



Joint Universities Accelerator School

2025

JUAS-2025 at CERN:

A Landmark 30th Anniversary Edition

For the first time in its 30-year history, the Joint Universities Accelerator School (JUAS) was held not in Archamps, France, but at CERN in Switzerland. This special “JUAS in the lab” edition celebrated the school’s milestone anniversary, offering students a unique, immersive ten-week experience at one of the world’s leading scientific laboratories. JUAS-2025 welcomed a record 75 participants—including 40 in Course 1—bringing the total number of students trained by JUAS over three decades to over 1,500, representing 79 countries. This year, Indonesia joined the JUAS community for the first time.

The success of JUAS-2025 was made possible by the generous support of 14 partner universities and 25 collaborating institutions and programs. Heartfelt thanks go to all our partners, the JUAS faculty, CERN colleagues, the ALICE experiment, ESRF, PSI, Bergoz Instrumentation, HUG, the Advisory Board, and the entire JUAS team. Special recognition is due to Darina Baizhanova, Florence Mouthon, and Grace Rodrigues, whose dedication was instrumental to the program’s success.

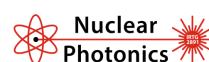
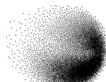
- The JUAS-2025 Advisory Board meeting was held at ESI (Archamps), marking the first return to Archamps in 20 years. Members toured the new student accommodation planned for 2026.
- The edition was marked by the passing of Fritz Caspers, a long-standing and beloved member of the JUAS faculty.
- A new agreement with the Accelerator Group of the European Physical Society (EPS-AG) now provides two grants: one for the top student of Course 1 to attend IPAC the same year, and one for the top student of Course 2 to attend IPAC the following year.
- Alexander Gerbershagen took over from Bertrand Jacquot for the cyclotron lectures.
- The program was streamlined, with fewer seminars and more independent study time, supported by the new 2,371-page JUAS book, which includes exercises and solutions.
- Social events included a gathering with JUAS alumni at CERN.
- The exam format was revised: instead of five 1.5-hour exams, students took four 2-hour exams—three on core topics and one comprehensive exam.
- A new visit to ELISA (Experimental Linac for Surface Analysis) at the CERN Science Gateway showcased a functioning 2 MeV proton accelerator.



Dr. Elias Métral
JUAS DIRECTOR

COLLABORATING INSTITUTIONS & PROGRAMMES

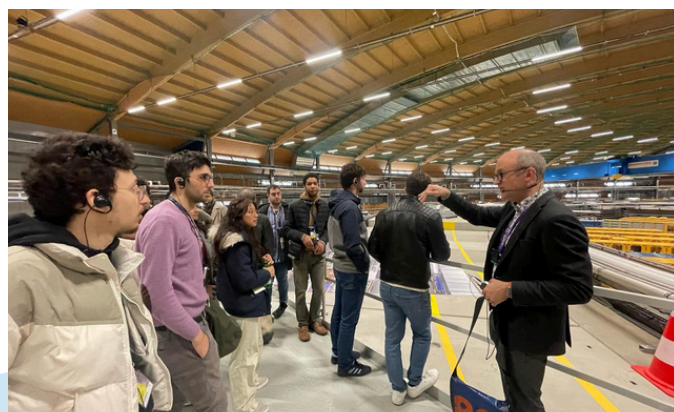
JUAS would not be able to function without the financial and/or in-kind support it receives from a range of facilities, companies and research programmes.



JUAS PARTNER UNIVERSITIES



The Joint Universities Accelerator School is a recognised course in the Master and/or Doctoral programmes of 14 European universities and the LASCALA Erasmus Mundus Joint Master Diploma. JUAS partner universities and programmes award ECTS and doctoral credits to their students who successfully complete the examinations at the end of each course.





Before the start of the school, participants were required to view a selection of short videos and successfully complete questionnaires on key aspects of electromagnetism and special relativity, two major topics which are the fundamentals of the program. In addition, a session on “key points to remember for particle accelerators” was run during the first day of the course.

The Accelerator Design workshop at CERN is a particularly important and appreciated part of JUAS.

Additional background videos to be viewed prior to the school included introductions to particle accelerators and their applications, radiofrequencies and applications of Hamiltonian formalism. Virtual visits of S-Dalnac, LEIR and the ALICE experiment at the CERN LHC were also made available.

Participants needing to validate the course to obtain ECTS or doctoral credits took four written exams and made one oral presentation*: the exams are spread out during the five weeks.

*Transverse beam dynamics, Longitudinal beam dynamics, Synchrotron radiation, Exam on all other lectures, Oral presentation on Accelerator Design workshop.

CORE TOPICS

(80H00)

Special Relativity, electromagnetism, classical and quantum mechanics: What to remember for particle accelerators

Elias METRAL (CERN)

Transverse Beam Dynamics

Bernhard HOLZER (CERN)

Longitudinal Beam Dynamics

Alexandre LASHEEN (CERN)

MADX (Intro & Workshop)

Nuria FUSTER MARTINEZ (CERN)

PyHeadTail (Intro & Workshop)

Benoît SALVANT (CERN)

Linacs

David ALESINI (INFN)

Transverse Linear Imperfections

Davide GAMBA (CERN)

Cyclotrons & FFAs

Alexander GERBERSHAGEN (PARTREC)

Synchrotron Radiation

Rasmus ISCHEBECK (PSI)

Injection / Extraction

Nicola CARMIGNANI (ESRF)

Transverse Nonlinear Effects

Sofia KOSTOGLOU (CERN)

Accelerator Design & Design Workshop

Bastian HÄRER (KIT) & Adrian OEFTIGER (GSI)

Collective Effects (mainly Space Charge & Instabilities)

Mauro MIGLIORATI (LA SAPIENZA)



JUAS was an amazing opportunity to learn about a wide range of topics on accelerators through well-structured lectures. While the pace was demanding, we had hourly breaks to ensure that we could absorb the material effectively. We got to meet leading experts and had the chance to go on many interesting visits. Even more so this year, as the school was held at CERN. I am heading home with a brain and lecture notes full of knowledge and a contact book filled with new friends. Many thanks again!



Lisa Beate Dingeldein
Master Student, TU Darmstadt
JUAS 2025 student



SEMINARS

(10H)

Particle Accelerators in the 21st century

Maurizio VRETENAR (CERN)

Introduction to CERN & its Accelerator Complex

Rende STEERENBERG(CERN)

Electron-positron circular colliders

Jaqueline KEINTZEL (CERN)

Future high-energy linear colliders

Philip BURROWS (University of Oxford)

The US Electron-Ion collider

Todd SATOGATA (Jefferson Lab)

Transverse non-linear manipulations

Massimo GIOVANNNOZZI (CERN)

Free-Electron Lasers

Eduard PRAT COSTA (PSI)

Fixed-target beamlines

Alexander GERBERSHAGEN (PARTREC)

Novel High Gradient Particle Accelerators

Ralph ASSMANN (DESY)

CERN LIU Project: Beam Dynamics aspects & solutions

Giovanni RUMOLO (CERN)

Seminars at ESRF

Jean-Luc REVOL (ESRF)



in
figures

5
INTENSIVE
weeks

36 faculty
members

from 11 Universities / Institutions

13 lectures
3 workshops
10 seminars
5 visits

47
participants

19 Master students
23 PhD students
5 Professional

31
MALES

16
FEMALES

18
nationalities

from 24 different
Universities /
Institutions

40 took the exams
41 followed the full programme
and 6 was registered "à la carte"

VISITS
(8H30)

- CERN LEIR Accelerator
- ALICE Experiment at the CERN LHC
- CERN Control Center
- European Synchrotron (ESRF)
- ELISA (CERN Science Gateway)

WORKSHOPS
(20H00)

- MADX
- PyHeadTail
- Accelerator design

“ JUAS successfully serves as a broad and dense introduction to particle accelerators. All the lectures, practical activities, seminars, and visits not only filled gaps in my previous knowledge but also expanded my comprehension of other important topics in the area. It marked a key step in my career.

”

André BERRETTA DA COSTA

Master Student, UNICAMP & CNPEM, Campinas, Brazil
JUAS 2025 student



The Technology & Applications of Particle Accelerators



17 FEBRUARY – 21 MARCH

As for course 1, participants were required to view background videos on fundamental topics at the core of the program.

The practical days at CERN are a particularly important and appreciated part of JUAS. On the first day of the school, different experts from CERN give presentations of different technologies and their applications at CERN. In 2025 the areas covered were magnets, vacuum, superconductivity, radio frequencies and CLEAR. Participants then had to choose two topics for their practical group work at CERN. Following the sessions, each group had to prepare collectively a written report on the manipulations they undertook and make an oral presentation of the results to a panel of experts.

Participants needing to validate the course to obtain ECTS or doctoral credits took four written exams as well as one oral presentation*: the exams are spread out during the five weeks.

*RF engineering, Normal & super-conducting magnets, Beam instrumentation, Exam on all other lectures, written report and oral presentation of the practical sessions

CORE TOPICS

(71H15)

Introduction to CERN practical days
CERN representatives

Introduction to RF

Andrea MOSTACCI (LA SAPIENZA)

Normal Conducting Magnets

Thomas ZICKLER & Jérémie BAUCHE (CERN)

RF engineering

Christine VOLLINGER & Manfred WENDT (CERN)

Superconductivity (intro): RF vs. Magnets

Claire ANTOINE (CEA)

Cryogenics for superconducting devices

Philippe LEBRUN (CERN)

Superconducting RF Cavities

Sergio CALATRONI (CERN)

Vacuum systems

Vincent BAGLIN (CERN)

Superconducting magnets

Paolo FERRACIN (LBNL)

Beam instrumentation

Peter FORCK (GSI)

Particle Sources

Thomas THUILLIER (IN2P3)

High Power Proton Linacs

Mohammad ESHRAQI (ESS)

Radiation safety

Xavier QUERALT (STFC)

Low energy accelerators

Wim MONDELAERS (GHENT UNIVERSITY)

Survey and Alignment of Accelerators

Jean-Christophe GAYDE (CERN)

Accelerator for medical & industrial applications

Erik VAN DER KRAAIJ (IBA)

Life-cycle and operability of particle accelerators

Samuel MEYRONEINC (INSTITUT CURIE)

PSI Accelerators Controls

Elke ZIMOCH (PSI)

PSI ProScan Introduction

Jacobus Maarten SCHIPPERS (PSI)



“ JUAS offered a comprehensive and in-depth exploration of accelerator science and technology. The high-level lectures and direct engagement with experts at CERN made it a truly valuable experience.. ”

Mattia ELISEI

Master Student
La Sapienza, University of Rome,
Rome, Italy
JUAS 2025 student

→ Course 2



→ in figures

5
INTENSIVE
weeks

44 faculty
members

from 16 Universities / Institutions

19 lectures
2 workshops
10 seminars
4 visits

47
participants

29 Master students
5 PhD students
13 Professionals

35
MALES

12
FEMALES

16
nationalities

from 16 different
Universities /
Institutions

32 took the exams
32 followed the full programme
and 15 were registered "à la carte"

SEMINARS

(9h00)

Particle accelerators, instruments of discovery in physics

Philippe LEBRUN (CERN)

Materials for SCRF cavities: Beyond niobium

Sergio CALATRONI (CERN)

Muon Colliders & associated technological challenges

Luca BOTTURA (CERN)

Energy recovery linacs

Michaela ARNOLD (TU DARMSTADT)

Accelerator driven system

Frédéric BOULY (CERN)

Radiation Oncology: Biology, Physics & Clinical Applications

André DURHAM (HUG)

AWAKE

Edda GSCHWENDTNER (CERN)

Seminars at PSI

Rasmus ISCHEBECK (PSI)

VISITS

(17H00)

- CERN: Linac4 + AD ELENA + Thin film coating facilities
- Bergoz instrumentation
- Geneva Hospital
- Paul Scherrer Institute (PSI): SLS, SwissFEL, ProScan, HIPA

WORKSHOPS

(21H00)

- CERN Practical Days
- Normal conducting magnets

“

Taking part in JUAS Course 2 was a wonderful experience for me. It has undoubtedly brought me forward academically, but also personally, and the time with the other participants was simply unforgettable. I would recommend it to anyone who has the opportunity to take part!

”



Laura Marie VERSEMANN

Master Student, University Rostock, Rostock, Germany
JUAS 2025 student

→ Course 1

→ Course 2

Social Events at JUAS



- Organised apero with the JUAS alumni
- International environment (students organised international dinners)
- Ice-breakings
- Team activities



One word for this week (one word per person)

60 responses

Word cloud visualization of responses:

- intense
- interesting
- exciting
- intensive
- confused
- social
- challenging
- great
- speaking
- growth
- difficult
- complicated
- new
- happy
- potential
- dynamic
- learning
- motivating
- informative
- stuffed
- overview
- tried
- physics
- position
- repetition
- informed
- gender
- mind-blowing
- successful
- emotional
- challenge
- great
- speaking
- growth
- difficult
- complicated
- new
- happy
- potential
- dynamic
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- mind-blowing
- successful
- emotional
- challenge

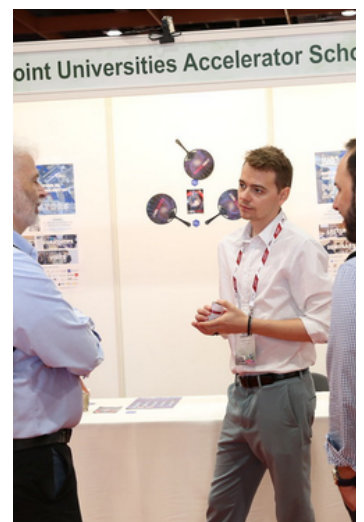
IPAC prize



IPAC is the leading international event for the worldwide accelerator community and industry.

IPAC'25 took place in Taipei (TAIWAN) in June. It is a unique opportunity to meet, interact and network with accelerator scientists, engineers, students and companies. Each year the JUAS-IPAC award is attributed to the first-ranked master's or doctoral student from Course 1. The award takes the form of a bursary, generously given by the IPAC organisers, covering conference fees, travel, accommodation and subsistence costs (EPS-AG grant).

Alfred PETERSSON, Master student at Lund University and CERN obtained the highest overall mark this year. During the full week of the IPAC-25 conference, Alfred helped Elias to promote JUAS at the stand devoted to ESI (see picture on the right) by explaining what ESI and JUAS are, and in particular sharing his experience with all the people who came and visited the stand. In addition, many of our alumni & professors stopped by the JUAS's stand to say hello, showing once again that school feels like a supportive family (see pictures below).





The 30th anniversary celebrations, held in November 2024, were opened by the JUAS director and JUAS alumnus Elias Métral, a senior accelerator physicist in CERN's Beams Department.

A key highlight of the event was the launch of the JUAS book, which is aimed at beginners starting out in particle accelerator physics. Over 60 authors contributed their expertise to the book, which is freely available online.

Elias Métral's introductory talk was followed by a welcome from the CERN Director of Accelerators and Technology, Mike Lamont, a talk about the origins and history of the accelerator school by former JUAS director (2011-2016) Louis Rinolfi, and contributions by representatives from local authorities, partner universities and sponsors. The series of roundtables by alumni, sponsors and partner universities took place in the afternoon.

In the audience were many JUAS alumni and members of the faculty, as well as representatives from industry. A video showcasing 30 years of memories through photos was created for the anniversary and presented at the event.

Accelerating News- 17 March, 2025 | By Alexandra Welsch (U. Liverpool)



Please see all the details on the INDICO page of the event: <https://indico.cern.ch/event/1372615/>



The JUAS Advisory Board, comprising representatives of JUAS partner universities and experts from leading European research facilities, meets annually in one of the partner universities. The 2025 meeting was hosted by European Scientific Institute (ESI Archamps) as 20 years ago on 26-27 May.

The agenda of the meeting included the report of each course of the 2025 edition of JUAS; an overview of participants' feedback on the program and overall organisation; outcome of the special edition at CERN; report on the 30th anniversary celebration of JUAS at CERN; the status of partner university agreements; the budget and review of financial support; proposed improvements for the 2026 edition and presentation of the new accommodation built close to ESI where the students can be lodged in the 2026 edition.



The Institut Scientifique Européen (ESI), was founded as a French non-profit organisation in 1994 at the initiative of CERN-based physicists in order to develop high-level training courses on technologies developed at CERN, the world's largest particle physics laboratory.

Located on the French-Geneva border, ESI organises thematic postgraduate schools with an extensive network of partner universities on the science, technology and applications of particle accelerators and detectors. More recently ESI has developed a series of summer schools in partnership with Université Grenoble-Alpes in the fast-moving area of innovation in digital health.

ESI's schools attract an international audience of post-graduate students and early-career professionals. Since its creation, ESI-Archamps has delivered high level teaching and training to more than 3000 young scientists and engineers from over 80 countries www.esi-archamps.eu



Schools at ESI in 2025



Planned Health Summer School on Research and innovation in Health (UGA)



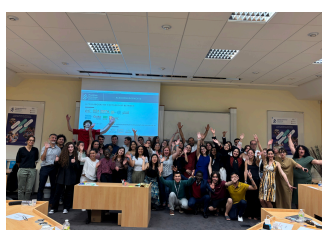
MHEDAS Summer School on Health Data (UGA & 7 Catalan Universities)



Santé Connecté Workshop (UGA)



Bien Vivre Bien Vieillir Summer School on Well-being and aging (UGA)



Precision Oncology Summer School on Entrepreneurship in Oncology (UGA & UCBL)



IFAST CBI on Accelerators in Health Care (CERN, CNRS etc)



TOSCA Summer School on Big Science Projects (University of Paris-Saclay & La Sapienza)



Salles Blanches/Données pré-cliniques (UGA)

Save the date !

JUAS-2026 is coming back to the European Scientific Institute (ESI Archamps). Participants will be accommodated in a newly built residence ECLA offering private rooms. You can apply via our website: <https://esi-archamps.eu/juas-presentation/>
Deadline is 5 November.

Course 1

The Science of Particle Accelerators

12 January > 13 February

Course 2

The Technology & Applications of Particle Accelerators

16 February > 20 March



Scan it to have the direct link



🎥 New Videos Are Live!

Discover what's new on our website:

- Student Testimonials – Course 1, 2025: Hear firsthand experiences and insights from our students.
- Celebrating 30 Years of JUAS: A stunning photo journey created for our anniversary.

👉 Visit our site to watch and celebrate with us!

<https://esi-archamps.eu/juas-presentation/>



Say hello to the faces behind our school adventures!

From left to right:

Florence MOUTHON (ESI Director)

Elias METRAL (JUAS Director)

Grace RODRIGUES (Accounting Manager)

Darina BAIZHANOVA (Project Manager)