technische universität dortmund

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

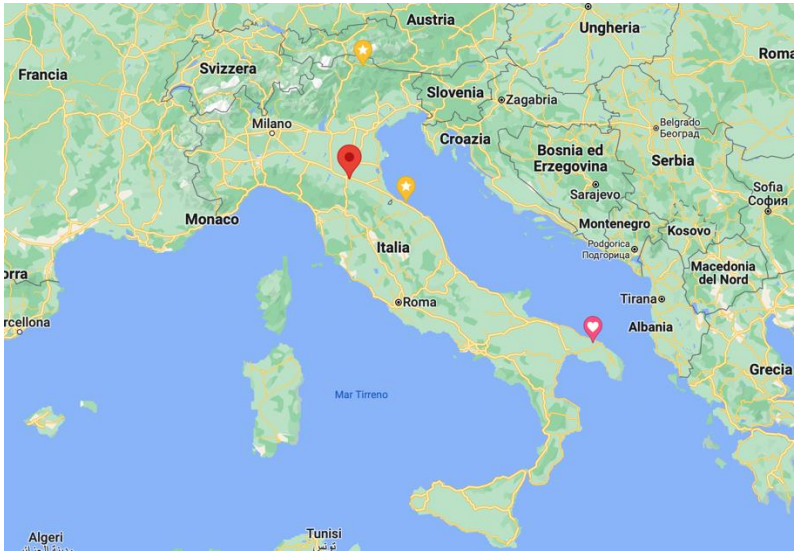
IMAPP

International Master on Advanced Methods in Particle Physics

Second year, first semester
@Bologna

prof. Angelo Carbone

Bologna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del Nord
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Tunisi

History – Alma Mater Studiorum - UNIBO

The University of Bologna is considered to be the oldest university in the Western world

Founded in 11th-12th centuries - The birth of the Studium and the Commune

It was the **outcome of the spontaneous and informal initiative of a few students**

A long history over Nine centuries

In the 21st century, UNIBO set up the first **Multicampus** scheme in Italy

The University today: numbers and innovation

The University of Bologna is made up of **32** Departments

One is the Department of Physics and Astronomy "Augusto Righi"

It is located in the city-centre of Bologna

90,291 students chose the University of Bologna (A.Y. 2020/2021), including **7,062** international students

5,882 people are part of the university community, including teachers (**2,917**) and professional staff (**2,965**)

96 international Degree Programmes, of which **79** are held in English.

48 PhD Programme Degrees (A.Y. 2020/2021)

Department of Physics and Astronomy (DIFA)

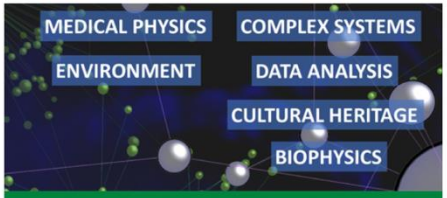
DIFA is a significant structure integrated with almost 500 researchers achieving a level of excellence in Research and Teaching

DIFA area hosts researchers, laboratories and infrastructures of

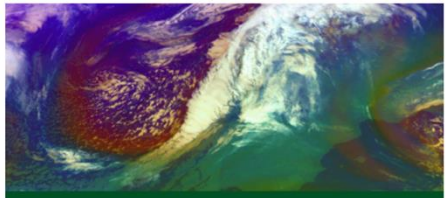
- Istituto Nazionale di Fisica Nucleare (Bologna's branch of INFN)
- INFN's Centro nazionale tecnologie informatiche (CNAF)

CNAF- Particle physics computing centre

Research areas



Applied physics and complex systems

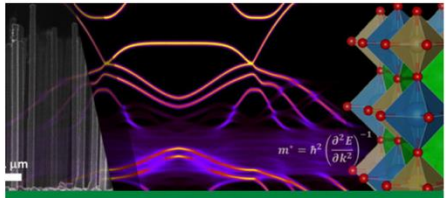


Atmospheric physics

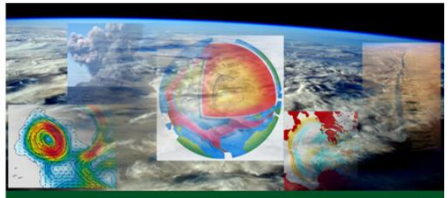
Astrophysics

Nuclear and subnuclear physics

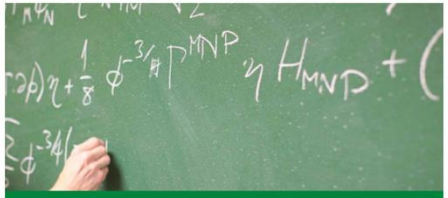
Physics education and history of physics



Physics of condensed matter, atoms and molecules



Physics of the Earth



Theoretical physics

Research areas

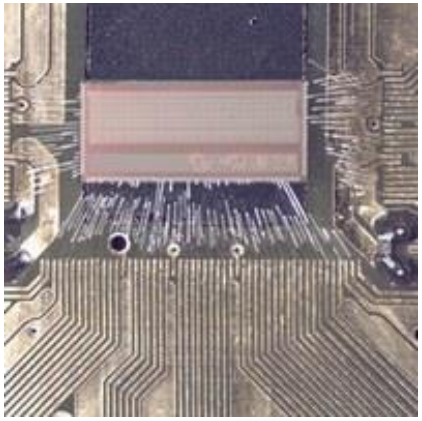
High Energy Particle Physics with accelerators
ATLAS, ALICE, CMS, LHCb

Nuclear Physics
FOOT, FAMU, n_TOF, NUCL-EX

Neutrino Physics
CUORE, ENUBET, NU@FNAL

Astroparticle Physics and Cosmology
AMS, DarkSide, EUCLID, KM3, LVD, XENON

Detector R&D, Technology Transfer and Computing



Bologna, in the heart of Data Valley

Bologna hosts **70% of Italian computing and storage capacity** at the **European research hub: the Big Data Technopole**

The semester in Bologna

First semester – second year

- Introduction day in Bologna: mid-September 2025
- Courses start in Bologna: mid-September 2025
- Courses end in Bologna: 23 December 2025
- Exam period: January-February 2026

Focus:
Particle Physics and Computer Science

The courses

Advanced Standard Model (IMAPP-03-01)				
Degree program: Advanced Methods in Particle Physics **Further degree programs:**				
Frequency: Winter semester	**Duration:** One semester	**Semester:** Third semester	**Credits:** 6	**Work load:** 150 h

1	**Module structure**				
	No.	**Element / course**	**Type**	**Credits**	**Contact hours per week**
	1	Lecture	Lec	6	4
2	**Language:** English				

Teachers:
prof. Fabio Maltoni
Dr. Davide Pagani

Content
Advanced knowledge of the theory of the Standard Model of elementary particles with open questions from a theoretical and phenomenological perspective

The courses

Phenomenology and experimental flavour physics (IMAPP-03-02)				
Degree program: Advanced Methods in Particle Physics **Further degree programs:**				
Frequency: Winter semester	**Duration:** One semester	**Semester:** Third semester	**Credits:** 6	**Work load:** 150 h

1	**Module structure**				
	No.	**Element / course**	**Type**	**Credits**	**Contact hours per week**
	1	Lecture	Lec	6	4
2	**Language:** English				

Teachers:
prof. Angelo Carbone
prof. Maximilliano Sioli

Content
The course covers aspects of flavor physics in the hadronic and the leptonic sector.

The courses

Computer science for High energy physics (IMAPP-03-03)				
Degree program: Advanced Methods in Particle Physics **Further degree programs:**				
Frequency: Winter semester	**Duration:** One semester	**Semester:** Third semester	**Credits:** 12	**Work load:** 300 h

1	**Module structure**				
	No.	**Element / course**	**Type**	**Credits**	**Contact hours per week**
	1	Lecture	Lec	12	8
2	**Language:** English				

Teachers:
prof. Maximilliano Sioli
Dr. Matteo Negrini
Dr. Gabriele Sirri
Dr. Francesco Giacomini
Dr. Andrea Chierici

Content

- Statistical data analysis for high-energy physics
- Data processing infrastructures for scientific applications
- Advanced C++ programming for computer science

The courses

Preparation for scientific research and internship orientation (IMAPP-03-04)				
Degree program: Advanced Methods in Particle Physics				
Frequency: Winter semester	**Duration:** One semester	**Semester:** Third semester	**Credits:** 6	**Work load:** 150 h

1	**Module structure**				
	No.	**Element / course**	**Type**	**Credits**	**Contact hours per week**
	1	Research	Res	6	4
2	**Language:** English				

Teachers:
Dr. Serena Maccolini
Several Invited speakers

Content

- How to write a paper
- Seminars for internships opportunities

Registration's to Bologna University

- To access UNIBO services you need to register on the UNIBO portal
- It is not urgent, you will receive an email at the beginning of 2025 when all the registration process to IMAPP is completed

Bologna's life

Bologna is an important agricultural, industrial, financial, and transport hub, where many large mechanical, electronic and food companies have their headquarters as well as one of the largest permanent trade fairs in Europe

Famous for nicknames

- "the learned one" (la dotta), hosting thousands of students
- "the fat one" (la grassa), referring to its rich cuisine

Bologna is a lovely place to live for numerous reasons.

Accomodation

There is not yet s standard procedure for getting accommodation, however, the University of Bologna offer several supports

- Accommodation Showcase (Vetrina Alloggi) virtual bulletin board

- SAIS (Student Accommodation and Information Service) supports **international exchange students** and enrolling students in finding accommodation
- Other resources for finding accommodation soon available on www.imapp.eu website