



## PRACTICAL INFORMATION

S. Vandergooten, ESI Project Manager

### JUAS 2023 (Course 1): The Science of Particle Accelerators

 9 Jan 2023, 11:00 → 10 Feb 2023, 14:00 Europe/Paris

 European Scientific Institute (ESI)

# Your Faculty during these 5 intensive weeks

juas...



UNIVERSITY OF OXFORD



SAPIENZA  
UNIVERSITÀ DI ROMA



# You...

# juas...



30 Participants



→ 6 Women

→ 24 Men

→ 13 Nationalities

→ 10 Master students  
19 PhD students  
1 Professional

→ 15 Universities/Intitutions

# The program (INDICO)

## JUAS 2023 (Course 1): The Science of Particle Accelerators

9 January 2023 to 10 February 2023  
European Scientific Institute (ESI)  
Europe/Paris timezone

Enter your search term

Overview

*NOTE: 1 slot of 1 hour = 50 minutes lecture + 10 minutes break*

<https://indico.cern.ch/event/1210739/>

**Starts** 9 Jan 2023, 11:00  
**Ends** 10 Feb 2023, 14:30  
Europe/Paris

European Scientific Institute (ESI)  
61 rue Antoine Redier  
Building "Mont Blanc 1"  
74160 Archamps  
France  
[Go to map](#)

[Elias Metral](#)

[JUAS 2023 - Photo Gallery - Course 1 - Parti...](#)

Scientific programme

Softwares

Pre-requisite & useful  
videos

Timetable

Examinations

IPAC Prize 2023

# The program (INDICO)

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### Scientific programme

(= 110h05)

Lectures

Seminars

Visits

Workshops

#### Topics

Topics	Nbr of hour(s)
Reminder on Special relativity & Electromagnetism	1h15
Transverse Beam Dynamics	11h40
Longitudinal Beam Dynamics	11h40
MADX	50 min
PyHeadTail	50 min
Linacs	6h40
Transverse Linear Imperfections	6h40
Cyclotrons & FFAs	5h00
Synchrotron Radiation	10h00
Transverse non-linear effects	4h10
Injection / Extraction	2h30
Accelerator Design	4h10
Collective effects (Space charge and instabilities)	10h00
<b>TOTAL</b>	<b>75h25</b>

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### Softwares



#### Practical sessions

(Requirements to properly install the needed softwares)

Topic	Lecturer	Deadline	Requirements	Guidelines
MAD-X Workshop	N. Fuster-Martínez	15 January	Windows/Linux/Mac + Browser (Firefox/Chrome...)	<a href="#">CLICK HERE</a>

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### Pre-requisite & useful videos

The following four pre-requisite videos **MUST be watched** before the program starts!

Two mandatory quizzes MUST be passed before the course 1 starts. Only one error per quiz is allowed (you can redo the quiz as much as you want, until you succeed)

- Electromagnetism (QUIZ 1)
- Special Relativity (QUIZ 2)
  
- MOOC on 'Python': VIDEO [+ TUTORIAL]
- Hamiltonian formalism (see "Hamiltonian Formalism 1.mp4")

### Additional background videos (optional):

- Teaser
- Introduction to Particle Accelerators
- Applications of Accelerators
- Radiofrequencies for Particle Accelerators
- Application of the Hamiltonian formalism to accelerators (see "Hamiltonian Formalism 2.mp4")

### Virtual visits of some machines (optional):

- S-DALINAC
- CERN LEIR Accelerator
- ALICE experiment at the CERN LHC

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### Timetable

Compact style  
**Indico style**  
Indico style - inline minutes  
Indico style - numbered

MONDAY, 9 JANUARY

11:00 → 12:45 **OFFICIAL OPENING**

🕒 1h 45m

- Presentation of ESI (10 min.)
- Presentation of JUAS (35 min.)
- Practical information (10 min.)
- Introduction of participants (50 min.)

**Speakers:** Elias METRAL (CERN), Robert Lionel HOLLAND (European Scientific Institute (FR)), Stephanie Denise H VANDERGooten (European Scientific Institute (FR))

12:45 → 14:00

**WELCOME LUNCH (provided by ESI)**

🕒 1h 15m

14:00 → 15:30

**Special relativity, electromagnetism, classical and quantum mechanics**

🕒 1h 30m

What to remember for particle accelerators

**Speaker:** Elias METRAL (CERN)

European Scientific Institute (ESI)

12:45 - 14:00

14:00

**Special relativity, electromagnetism, classical and quantum mechanics**

Elias Metral



# The program (INDICO)

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### Examinations

#### WRITTEN Examination

5 topics, each allocated one and a half hours (1h30):

- Exam 1: **Transverse beam dynamics** (coefficient 14): Monday 23 January
- Exam 2: **Longitudinal beam dynamics** (coefficient 14): Monday 23 January
- Exam 3: **Synchrotron radiation** (coefficient 12): Tuesday 7 February
- Exams 4 & 5: To be announced (on 1st February): Wednesday 8 February

#### ORAL Examination

For the **Accelerator design workshop** (coefficient 6): Monday 6 February

*Note: there will be a **bonus** for those who will hand back a well filled notebook after the MADX Workshop*

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### IPAC Prize 2023



We are delighted to inform applicants to JUAS-23 of the **JUAS-IPAC Prize 2023**, awarded by the IPAC Committee, in charge of organising IPAC 23, the International Particle Accelerator Conference, to be held in **Venice (Italy)** on **7 - 12 May 2023**.

The Prize will take the form of a cash grant covering registration, travel, hotel and subsistence costs at IPAC 23.

The Prize will be awarded to one student attending Course 1 – Science of Particle Accelerators. He/she will be selected by the JUAS Director and recommended to the IPAC Committee according to the following criteria:

- enrolled in a Master or PhD programme
- obtaining the highest overall mark in the Course 1 examinations
- committed to pursuing his/her career in the field of particle accelerators
- willing to present his/her work (Master's thesis, doctoral research) at the Conference
- willing to assist the Conference organisers (e.g. acting as scientific secretary of a session)
- willing to promote JUAS on the stand devoted to particle accelerator schools

More information about the IPAC conference available [HERE](#).

# Visits

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## Monday 23 January

- Departure from ESI at **13:30** // Return from CERN (bus departure at 20:30)
- Program:
  - ALICE introduction, exhibition & experiment in underground cavern
  - CERN LEIR Accelerator
  - Introduction on Colliders session
  - Dinner



## Thursday 9 February

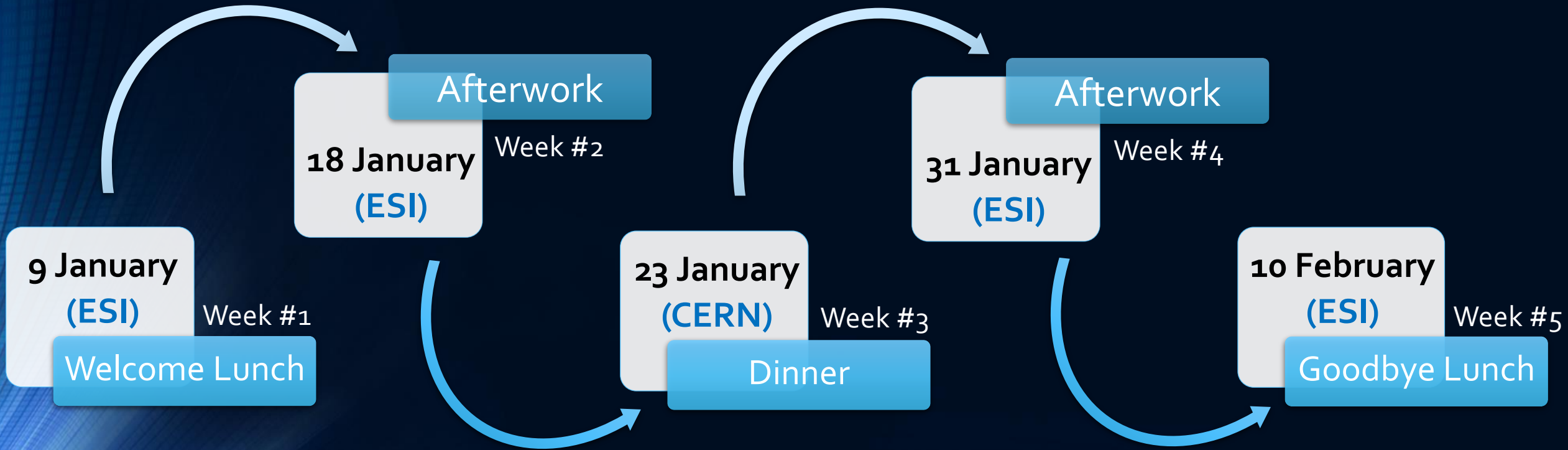
- Departure from *La Colombière* at **9:00** // Return from ESRF (bus departure at 17:00)
- Detailed program not finalized yet

It will be **MANDATORY** to bring your ID Card / Passport (and visa when applicable) for all the visits scheduled in the programme. This is due to the very strict security protocols in place in the institutions you will visit!

# Lunches & Dinners



You are in charge of your own daily meals.



# Shuttle / car-sharing



A special thank to Max Begue, Arnaud Magnin and Giacomo Broggi for having accepted to share their cars during the school with those who are at *La Colombière*\*!



Thank You

## 22 people\*

- ✓ 14 seats available
- + Daily shuttle (8 people)

### Morning:

- Pick-up at 8h30

### End of the day:

- Pick-up about 15 minutes after the end of the program



# Evaluation forms (topics / speakers)

1a) How would you rate the following aspects of the lecture ? \*

(0: Did not attend or not applicable) / 1: Unsatisfactory -> 5: Highly Satisfactory

	0	1	2	3	4	5
Level of the subject	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oral presentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Written teaching material	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exercises/tutorials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**EVALUATION FORM - Week #2**  
Please fill in the evaluation form of the week  
20 January 2023 16:30  
European Scientific Institute (ESI)  
JUAS 2023 (Course 1): The Science of Particle Accelerators

**EVALUATION WEEK #1**  
Please fill in the evaluation form of the week  
13 January 2023 16:30  
European Scientific Institute (ESI)  
JUAS 2023 (Course 1): The Science of Particle Accelerators

- ❖ Links available on INDICO (Fridays).
- ❖ Purpose: To improve JUAS program in the future !

FRIDAY, 13 JANUARY


16:30 → 17:00 **EVALUATION WEEK #1**

Please fill in the evaluation form of the week

[Evaluation form - W...](#)

**FEEDBACK**

**COMMENTS**



- A global evaluation form will be sent to you at the end of the course.
- Specific to organizational & logistical questions.
- Your feedback will bring added value for next editions !

# Certificate of participation / Attendance list



At the end of the course, we will generate your individual certificate of attendance (including your marks - for those who will take the exams). You will receive it in March.




**Joint Universities Accelerator School 2022**

**CERTIFICATE**

This is to certify that [REDACTED]

attended the following general lectures, tutorials, seminars, practicals and visits during:

**Course 1: The Science of Particle Accelerators (96 hours of live sessions)**  
(10 January to 11 February 2022, held remotely)

**Lectures (69h00)**

- Reminder on Special relativity & Electromagnetism
- Transverse Beam Dynamics
- Longitudinal Beam Dynamics
- MADX
- PyHeadTail
- Transverse Linear Imperfections
- Linacs

**Seminars (8h15)**

- Particle Accelerators in the 21st century
- Introduction to CERN & its Accelerator Complex
- Collider's session
- Transverse non-linear manipulations
- Nuclear collisions at the LHC

**Visits (3h45)**

- CERN LEIR Accelerator
- ALICE Experiment at the CERN LHC
- ESRF

- Synchrotron Radiation
- Transverse non-linear effects
- Accelerator Design
- Collective effects (Space charge and instabilities)
- Cyclotrons & FFAs
- Injection / Extraction

**Workshops (15h00)**

- MADX
- PyHeadTail
- Accelerator Design

completed course work and examinations resulting in:

Overall mark of student (out of 20): [REDACTED]

Overall mark: class average: [REDACTED]

Overall mark: class standard deviation: [REDACTED]

**Elias Métral**  
JUAS Director

**Philippe Lebrun**  
ESI President ad interim



















**Joint Universities Accelerator School 2022**

Course 1: The Science of Particle Accelerators  
(10 January to 11 February 2022)









**MARKS (out of 20)**







Obtained by [REDACTED]

EXAMINATION	STUDENT MARK	CLASS AVERAGE	CLASS STANDARD DEVIATION
Transverse Beam Dynamics Coefficient 14	[REDACTED]	[REDACTED]	[REDACTED]
Longitudinal Beam Dynamics Coefficient 14	[REDACTED]	[REDACTED]	[REDACTED]
Synchrotron Radiation Coefficient 12	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Accelerator design Coefficient 6	[REDACTED]	[REDACTED]	[REDACTED]

**Elias Métral**  
JUAS Director

**Philippe Lebrun**  
ESI President ad interim

# Last information

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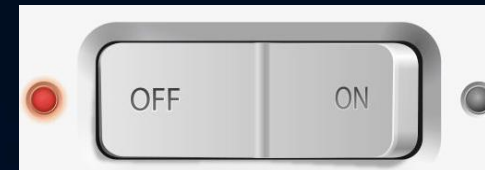
- Please sign the agreement regarding reproduction of photographic images



- Attendance list MUST be signed upon your arrival every day



- My winter holidays on week #5 (6 → 10 February)



- Thank you -