ITA-CET

Committee on Education and Training

# Newsletter

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IN THIS ISSUE

# Editorial

Dear ITA friends,

Since the mid-2000s, there has been a major boom in the tunnelling and underground space market worldwide. Over the last ten years, the European and American markets have roughly doubled, but the most noticeable growth rates can be found in South America, the Middle East and Asia. Africa is also set to claim its stake in the market in forthcoming years, with several emerging countries showing an increasing interest in the industry. This growth is largely due to global urbanization and the need to find underground solutions to meet the needs of the world's rising population.

As the various articles in this issue show, there is consequently a growing demand for education and training in the tunnelling and underground space sector. University courses are increasingly sought after, with companies now headhunting engineers before they have even obtained their degree.

New training facilities are therefore popping up worldwide. Malaysia now has its Tunnelling Training Academy and in India there is talk of plans to set up a "Tunnel Technology Institute", to relieve the country of its dependence on foreign expertise. Europe is also investing in innovative underground training facilities, with an ambitious project underway in Austria.

Through its actions, the ITA-CET Committee contributes to identifying current training requirements around the globe and providing education and training opportunities to student engineers and young professionals eager to make a career in the industry.

Since our last issue in May this year, another 6 training sessions have been held in South America, Asia and Europe, organized in collaboration with the ITACET Foundation. The Committee has continued to expand its list of potential lecturers, with three new additions: Senthil Nath, senior tunnel engineer at Geoconsult, Bjørn Nilsen, a professor at the Norwegian University of Science and Technology and Fermín Sánchez-Reyes, associate professor at the National University of Mexico.

The Committee is also pleased to welcome a new organization on-board: GT Ground Engineering from Romania, eager to help promote training in the field of tunnelling and underground space in this country.

Collaboration has been strengthened between the Committee and universities in Thailand and Chile, who have both shown interest in developing specialized Master's, similar to the ITA-endorsed Master's available in France, Italy, Spain and the UK. Members of the ITA-CET university network have also established collaborations with emerging countries. This university network is set to grow in the forthcoming months as further contacts are to be made with universities in Europe and elsewhere.

As you can see, the Committee has had another busy year and 2017 is set to be equally active. Many thanks to those who have been involved one way or another in our activities and season's greetings to you all!

Rober Galler ITA-CET Chairman



FOR MORE INFORMATION

http://www.ita-aites.org/en/wg-committees/committees/ita-cet

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# Focus on the Italian specialized Master's in Tunnelling and Tunnel Boring Machines

by Daniele Peila (Master's course director)

Students of the 10th edition of the Master's

The need for experts in tunnelling is rapidly increasing throughout the world. The specific qualifications required cannot be provided by traditional first and second level university degrees and call for a specially designed course. The Politecnico di Torino has therefore developed a Specialized Master's in Tunnels and Tunnel Boring Machines which has been endorsed by the ITA (International Tunnelling and Underground Space Association).

This university course merges theory-based lectures with lectures and presentations by renowned experts from construction companies, TBM manufacturers and design companies, in order to provide the multidisciplinary knowledge that is required to work in the tunnelling sector.

Applicants for this one-year, full time course must have at least a 5-year (10 semesters) university background and have a Master of Science (or equivalent) in one of the following fields or related subjects: civil engineering, environmental engineering, engineering geology or geology. Students are also required to have good knowledge of written and spoken English.

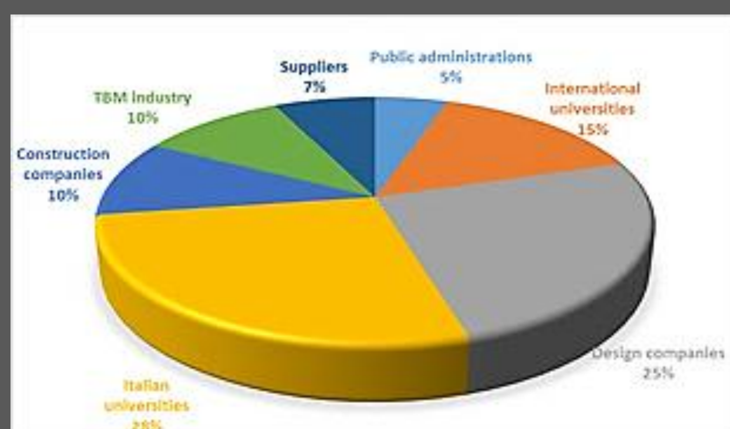
The course starts in January each year, with lectures given up until July. Site visits are regularly organized throughout the year, which enable students to see theoretical aspects put into practice in real-life projects. This year for example, the students visited the French side of the Frejus Exploratory Tunnel and had the chance to tour round the segmental lining factory and the underground cavern for the assembly of an NFM single shield rock TBM. They also visited the Herrenknecht factory in Schwanau, Germany, where EPBs, mixed shield TBMs and rock TBMs are being built for future projects. As student Rodrigo Winderholler explains: "Seeing the separate TBM components and studying them in detail is fundamental to understanding their working principles and functioning".

In July, students then start an internship (250 h) until November, which takes place on a tunnel construction site or in a design company. The Master's course director assigns the job site based on an interview with the students. On the basis of their internship work, students then prepare a written report that is discussed in the final exam.

The subjects covered in the Master's are grouped into nine modules. The corresponding teaching hours and ECTS can be seen in the table below.

| SUBJECT | ECTS | LECTURES HOURS |
|---|---|---|
| Tunnel design and construction method | 8 | 80 |
| Rock Mass Characterization. Geo investigations and risk assessment | 6 | 60 |
| Tunnel supports | 5 | 50 |
| Numerical design | 3 | 30 |
| General aspects of mechanized tunnelling and Hard Rock TBMs | 8 | 80 |
| Soil mechanics tunnelling | 6 | 60 |
| Plants and microtunneling | 3 | 30 |
| Contractual and legislative aspects, work sites management, quality | 4 | 40 |
| Safety and environmental issues of work sites | 3 | 30 |
| Final report | 4 | 100 |
| Internship | 10 | 250 |
| TOTAL | 60 | 810 |

The pie chart below shows the background of course lecturers.




In addition to the final exam, three other written exams are taken during the course of the Master's:

- Exam 1, after modules 1 to 4,
- Exam 2, after modules 5 to 7
- Exam 3, after modules 8 and 9.

Students at work in the soil mechanics laboratory

The students who follow the Master's course are of interest to design firms, construction companies and tool suppliers, as well as TBM manufacturers. Public administrations and tunnel owners can also benefit from the skills acquired during the course.

**"A programme that gives students access to some of the best engineering minds in the field of underground construction………"**

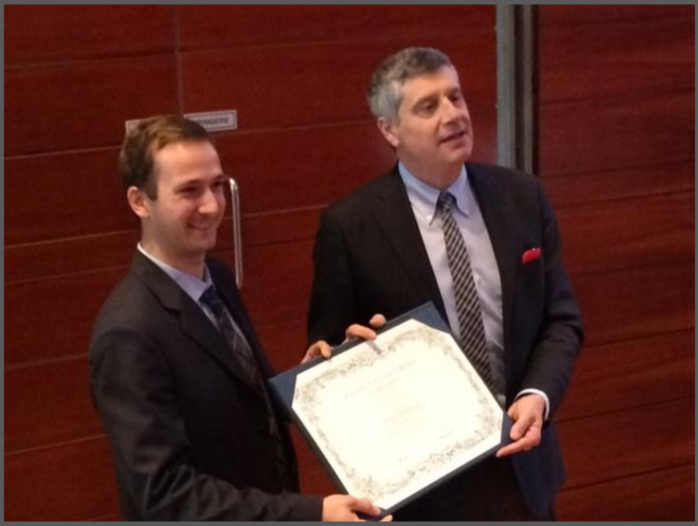
As past student Luis Piek explains: "The Master's in Tunnelling and Tunnel Boring Machines at the Politecnico di Torino was an excellent opportunity for me. It provided a well-balanced mix of academic professors, engineering consultants, and tunnel contractors in an intimate environment that was unique in the world. Professor Peila and Pelizza have built a programme that gives students access to some of the best engineering minds in the field of underground construction. Since graduation, I have utilized the programme to continue my tunnelling career. I would recommend this Master's course to other engineering students who want to become professional engineers, contractors, or owner representatives in the field of tunnels and tunnel boring machines".

This Specialized Master's has now reached its 10th edition, which comprised 15 students. Claude Berenguier, Secretary General of the ITA-CET Committee sat on the panel of examiners who listened to the students defend the following theses on the 6th December:

- "Mechanized and conventional tunnelling: Pros and cons. The case of the Catania metro Project" (A. ALKHARASHI).
- "Two-component backfill grout system in the Follo Line project case study" (A.M. ALVAREZ ORTIZ).
- "Implementation methodology for the investigation and location of karstic voids and their tackling in an urban environment" (I. ANAGNOSTOPOULOS).
- "Common problems and resolutions in tunnelling and underground projects. The Forrestfield airport link case study in Australia" (A. ANDERS).
- "TBM Performance: Al –hayer wastewater conveyor" (A.N. BUD)
- "Drill and blast excavation of main tunnels and raise boring of a shaft in a talc mine" (D. CORAGLIOTTO).
- "Structural aspects regarding TBM assembly and annexed equipment" (C.F. FAVERIO).
- "Tube-à-manchette (TAM) grouting: Turin Metro line 1, 3rd section Lingotto-Bengasi (L.GUERINO).
- "Analysis of drill-blast cycle times for the USBRL tunnel in the Himalayan mountains" (N. KUMAR).
- "Geognostic Maddalena Tunnel: TBM performance analysis in hard rock" (L. GUERINO).
- "Geotechnical considerations in tunnel design for the renewal of a hydroelectric power plant" (G.H. RACIOPPI).
- "Risk management analysis for soft ground TBM type selection" (C.F. FAVIERO).
- "TBM performance analysis in the Xe-Pian Xe-namnoy project"(S. SON).
- The assembly of two Herrenknecht EPB TBMs on the Novi Ligure job site for the Terzo Valico project" (G. Stefano).
- "Building information modeling applied to underground structure design" (R. WINDERHOLLER).

If you would like to obtain more information on the course, please visit the official web site.

A blog dedicated to the 2015-2016 edition is also available and provides an insight into the course from a student's point of view.



Above: student Rodrigo Winderholler with the course director.
Below: the students of the 2015-2016 edition proudly show off their degrees.