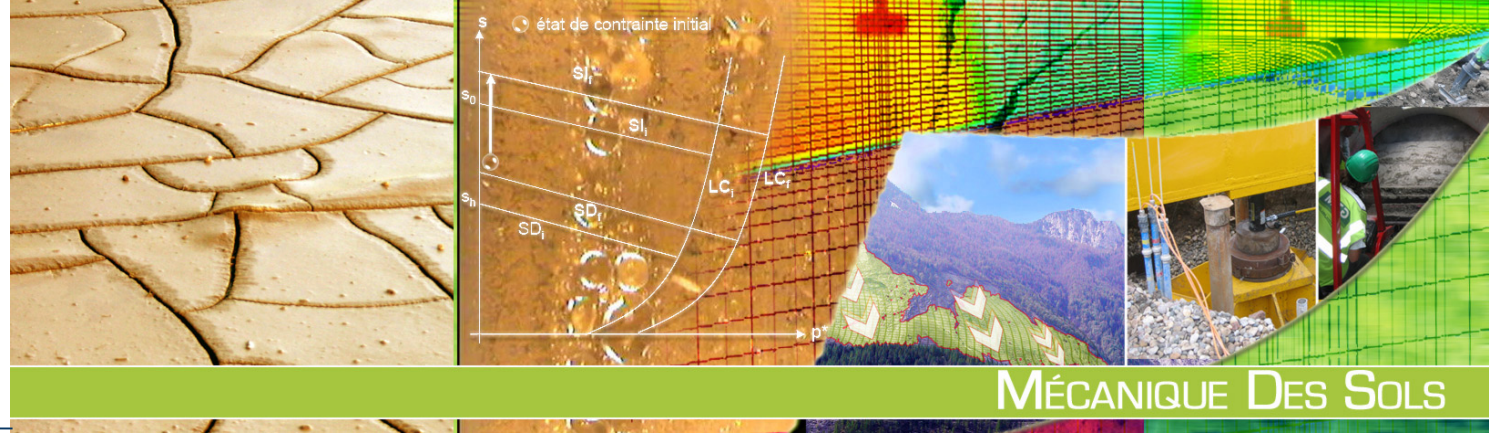

TC 306 - September 13th 2015 - Edinburgh

Industry meets academia: what should future geo-engineers be learning in school

Curricula requirements for the geotechnical engineers of the 21st century

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Ecole Nationale Supérieure de Geology

Since 1908, we have been producing Engineers in **Geosciences** (6 semesters)

3 semesters (common courses) :

- The chemistry and physics of the Earth
- Geology and Hydrology
- Mechanics,
- Information technology
- Law and economics
- …

120

3 semesters

Resources, land use and water management	Geotechnical engineering ***30-40***	Petroleum geosciences
Geomodelling and numerical geology	Reservoir engineering and hydrodynamics	Environmental science and technology
	Geophysics	

Farimah Masrouri

Industry

Teaching:

ENSG – Engineering School

Advanced Soil Mechanics (Modelling, Yielding and Plasticity of soils, Critical State, Unsaturated Soil Mechanics, …)

Natural Risk Assessment

Geotechnical Engineering (Foundations, Piles, Retaining Walls and Sheet Piles, Embankments, Dams, Geothermal Structures,…)

Research:

Coupled Behaviour (Hydraulic – Mechanical - Thermal & Chemical), and Physical & Numerical Modelling of Clayey Soils (Saturated, Unsaturated, Swelling or Rigid, Natural or Remolded – Treated) in Multi-Scales: Lab (micro- & macroscopique) and in-situ

Aging and Time effects

Applications: Geotechnical, Geothermal and Energy Structures, Construction Safety and Geo-environmental Engineering

Head of LEMTA research group: Soil Mechanics - Porous media: multi-scale and multi-physical behaviour and flows

Outline

- **Relations with industry**
- **Curriculum modifications**
- **Concluding remarks**

Relations with industry

Industry → **Educational part:**

- Participation in management board of the school (9/40)
- Sponsoring → Softwares, Construction site visit, Study trips,…
- Teaching at graduate level

Relations with industry

Industry → **Educational part:**

- Forum: *Industry meets future Engineers/year* → Training & hiring
- Apprenticeship tax paid by companies in support of universities for the training of their future staff
- Club: *Geotech Club* → 12 different companies: a meeting /year

Curriculum modifications

Industry

Educational part:

Changes in form

- Synthesis of previously separated courses
- Strong emphasis in courses on:
    - Multidisciplinary approaches
    - Team dynamics
    - Industry projects
    - Communication skills
    - New course materials in the forms of multimedia presentations, simulation soft wares, and communications via the Internet.

Curriculum modifications

Industry →

Educational part:

Changes in substance

Packages of 25h each

- Risk assessment in Geotechnics: 1995
- Soil dynamics: 2010
- Environmental Geotechnics: 2010
- Geothermal structures: 2013
- In situ tests (on construction sites): Pressurmeter, SPT, …
- New and revised laboratories in Geotechnics
- **Case histories (Teachers from industry)**

Energy pile

MINNEAPOLIS, Minnesota 2007

Concluding remarks

What future geo-engineers should be learning in school, must be defined in close cooperation and in a continuous manner with industry.

Curriculum should be based on sound pedagogy, embrace concepts of inclusivity and be adaptable to new technologies and inter-disciplinary areas.

We should seek to strengthen the cognitive ability of engineers and lead them to practices that work in cooperation and harmony with nature for the benefit of society.

Thank you for your kind attention