

**Please select the programme level \*Bachelor's level**

**Programme Title (tentative) \***

Applied Sciences to Nature and Sustainable Environment

**Please list all involved Academic Coordinators (name, role, university, email)  
and indicate (if possible) who will be degree-awarding partners \***

**"G. d'Annunzio" University Chieti Pescara**

- *Lucia Marinangeli, Dip. Scienze, Univ. d'Annunzio, expertise: remote sensing, comparative geology*
- *Tommaso Piacentini, Dip. Scienze, Univ. d'Annunzio, expertise: Geomorphology, Physical Geography*
- *Eleonora Aruffo, Dip. Scienze, Univ. d'Annunzio, expertise: Atmosphere physics*
- *Gitana Aceto, Dip. Scienze, Univ. d'Annunzio, expertise: Pathology*

**Other possible partners whose participation is under evaluation:**

- University of Oviedo (Spain)
- University of Crete (Greece)
- "Gheorghe Asachi" Technical University of Iași (Romania)

## Please provide a programme description \*

**Mission:** This programme aims to prepare modern environmental professionals capable of assessing challenges from local to global scales using a **holistic approach**. It addresses the urgent demand for expertise in land management, human-environment interactions, and climate change mitigation.

**Curriculum Focus:** The degree is grounded in the "One Health" dynamic, viewing the health of the territory and humans as a unique, integrated system.

The curriculum will integrate:

- **Interdisciplinary Sciences:** Geology, Biology, Chemistry, and Environmental Science.
- **Socio-Cultural Perspectives:** Analyzing the interaction between anthropogenic activities and natural biotic/abiotic components.
- **Applied Sustainability:** Concrete management of natural risks and sustainable development in line with the **UN 2030 Agenda**.

### **INGENIUM connection and flagship:**

This degree represents a strategic expansion of INGENIUM's **Health & Welfare** and **Engineering** thematic areas.

The proposal adheres to the core requirements set out in the **D4.1 Joint Programmes Report:**

- **Innovative Delivery & Digital Integration:** The course proposes a blended design with 50% of activities delivered online, balancing practical training and digital content. Virtual platforms will provide interactive resources, simulated laboratories, and collaborative spaces for inter-university projects. All materials will comply with accessibility standards and offer multilingual support. Active methodologies such as flipped classroom and project-based learning will be implemented, supported by analytical tools to personalize learning paths.

This aligns with the INGENIUM goal of utilizing digital platforms for inclusive education.

- **Mobility (Physical & Virtual):** The programme meets the INGENIUM requirement for **25% mobility** through a blended model.

### **Description and Specific Educational Objectives:**

The curriculum described herein, enriched by a wide range of teaching and practical activities, primarily aims to train professionals capable of addressing environmental and territorial challenges through a scientific and multidisciplinary approach. Thanks to the diversity of the courses offered, students acquire theoretical and practical skills ranging from natural sciences (biology, geology, chemistry, environmental sciences) to environmental management, with a strong focus on the use of GIS technologies, natural resource management, and the monitoring of environmental changes for the environmental sustainability assessment.

The main Educational Objectives addressed by the degree are in summary:

#### **1. Advanced knowledge in natural, biological, and environmental sciences:**

- **Biology, Microbiology, and Biochemistry:** Students will gain a deep understanding of animal and plant biology, ecological dynamics, and the biochemical processes governing life. In-depth study of microbiology and molecular biology will provide the tools to understand the relationship between living organisms and the environment, focusing on biodiversity, evolution, and ecological interactions.

- *Organic and Analytical Chemistry*: The fundamentals of organic chemistry will be explored, analyzing chemical reactions and organic compounds in relation to ecosystems, alongside analytical techniques for environmental monitoring and contaminant assessment.
2. ***Advanced techniques for environmental data analysis and management:***
    - *Mathematics and Geostatistics*: Through the combination of applied mathematics and geostatistics, students will learn to manage and interpret complex data related to natural and environmental phenomena, applying mathematical models for the simulation and prediction of territorial and climatic changes.
    - *Data Analysis Laboratory and GIS*: Students will acquire proficiency in using software tools for data analysis and the creation of thematic maps through GIS (Geographic Information Systems), which are essential for monitoring and planning natural resource management, environmental protection, and risk management.
  3. ***Applied skills in geology and geomorphology:***
    - *Environmental Geology*: Assessment of soil and rock properties, geotechnical behavior, and their role in sustainable land-use planning.
    - *Geomorphology and Geological Hazards*: Analysis of landforms and surface processes to evaluate natural hazards (landslides, floods, coastal erosion) and design mitigation strategies.
    - *Mineralogy and Environmental Mineralogy*: Identification and characterization of minerals, including their environmental impact (e.g., heavy metals, acid mine drainage), and application in remediation techniques.
    - *Mineral Resources and Sustainable Exploitation*: Understanding ore genesis and resource evaluation, aligned with circular economy principles.
    - *Hydrogeology and Water Resources*: Study of groundwater systems, aquifer vulnerability, and water quality monitoring for sustainable management.
    - *GIS and Remote Sensing in Geosciences*: Integration of spatial analysis tools for mapping geological hazards, monitoring environmental changes, and supporting decision-making in resource management.
  4. ***Interdisciplinary knowledge on sustainability and climate change:***
    - *Atmospheric Physics, Meteorology, and Applied Climatology*: Students will acquire skills in understanding atmospheric and climatic dynamics, with a focus on climate change, atmospheric modeling, and greenhouse gas analysis. They will also develop the ability to analyze hydro-meteorological data applied to practical contexts and sustainability assessments.
    - *Sustainability and Natural Resources*: The program will cover natural resource management, environmental impact analysis, and solutions for biodiversity conservation and pollution reduction, as well as sustainability reporting.
  5. ***Communication skills and scientific dissemination techniques:***
    - *Scientific English*: Students will acquire solid proficiency in the English language, focusing on scientific lexicon, to effectively read, write, and communicate in international scientific contexts and collaborate with global partners in the environmental field.
  6. ***Work-Based Learning***: The curriculum emphasizes the integration of theory and practice through field campaigns and internships, ensuring strong links with industry and society

Upon completion of the program, students shall be able to gain the following Learning Outcomes:

1. Analyze and apply biological, ecological, and geological concepts

- Interpret biological, ecological, geological and geomorphological processes that shape landscapes and ecosystems, linking them to natural hazards and sustainable land management.
  - Evaluate environmental change in relation to the geology and geomorphology of a territory, identifying risk factors and proposing science-based management options.
2. Manage and analyze environmental data using advanced technological tools
    - Utilize data analysis software and GIS/remote sensing to collect, analyze, and visualize environmental and geoscientific information for spatial planning and resource management.
    - Apply mathematical and geostatistical models to predict environmental, hydrogeological and climatic phenomena, informing adaptation and mitigation strategies.
  3. Design sustainable solutions for natural resource and territory management
    - Design and implement solutions for the sustainable management of soil, water and geo-resources, integrating natural sciences with environmental policy instruments.
    - Conduct Environmental Impact Assessments (EIA) considering geological media (substrate, soils, aquifers) and the effects of anthropogenic activities on biodiversity and environmental quality.
  4. Monitor and evaluate climatic, hydrological, and geomorphic change
    - Monitor climate and hydro-meteorological data (e.g., temperature trends, precipitation regimes, extreme events) and relate them to geomorphic responses (erosion, slope instability, coastal change).
    - Identify major environmental threats—such as contamination, land degradation and biodiversity loss—and propose evidence-based solutions.
  5. Apply field and laboratory methods in environmental geology
    - Plan and execute field campaigns, perform geological and geomorphological mapping, and collect representative samples following QA/QC protocols and safety procedures.
    - Characterize rocks, soils and sediments using mineralogical, geochemical and physical tests to diagnose environmental problems (e.g., acid mine drainage, metal mobility, soil contamination).
  6. Characterize minerals and assess mineral resources within a sustainability framework
    - Identify and characterize minerals and mineral associations relevant to environmental mineralogy and risk assessment.
    - Evaluate ore genesis and resource potential, integrating circular economy principles and life-cycle thinking in decision-making.
  7. Analyze groundwater systems and manage water resources

- Describe aquifer properties, flow and transport processes; assess vulnerability, recharge and water quality using hydrogeological methods and models.
  - Design monitoring plans and propose nature-based and engineered interventions for sustainable groundwater management.
8. Map, model and mitigate geological hazards
- Produce hazard and susceptibility maps for landslides, floods, earthquakes and coastal hazards using GIS, remote sensing and terrain analysis.
  - Formulate risk reduction and adaptation measures, and support emergency planning with actionable geoscientific evidence.
9. Communicate scientific knowledge and support decision-making
- Communicate results clearly in Scientific English and partner languages, preparing technical reports, policy briefs and public outreach materials.
  - Use visual analytics and cartographic standards to convey uncertainty, assumptions and limitations to diverse stakeholders.
10. Demonstrate professional and ethical practice aligned with One Health and SDGs
- Apply ethical, legal and deontological principles in environmental data handling, fieldwork and stakeholder engagement.
  - Align geoscientific practice with One Health and UN 2030 Agenda goals, integrating equity, inclusion and inter/transdisciplinary collaboration.

### **MOBILITY FRAMEWORK (PROVISIONAL HYPOTHESIS):**

- **option 1** - Mandatory year Rotation:
  - One common year (60 ECTS) at UdA (Italy);
  - One common year (60 ECTS) at another partner site (Oviedo, Iasi, Creta);
  - One splitted year (60 ECTS) respectively at UdA (Italy) and at another partner site for practical lab/field activities, internships, thesis (free option for students).
- **option 2**– one year online + semester mandatory rotation:
  - One common year semester online (30 ECTS);
  - One common semester (30 ECTS) at UdA (Italy);
  - One common semester (30 ECTS) at another partner site (Oviedo, Iasi, Creta);
  - One common semester (30 ECTS) at another partner site (Oviedo, Iasi, Creta);
  - One common semester (30 ECTS) at another partner site (Oviedo, Iasi, Creta);
  - One splitted semester (30 ECTS) respectively at each partner’s site for practical lab/field activities, internships, thesis (free option for students); or shared among partner infrastrutture.
- **option 3**
  - One common semester online (30 ECTS) + one common semester (30 ECTS) at one partner’s site;
  - One common semester online (30 ECTS) + one common semester (30 ECTS) at another partner site;

- One splitted year (60 ECTS) respectively at each partner's site for practical lab/field activities, internships, thesis (free option for students); or shared among partner infrastrutture.

In this framework, theory is partially online, practical activities—such as **laboratory work, field works, and sampling campaigns**—will be shared among partner infrastructures, requiring direct physical teacher-student interaction and mobility.

**Multilingualism:**

In accordance with INGENIUM standards, the programme could be multilanguage (English, Spanish, Italian), fostering intercultural competence. The support of the Edunext Programme could also allow for simultaneous digital translation.

## Please describe the planned implementation timeline \*

This is a preliminary proposal based on the positive contribution and/or declaration of intent of four partners:

- UdA Chieti Pescara as proposer
- Oviedo, TUIASI and Creta as possible partners.

Moreover, the proposal leverages the existing "Doctoral Ecosystem of Natural Sciences".

However, some of the possible partner verified that implementing this joint degree programme would require the creation of new teaching groups and activities and an increase in the teaching load for faculty members. The authorities (e.g., University of Oviedo), at this preliminary stage of the process, would not authorize new teaching groups and activities (to avoid potential new faculty hires). The option to fit the students of the international joint degree into the ordinary classes of the existing bachelor's programmes are not possible at this stage even if the Joint Degree is considered particularly interesting and exciting. For this reason, a preliminary work for evaluating the implementation is still required in order to verify how to combine the Ingenium inputs and the single universities regulations and to overcome the limitation given by the different partners regulations.

### POSSIBLE TIMELINE

- **Phase 1 (winter-spring 2026):** preliminary work for evaluating the implementation and to verify how to combine the Ingenium inputs and the single universities regulations and limitations. Formalize the network and consortium and
- **Phase 2 (summer-fall 2026):** Define the specific structure of shared modules; develop the *Joint Programmes Implementation Form* and align learning outcomes with the **INGENIUM Pathway Framework** (see also the BIP proposal: *Teaching Environment and Environmental Sustainability in the Third Millennium: Innovation and Artificial Intelligence in a Transnational European Framework*).  
Definition of the structure the *Joint Programmes* and university and national preliminary checks.
- **Phase 3 (fall 2026 – winter 2027):** Accreditation via EQAR-registered agency
- **Phase 4 (spring-fall 2027):** Programme launch (spring 2027) and first students' intake (fall 2027): Academic year 2027/28.

### STEPS NEEDED TO ACHIEVE FULL JOINT ACCREDITATION

#### Phase 1: INGENIUM

1. **Internal Evaluation:** The **IEC-Academic Committee** evaluates the proposal based on four criteria: relevance, innovativeness, interdisciplinarity, and transnationality.
- 2 **Final Endorsement:** If successful, the programme receives formal endorsement from the **INGENIUM Alliance Council (IAC)**. This acts as the internal "green light" ensuring institutional commitment.

#### Phase 2: National Preliminary Checks (Italian Specifics; Spanish Specifics)

For the Italian partner (e.g., Ud'A), specific national verification steps must be cleared *before* the European evaluation begins to ensure the degree has legal value in Italy.

3. **Database Upload (SUA-CDS):** The Italian university must upload the programme information into the Ministry's database (SUA-CDS) in a specific section that remains open year-round.

4. **CUN Verification (Curriculum):** The National University Council (CUN) verifies that the joint curriculum is **equipollent** (equivalent) to the Italian degree class proposed (in your case, L-32).

5. **ANVUR Verification (Staffing):** ANVUR checks that the consortium meets minimum teaching requirements. For a Bachelor's degree (Laurea), the consortium needs a total of **9 teachers**, and the Italian partner must provide at least **1 Full/Associate Professor and 1 Researcher (BIP realization for the joint programme implementation)**

### **Phase 3: The European Approach (External Accreditation)**

Once internal and national checks are cleared, the consortium undergoes the **European Approach for Quality Assurance of Joint Programmes (EA)**, a single evaluation valid for all partners.

6. **Select an Agency:** The consortium chooses a Quality Assurance agency registered in **EQAR** (European Quality Assurance Register). This can be ANVUR or a foreign partner's agency.

7. **Self-Evaluation Report (SAR):** The partners jointly write a report demonstrating compliance with the 9 European Standards (e.g., Joint Design, Learning Outcomes, Student Support).

8. **Site Visit:** A panel of experts conducts a site visit (usually at one location, involving representatives from all partners) to interview staff and students.

9. **Evaluation Report:** The panel issues a report judging the programme as "compliant," "partially compliant," or "non-compliant".

10. **Final Decision:**

- **ANVUR Validation:** If a foreign agency conducted the review, ANVUR validates the result and transmits the positive opinion to the Italian Ministry (MUR) for final accreditation.

### **Phase 4: Implementation**

11. **Consortium Agreement:** Partners sign the final legal agreement defining financial and operational responsibilities.

12. **Launch:** Student recruitment begins, followed by the start of academic activities (Launch).