



# Lecture 1 - Course Overview

- Lecturers
  - Istituto Nazionale di Astrofisica (INAF)
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    - Marco Molinaro - [marco.molinaro@inaf.it](mailto:marco.molinaro@inaf.it)
    - Marco Frailis - [marco.frailis@inaf.it](mailto:marco.frailis@inaf.it)
  - AREA Science Park
    - Federica Bazzocchi - [federica.bazzocchi@areasciencepark.it](mailto:federica.bazzocchi@areasciencepark.it)
- [Moodle@UniTs](#) → Lecture materials
- Microsoft Teams → Live recordings

- Introduction
- Data and Metadata Models & Structures
- Data Infrastructures
- Data Resource Interoperability and Access

# Description of the course & lessons (1)



- Introduction
  - Big Data
  - Open Data
  - FAIR principles
- Data and Metadata Models and Structures
  - data model definitions and design
  - data structures and metadata
  - UML, ORM, XML, XSD, YAML, JSON
  - data structure formats, tabular formats, images, hierarchical structures, including metadata query-ability

# Description of the course & lessons (2)



- Data Infrastructure
  - Large scale data infrastructure and hardware/software stack for large data management
  - Parallel and distribute storage
  - Cloud storage and associated services
- Interoperability
  - (Persistent) Identifiers
  - (Resource) Catalogues
  - Data models for Discovery
  - Data Curation & Preservation
  - Interfaces & Dataset Access

# Why This Course Matters



- **Beyond the Database**
  - Modern data challenges exceed the capabilities of standard RDBMS.
  - Understanding *how* systems work is as important as knowing how to query them.
- **The "Data Deluge" in Research & Industry**
  - From Square Kilometre Array (SKA) to Genomics: managing Petabyte-scale datasets.
  - Bridging the gap between raw storage and meaningful discovery.
- **Career Resilience & Professionalism**
  - **Architectural Thinking:** Moving from "Data User" to "Data Architect."
  - **FAIR Compliance:** Mastering the global standards required by modern funding agencies (EU/PNRR) and top-tier tech companies.
  - **Future-Proofing:** Skills in interoperability and curation ensure data remains valuable for decades, not just days.
- **Interdisciplinary Edge**
  - Mastering the stack that powers both Big Science and Big Tech.

# Lesson Calendar



February + March							April							May + June								
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S		
23	24	25	26	27	28	1				1	2	3	4	5						1	2	3
2	3	4	5	6	7	8	6	7	8	9	10	11	12	4	5	6	7	8	9	10		
9	10	11	12	13	14	15	13	14	15	16	17	18	19	11	12	13	14	15	16	17		
16	17	18	19	20	21	22	20	21	22	23	24	25	26	18	19	20	21	22	23	24		
23	24	25	26	27	28	29	27	28	29	30				25	26	27	28	29	30	31		
30	31													1	2	3	4	5	6	7		

  

	Introduction (Bignamini)
	Data and Metadata Models and Structures (Bignamini + Frailis)
	Data Infrastructure (Bazzocchi)
	Data Resource Interoperability and Access (Bignamini + Molinaro)
	Recovery lesson

  

Monday: 10-12 (Classroom 4A - H2bis)  
 Friday: 11-14 (Classroom 4C - H2bis)

# Knowledge Verification



- Preparation of a small *project* on data management
  - Using everything that has been learned during the course
    - Definition of data model and data structure
    - Interoperability
    - Possible solutions of distributed data infrastructure
    - Data storage and long term preservation
    - Data access
    - ...
  - Critical approach to the project with respect to the themes addressed during the lessons
  - Possibly showing some real snippets or ideas of implementation
    - ... but do not focus only on the demo!
- Presentation of the project to the class & lecturers
  - Slides in English
  - With dedicated Q&A time
- There are no fixed date for the exams
  - Contact us to agree on the project details
  - Send us an email to agree on a date

- Organisational set-up
  - Register on [Moodle@UniTs](#)
  - Join on Microsoft Teams (code j0sjg1p)
  - Do you have any requests?
  - Do you plan to follow the course primarily in person or remotely?
- Fill in the survey form
  - Discuss it
- Open discussion on the expectations
- (and/or) insights on the course content