

Formation in Soil and Water Bioengineering Workshop

EVORA · 9th March 2018

ECOMED

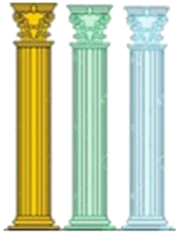


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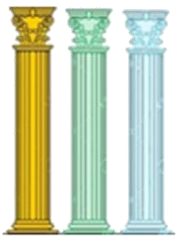


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Introduction to the subject

JOÃO PAULO FERNANDES University of Évora

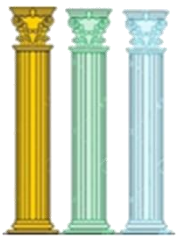




Soil and water bioengineering is a discipline that combines technology and biology, making use of plants and plant communities to help protect land uses and infrastructures, and contribute to landscape development.

Typically, plants and parts of plants are used as living building materials, in such a way that, through their development in combination with soil and rock, they ensure a significant contribution to the long-term protection against all forms of erosion. In the initial phase, they often have to be combined with non-living building materials, which may, in some cases, ensure more or less temporarily, most of the supporting functions.





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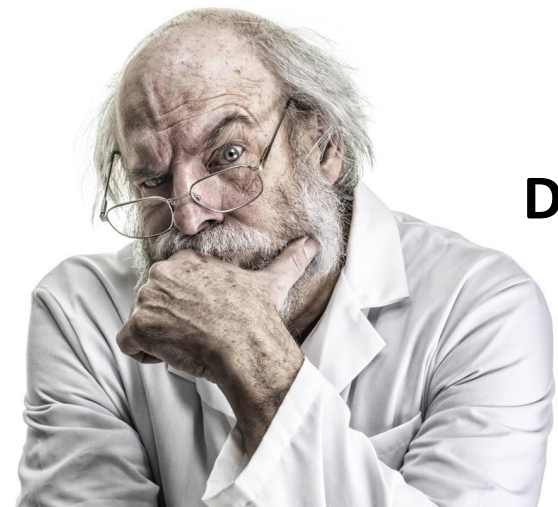
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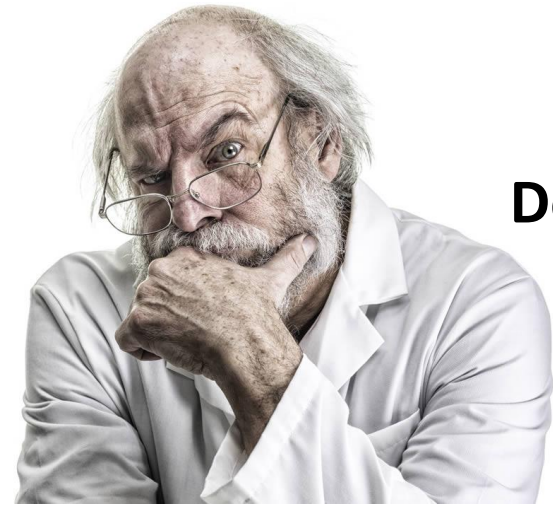
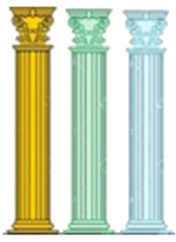


Doubts

What is Bioengineering from a professional perspective?

- A technical discipline on its own?
- A set of techniques and technical approaches within Civil Engineering and other construction disciplines (Landscape Architecture, Architecture, etc.)?
- Something in between?





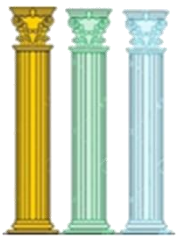
Doubts

What is the adequate space of formation in Bioengineering?

- As any other specialized technic within a graduation course (BSc or MSc)?
- As an autonomous course in itself (BSc or MSc)?
- Something in between (Major, Minor)?

Complemented by specialized technical formation for builders and workers





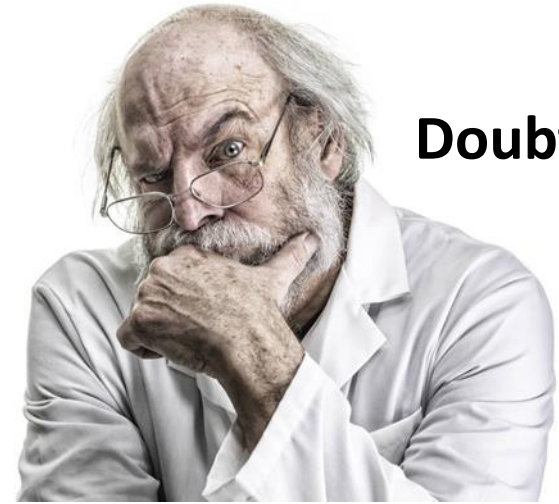
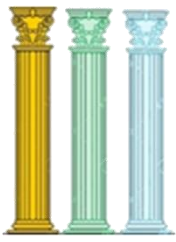
In effect, when speaking of formation one has to integrate all main actors involved in the Bioengineering process:

- Planner and designer as well as consultant specialist
- Contractor and construction responsible
- Worker

One can identify other levels, but these seem to be the critical ones.

They correspond to three levels of formation: **academic, technical or vocational and specialized professional.**



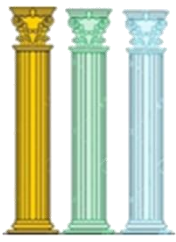


Doubts

What are the necessary skills ?

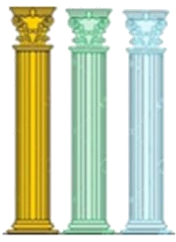
- Common engineering disciplines plus some formation in plants and ecology?
- Aimed formation covering not only domains such as Hydraulics, Hydrology, Structures, Geotechnics, Engineering Geology, etc., but also Soils, Climate, Vegetation, Ecology and specific Plant biotechnics and biomechanics?





Idea?

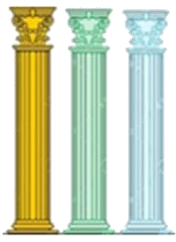
Considering the needs identified in the surveys, in order to cover the main formation subjects, adapt to the different needs in terms of type of specialized technicians and workers and correspond to the general institutional formation structure of the involved countries, following formation model can be proposed:



1 - Academic level

At this level one can consider two different types of curricula, with different targets:

1. Specialized master course
2. Specialization major (or more probably) minor course for civil engineers, geotechnics, plant specialists, ecologists (etc.) giving them technical knowledge and habilitation to cooperate in a bioengineering project and work conduction.



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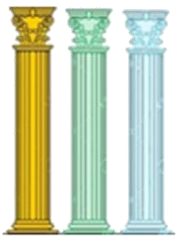


The content of these courses must include, in the case of the specialized master course following subjects:

- **Hydraulic (specialized for Bioengineering)**
- **Hydrology**
- **Soil Science**
- **Geotechnics and soil erosion and stability**
- **Botanic applied to Bioengineering**
- **Ecology applied to Bioengineering**
- **Plants as building materials**
- **Structures**
- **Materials**
- **Stability**
- **Planning and design in bioengineering**
- **Construction site planning and management**
- **Practical formation (2 intensive fully dedicated weeks):**
 - o Intervention project of a predefined site
 - o Construction of the projected intervention (in cooperation with local authorities)

The masters and the minors would include the subjects best suited for the student's basic formation.





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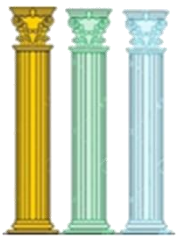
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2 – Technical/vocational formation (1 to 3 years depending on the national model for secondary education)

These courses are normally in a middle stage between ground formation and academic formation (building normally the last years of secondary education) and aim at giving a practical formation habilitating the student with the necessary skills to conduct a construction project as contractor or sub-contractor, plan and manage a construction site, coordinate different construction teams.





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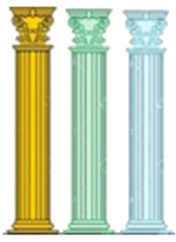
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Idea?

- Subjects (for a 3 year 3100 hours course):
- Basic formation (1000 to 1500 hours) (necessary to ensure a secondary degree)
 - Mother language
 - Foreign language
 - Information technologies
 - Domain of cultural integration
 - Mathematics
 - Physics and chemistry
 - Applied biology and ecology
- Specialized formation 1500 to 2000 hours)
 - Technological workshop – introduction to technology
 - Construction technology
 - Technical design
 - Specific technics:
 - Construction design technics
 - Measures and budgeting techniques
 - Construction direction and management
 - Structures
 - Fluvial, hydraulic and hydrologic
 - Slope and soil stabilization
 - Drainage and other infrastructures
 - Plant production and handling
 - Construction materials – typologies, applications, limitations
 - Construction site management
 - Topography and GIS
 - Safety and accident prevention
- Practical formation in real working conditions (500 hours)





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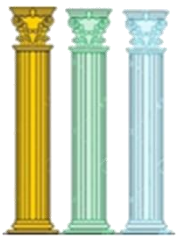


3 – Specialized professional short duration formation

This formation is aimed at the unspecialized worker or can also be considered as a specialization formation for already skilled workers (it provides a habilitation certificate to work in bioengineering projects).

It can last from 15 days to two months.





Formation subjects (selected and developed according to the nature and target of the course):

- Construction techniques
 - Structures
 - Fluvial, hydraulic and hydrologic
 - Slope and soil stabilization
 - Drainage and other infrastructures
- Plant production and handling techniques
- Construction materials – typologies, applications, limitations
- Safety and accident prevention
- Practical formation in real working conditions (50 extra hours)