratory).

SUN2C LECTURE

Energy grids

Friday – Nov 6 | 10:30 – 12:30

In this session, the students will learn the organization and operation principles of electrical grids. They will also know the most important control mechanisms. At the end of the unit, students will understand how the electrical grid is organized, know the main control principles of grids, understand the role and impact of renewable energy and have an idea of inverter-based generation. A special focus of the lecture is given to frequency regulation as one of the most important mechanisms to maintain grid stability. For this, the role of short-term storage will be addressed.

KEYWORDS

Electric grids • Inverter-based power generation • Frequency regulation • Energy storage



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