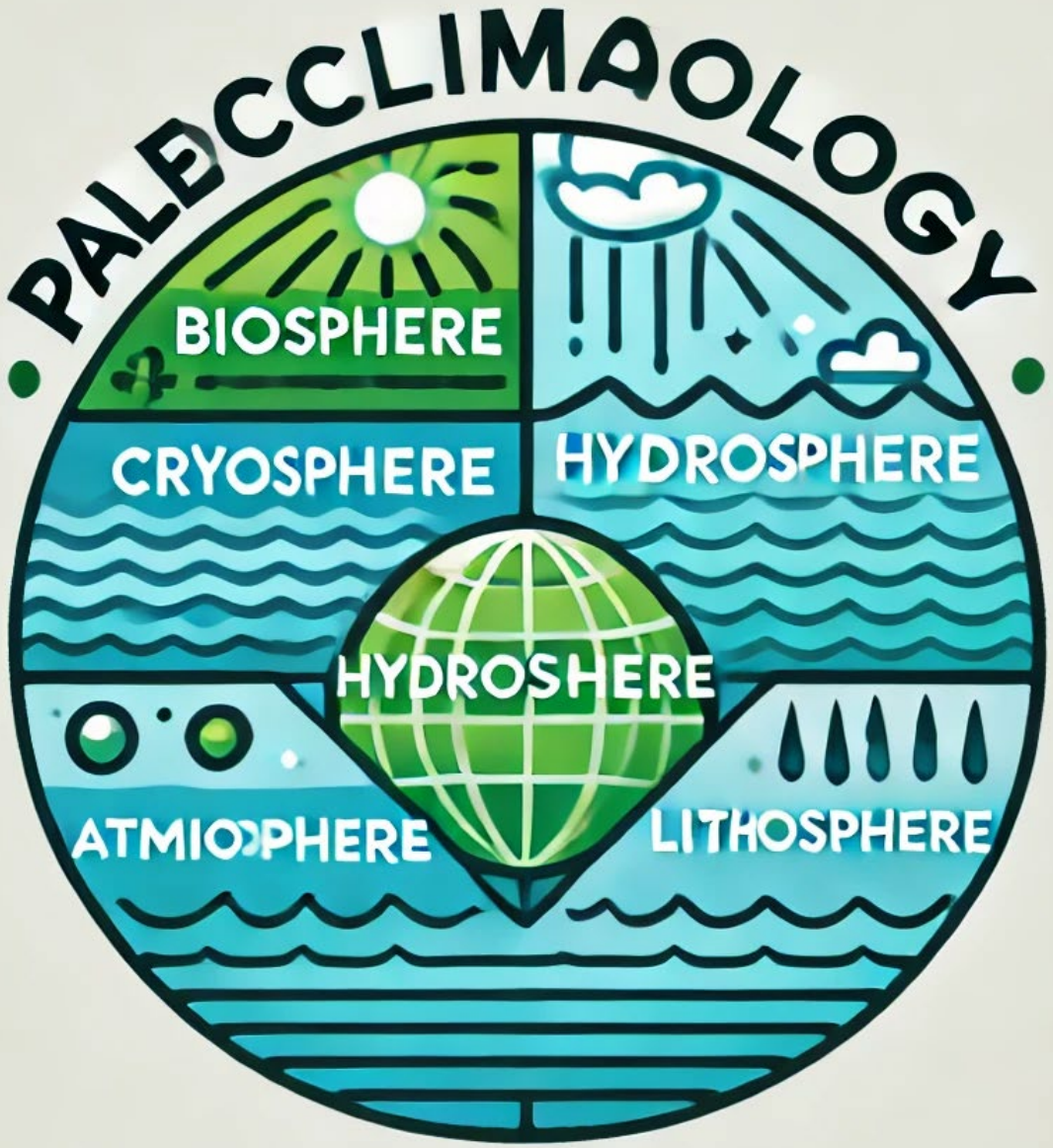
# PALEOCLIMATOLOGY, CLIMATOLOGY AND CLIMATE MODELS

- Bachelor’s degree in Earth and Climate dynamics
- II YEAR – I SEMESTER
- 2024/2025

**Paleoclimatology Module** + Climatology and Climate Models



# COURSE OVERVIEW AGENDA

**1.Schedule**: Outline of class timings and important dates.

**2.Exam**: Details on assessment methods and evaluation criteria.

**3.Aim of the Course**: Objectives and expected outcomes for students.

**4.Previous Knowledge**: Prerequisites and foundational concepts required.

**5.How and Where to Study**: Recommended resources and study strategies.

**6.Contents**: Overview of topics and materials to be covered throughout the course.

# TEACHING METHODOLOGY

**12 CFU/ ECTS (European Credit Transfer System)**

PALEOCLIMATOLOGY MODULE => 6 ECTS
(semester start to mid November)
Prof. Claudia Agnini
40 hours (face to face classes)
16 hours work group activities + class laboratory
(Journal club) => group presentation

CLIMATOLOGY AND CLIMATE MODELS => 6 ECTS
(mid November to semester end)
associate professor GEO/12
48 hours (face to face classes)

# WHERE AND WHEN: SCHEDULE 2024/2025

## Department of Geosciences - Classroom 1F

| | Monday | Tuesday | Wednesday | Thursday | Friday | |
|---|---|---|---|---|---|---|
| 8:30-9:30 | | | | | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 1F) | 8:30-9:30 |
| 9:30-10:30 | | | | | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 1F) | 9:30-10:30 |
| 10:30-11:30 | | | | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 2H) | | 10:30-11:30 |
| 11:30-12:30 | | | | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 2H) | | 11:30-12:30 |
| 12:30-13:30 | | | | | | 12:30-13:30 |
| 13:30-14:30 | | | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 1F) | | | 13:30-14:30 |
| 14:30-15:30 | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 2H) | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 1F) | - | | | 14:30-15:30 |
| 15:30-16:30 | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 2H) | Paleoclimatology, Climatology and climate models . Agnini PA GEO/12 - (Aula 1F) | - | | | 15:30-16:30 |
| 16:30-17:30 | | | - | | | 16:30-17:30 |
| 17:30-18:30 | | | - | | | 17:30-18:30 |
| 18:30-19:30 | | | | | | 18:30-19:30 |

# EXAM DATES

| **PALEOCLIMATOLOGY, CLIMATOLOGY AND CLIMATE MODELS** | | |
|---|---|---|
| (L-34 Earth and Climate Dynamics– II Year - I Semester) | | |
| Exam dates A.A. 2024-2025 | | |
| **Date** | **Hour** | **Venue** |
| 22/01/2025 | h. 9.00 | Dip. di Geoscienze (Room TBD) |
| 11/02/2025 | h. 9.00 | Dip. di Geoscienze (Room TBD) |
| 18/06/2025 | h. 9.00 | Dip. di Geoscienze (Room TBD) |
| 04/07/2025 | h. 9.00 | Dip. di Geoscienze (Room TBD) |
| 21/08/2025 | h. 9.00 | Dip. di Geoscienze (Room TBD) |

# EXAM -1

**Written test (duration 1h):**
5-10 multiple choice questions => 9/30
2 open questions => 16/30
**Journal club**:
Group presentation on paper published on high ranking journal on a topic voted by the Students =>5/30

The knowledge and skills acquired during the course are assessed through a **written examination**, accounting for ca. 85% of the evaluation (25/30). This examination evaluates concepts, scientific terminology, synthesis abilities, and critical thinking.

Additionally, students' skills will be assessed through **group presentations** on assigned topics, accounting for the remaining 15% (5/30), which also assesses teamwork.

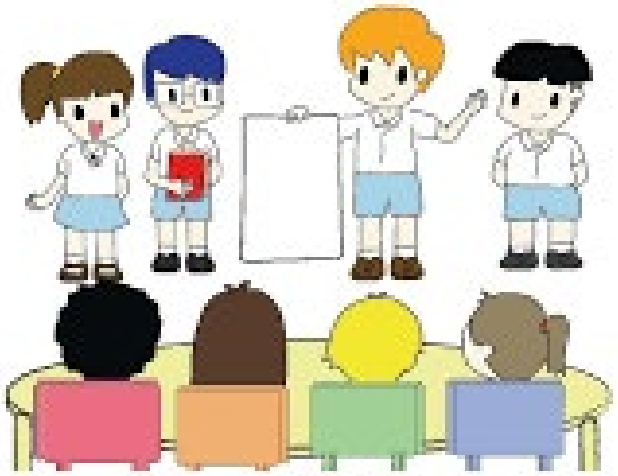
# EXAM -2

written test (85%)

5-10 multichoice questions
2 open questions

**Evaluation criteria:**

group presentation (15%)

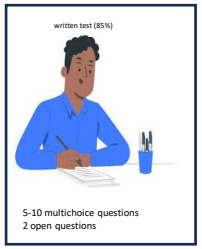


1 group presentation
Q&A

- multiple choice questions: correctness of the answers
- 2 open questions: 1) knowledge of the topics covered in the course; 2) understanding of the topics covered in the class; 3) criticism and link capability on the knowledge acquired during the course; 4) synthesis ability; 5) proper terminology.

- Journal class: 100% peer student evaluation

# EXAM -3




EVALUATION CRITERIA GRID - OPEN QUESTIONS

**Knowledge of the Topics Covered in the Course**

Level 1 (Poor): Knowledge of the topics is very limited and incomplete. The student demonstrates a superficial understanding of fundamental concepts.
Level 2 (Adequate): Knowledge of the topics is sufficient but could be improved. The student shows a basic understanding of key concepts.
Level 3 (Good): Knowledge of the topics is solid and comprehensive. The student demonstrates a good understanding of the concepts covered in the course.
Level 4 (Excellent): Knowledge of the topics is exceptional. The student shows a deep and sophisticated understanding of the material.

**Understanding of the Topics Covered in the Class**

Level 1 (Poor): Understanding of the topics is limited, and the student has difficulty connecting concepts.
Level 2 (Adequate): Understanding of the topics is adequate but could be deepened. The connection between concepts is present but not always clear.
Level 3 (Good): Understanding of the topics is solid, and the student can connect concepts clearly.
Level 4 (Excellent): Understanding of the topics is exceptional, and the student demonstrates an advanced ability to critically and thoroughly connect concepts.

**Criticism and Link Capability on the Knowledge Acquired During the Course**

Level 1 (Poor): The ability to criticize and link information is poor or absent.
Level 2 (Adequate): The ability to criticize is present but could be further developed. The linking of information is sufficient.
Level 3 (Good): The ability to criticize is good, and the student can effectively link the information acquired during the course.
Level 4 (Excellent): The ability to criticize is exceptional. The student demonstrates deep reflection and an advanced ability to link acquired knowledge innovatively.

**Synthesis Ability**

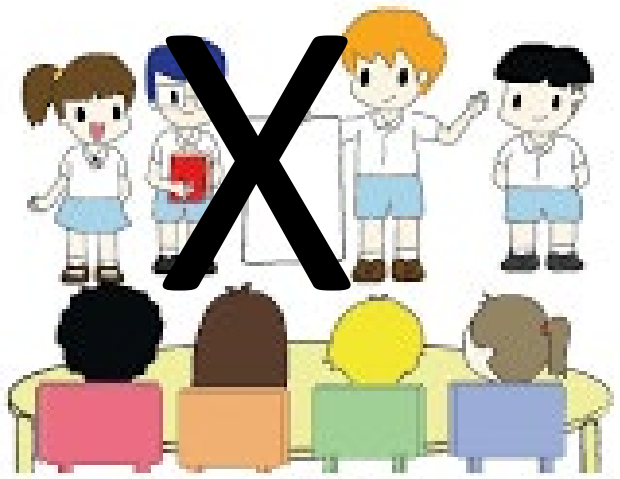
Level 1 (Poor): Synthesis ability is limited or absent.
Level 2 (Adequate): Synthesis ability is present but could be further developed. The presentation of information is basic.
Level 3 (Good): Synthesis ability is good, and the student can present information clearly in a synthesized manner.
Level 4 (Excellent): Synthesis ability is exceptional. The student demonstrates an advanced ability to integrate and present information clearly and concisely.

**Proper Terminology**

Level 1 (Poor): The use of terminology is imprecise or inappropriate.
Level 2 (Adequate): The use of terminology is adequate but could be improved in some cases.
Level 3 (Good): The use of terminology is good, and the student demonstrates an appropriate mastery of the specific language of the course.
Level 4 (Excellent): The use of terminology is excellent. The student demonstrates an advanced and accurate mastery of the terminology related to the course.

# EXAM -4

group presentation (15%)



1 group presentation + Q&A

I would like to remind you that in the "exam info" folder on the STEM Moodle platform (https://stem.elearning.unipd.it/) for this course, you can find all the necessary information. The final grade consists of two parts: Maximum grade: 30/30 with honors:

0-5/30 -> Journal Club
0-25/30 -> written test

If any of you have not participated in the Journal Club activity during the course, you can recover the 5 points by preparing a report on one of the papers used for the presentations, which you can download from the Moodle folder (Journal Club 2024). The report should be sent to claudia.agnini@unipd.it or alternatively upload on moodle STEM no later than the day before the exam date.

# AIM OF THE COURSE

The reconstruction of Earth's history and climate from the Precambrian to the Quaternary by means of the main geological, climatic and biotic events.

Provide basics to allow for the reconstruction/ evolution/ dynamics of the environment and climate of the past in a rigourous chronological framework(archives, proxies, stable isotopes, the astronomic theory of climate, climate evolution from the Precambrian to recent)

# Prerequisites, textbook and study material

## Prerequisites:

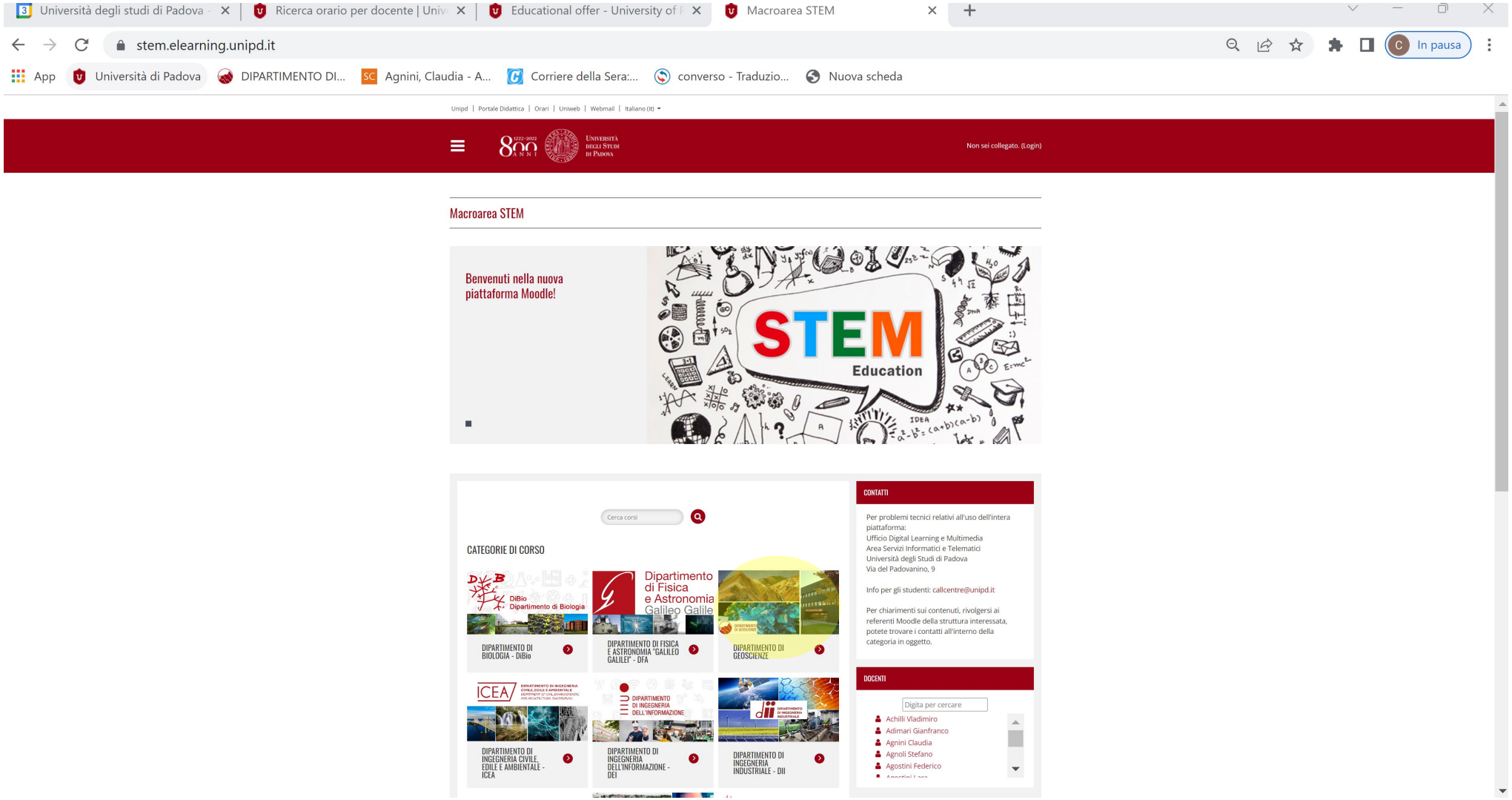
- ✓ Basic knowledge of Geology and Paleontology

## Textbook and study material:

- ✓ **Ruddiman William F. (2007).**Earth's Climate (Past and Future) 2nd Edition. W.H. Freeman and Company.
- ✓ Education material provided by the Lecturer (STEM moodle)
- ✓ Class notes

# E-learning – moodle STEM

https://stem.elearning.unipd.it/



# E-learning – moodle STEM

stem.elearning.unipd.it/course/index.php?categoryid=48

App | Università di Padova | Agnini, Claudia - Au... | DIPARTIMENTO DI... | Corriere della Sera:... | easystaff | STEM-e-learning | easybadge | Web of Science | chat gpt | loginmiur.cineca.it | PICA | PhD Geosciences | Tutti i preferiti

Unipd | Portale Didattica | Orari | Uniweb | Webmail | My Media | Italiano (it) | Webmail | Uniweb

Università degli Studi di Padova | Home | Italiano (it) | Login

Corsi / DIPARTIMENTO DI GEOSCIENZE

## DIPARTIMENTO DI GEOSCIENZE

DIPARTIMENTO DI GEOSCIENZE

Cerca corsi

Scheda Rischio - Servizio Medicina Preventiva

A.A.2024 - 2025

A.A. 2023 - 2024

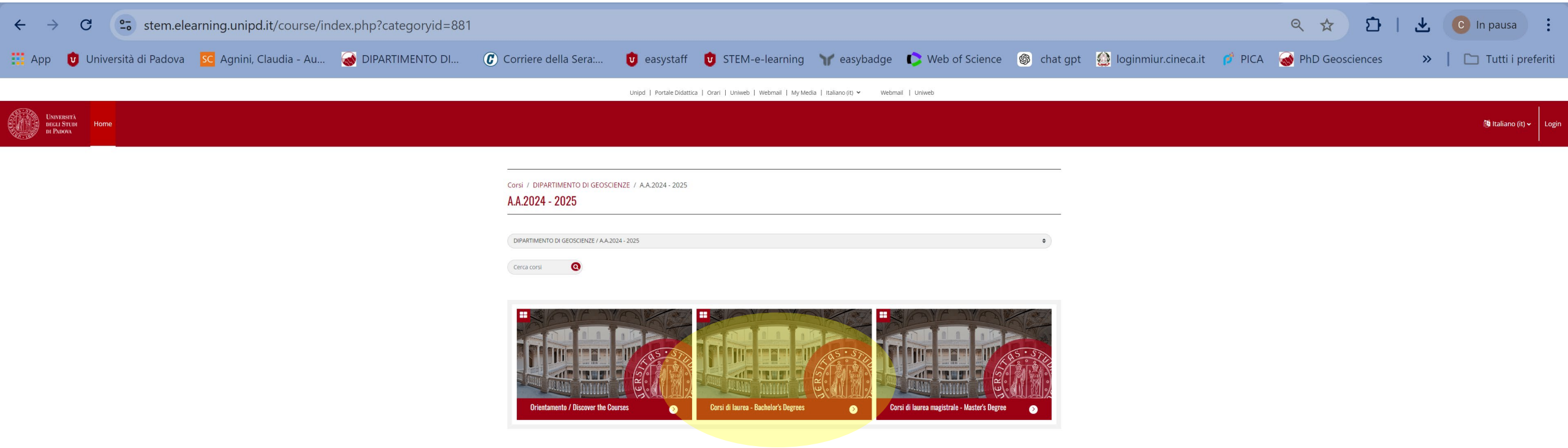
A.A. 2022 - 2023

A.A. 2021 - 2022

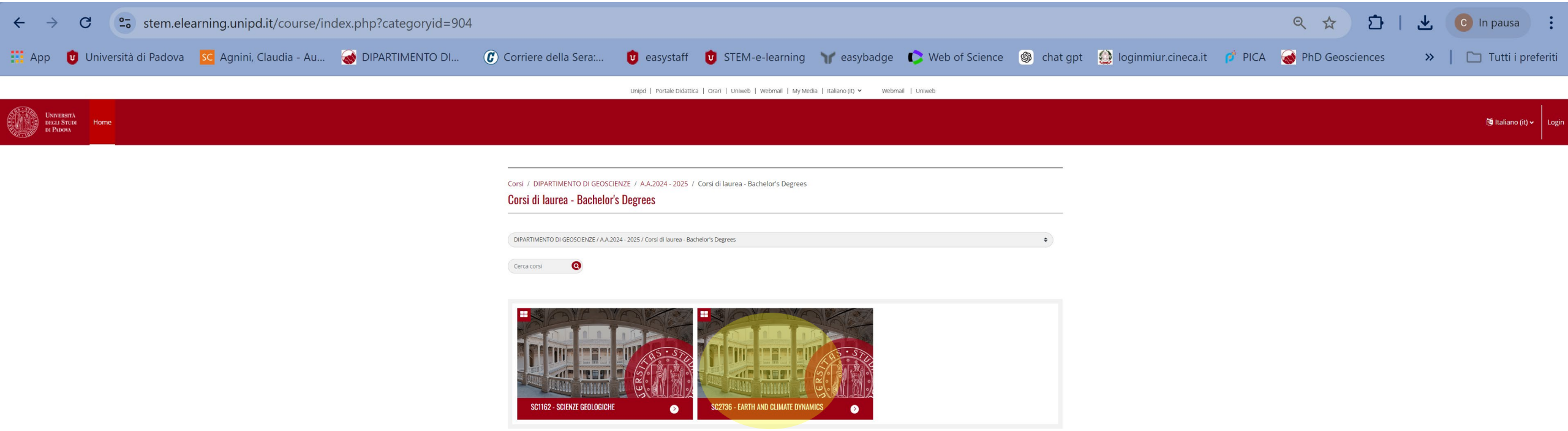
Biblioteca / Library

Area Riservata

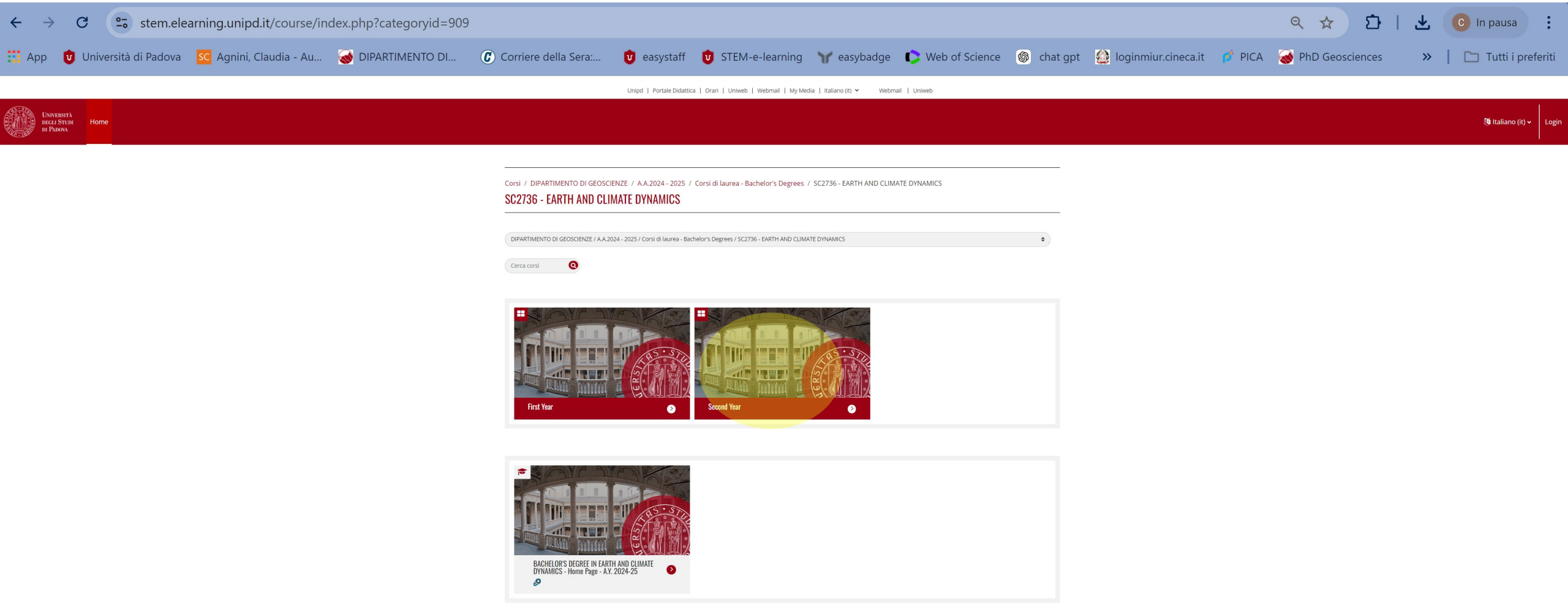
# E-learning – moodle STEM



# E-learning – moodle STEM



# E-learning – moodle STEM



# E-learning – moodle STEM

stem.elearning.unipd.it/course/index.php?categoryid=916

In pausa

App | Università di Padova | Agnini, Claudia - Au... | DIPARTIMENTO DI... | Corriere della Sera:... | easystaff | STEM-e-learning | easybadge | Web of Science | chat gpt | loginmiur.cineca.it | PICA | PhD Geosciences | Tutti i preferiti

Unipd | Portale Didattica | Orari | Uniweb | Webmail | My Media | Italiano (it) Webmail | Uniweb

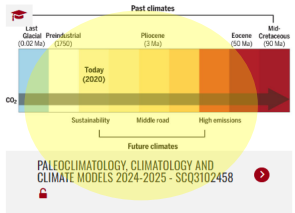
Università degli Studi di Padova | Home | Italiano (it) | Login

Corsi / DIPARTIMENTO DI GEOSCIENZE / A.A.2024 - 2025 / Corsi di laurea - Bachelor's Degrees / SC2736 - EARTH AND CLIMATE DYNAMICS / Second Year

## Second Year

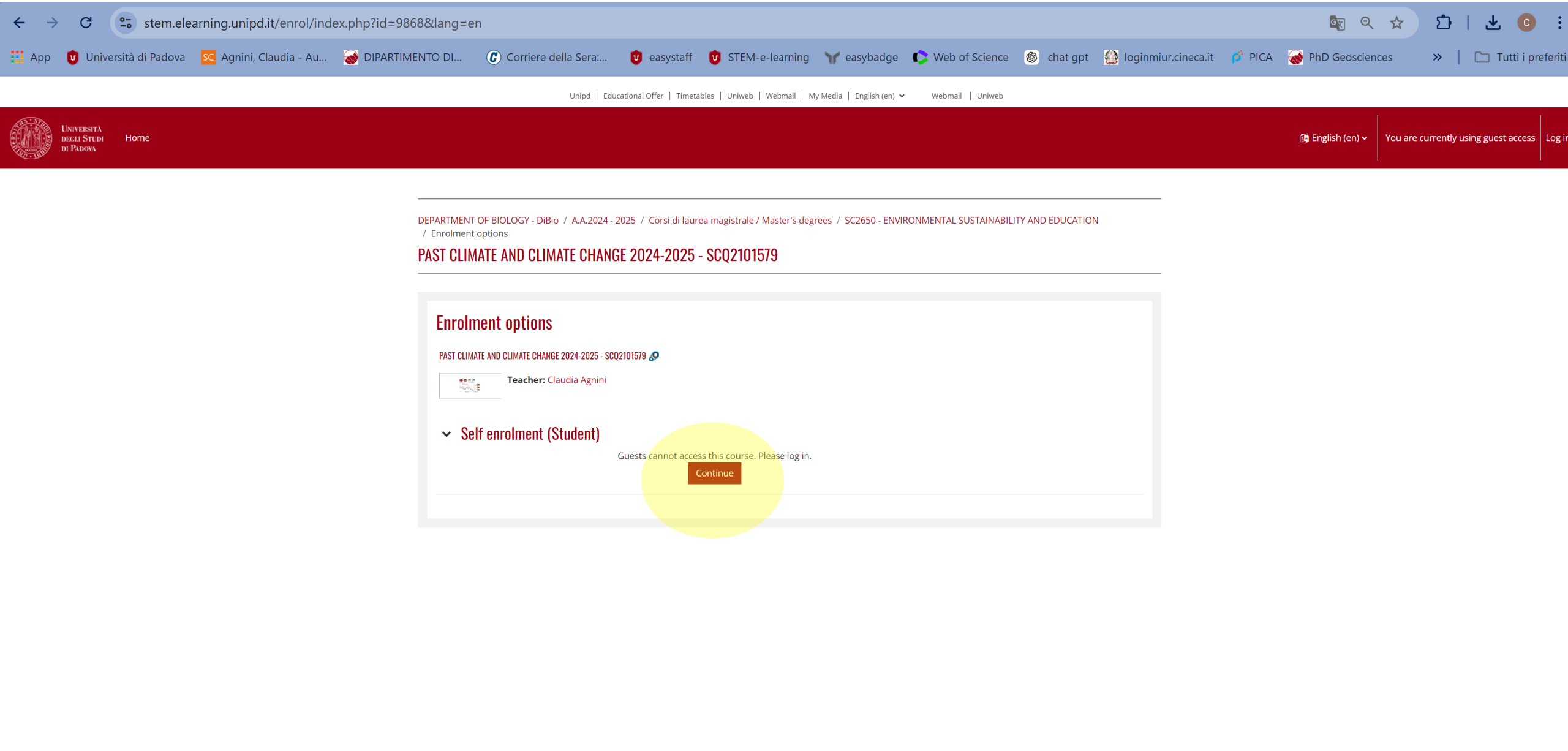
DIPARTIMENTO DI GEOSCIENZE / A.A.2024 - 2025 / Corsi di laurea - Bachelor's Degrees / SC2736 - EARTH AND CLIMATE DYNAMICS / Second Year

Cerca corsi

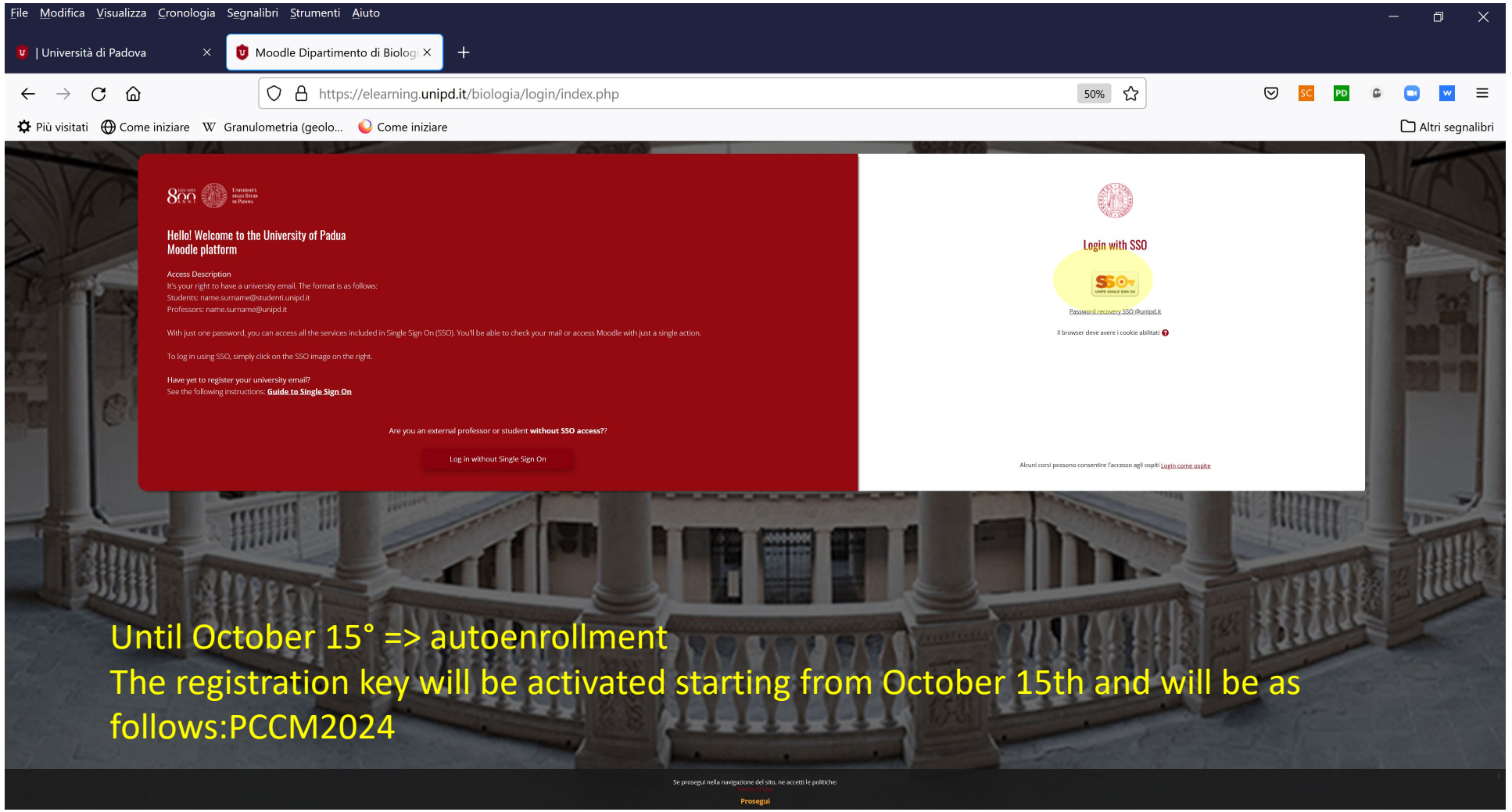



PALEOCLIMATOLOGY, CLIMATOLOGY AND CLIMATE MODELS 2024-2025 - SCQ3102458

# E-learning – moodle STEM

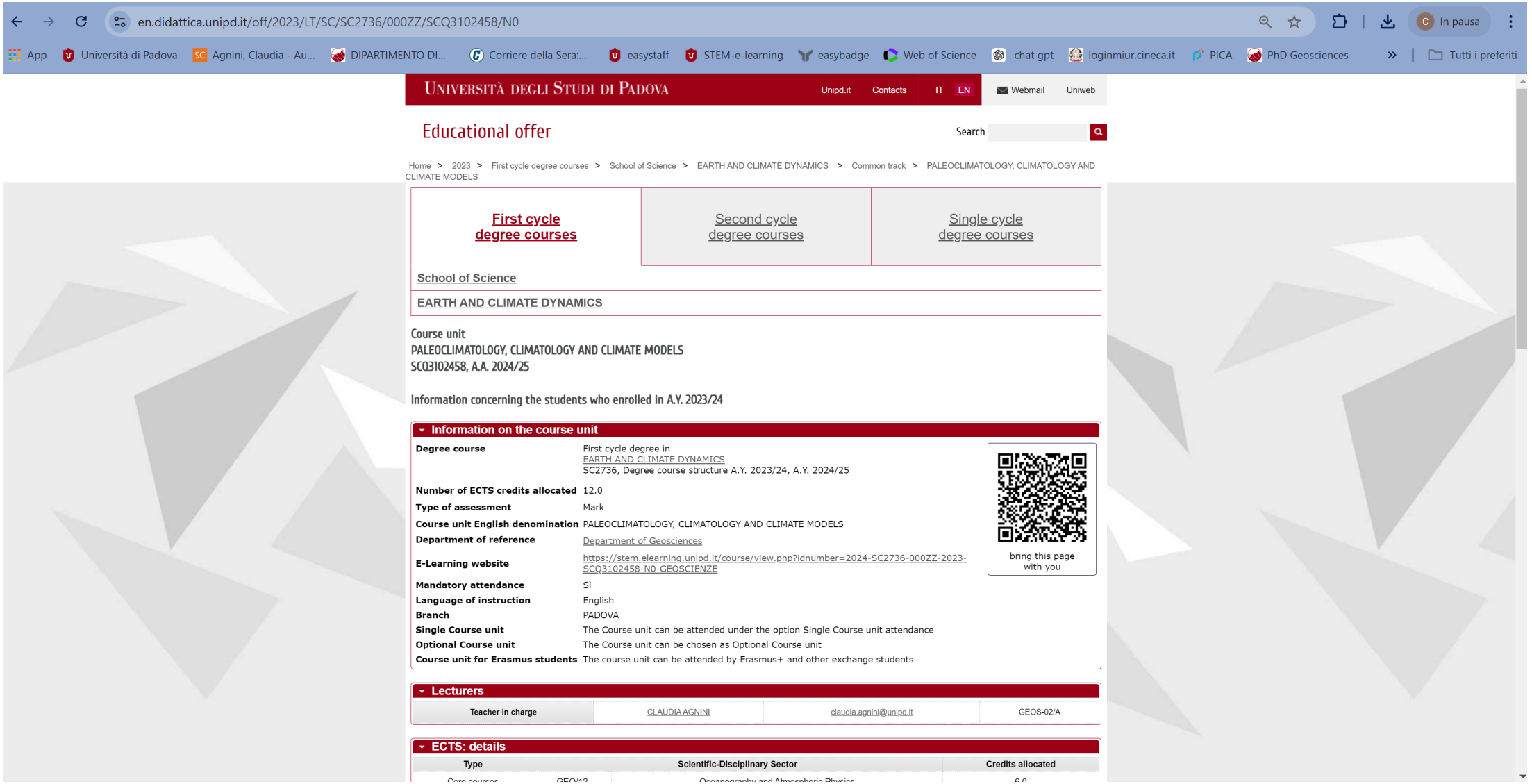


# E-learning – moodle Dip. di Biologia

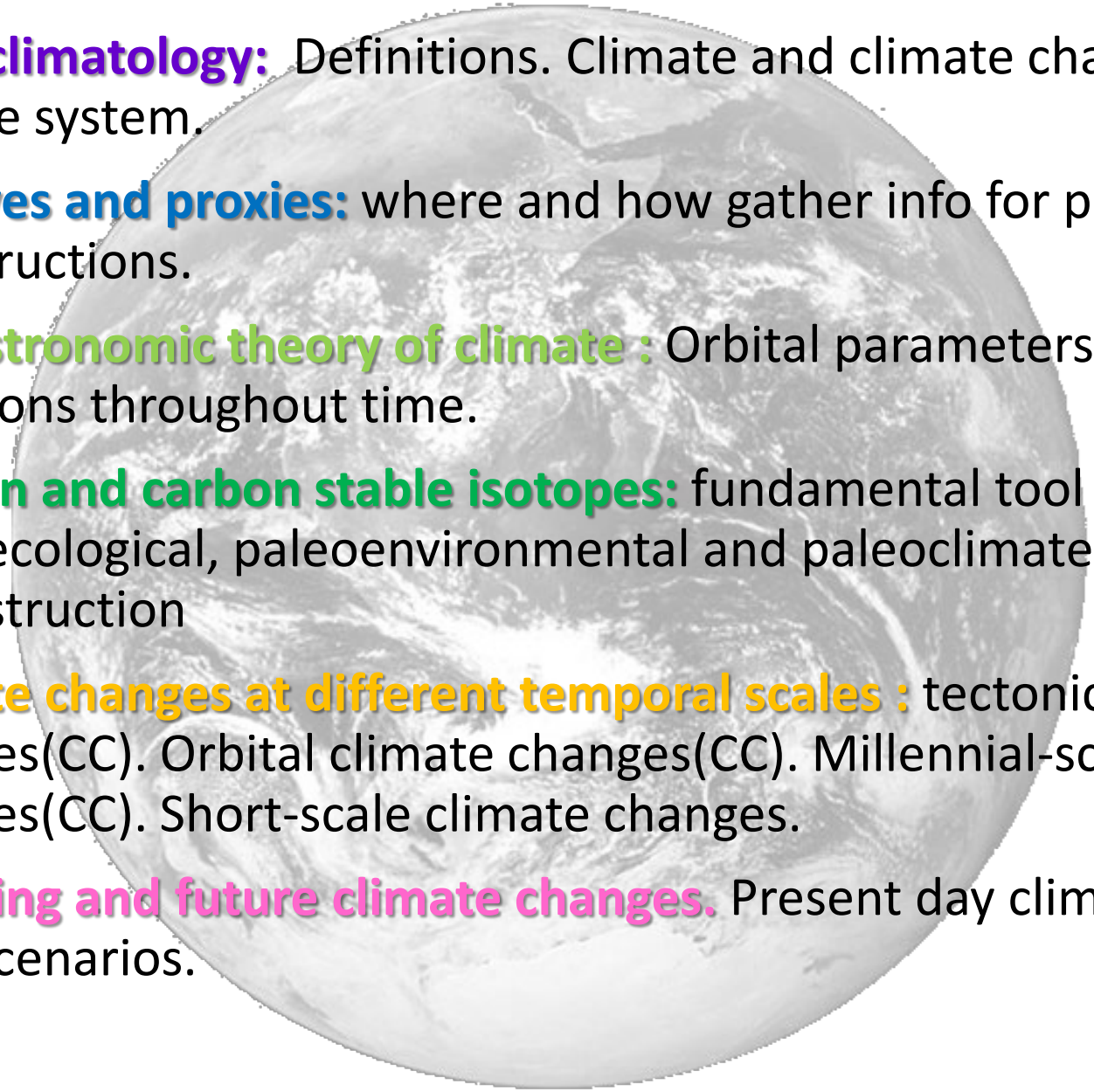


# FURTHER INFO: SYLLABUS

https://en.didattica.unipd.it/off/2023/LT/SC/SC2736/000ZZ/SCQ3102458/N0



# CONTENTS-1



- **Paleoclimatology:** Definitions. Climate and climate changes. The climate system.
- **Archives and proxies:** where and how gather info for past recostructions.
- **The astronomic theory of climate :** Orbital parameters and their variations throughout time.
- **Oxygen and carbon stable isotopes:** fundamental tool for paleoecological, paleoenvironmental and paleoclimate reconstruction
- **Climate changes at different temporal scales :** tectonic climate changes(CC). Orbital climate changes(CC). Millennial-scale climate changes(CC). Short-scale climate changes.
- **On going and future climate changes.** Present day climate state. IPCC scenarios.

# CONTENTS-2

**Climate evolution from the Precambrian to the Quaternary:**

Faint young Sun Paradox (today +25-30%).

Glacial climate regimes in the geological past (e.g., Snowball Earth).

Greenhouse climate regimes in the geological past.

From greenhouse to icehouse: the last 50 Myrs.

Orbital climate changes. Astronomic forcing on insolation. Insolation forcing on monsoon regime. Insolation forcing of the ice sheet dymanics.

Climate changes in the last 20kyrs. The Last Glacial Maximum (LGM) and the last deglaciation.

The millennial climate oscillations (the climatic surprises).

Climate and human being. Climate in the last 1000 years and in the last century.  Cause of the global climate changes and possible future scenarios.

# What is the first word that comes to mind when you consider past climate?

## How to participate?

Copy participation link

1 Go to wooclap.com

2 Enter the event code in the top banner

Event code
**PCCM24**

https://app.wooclap.com/events/PCCM24/0