



POLITECNICO DI TORINO



TUSC

Endorsed by:  ASSOCIATION INTERNATIONALE DES TRAVAUX EN SOUTERRAIN | ITA INTERNATIONAL TUNNELLING ASSOCIATION

Under the patronage of:



Italian Tunnelling Society
Member of ITA/AITES

TUNNELLING AND TUNNEL BORING MACHINES

VI EDITION 2007-2008

Director: Prof. Sebastiano Pelizza
Politecnico di Torino



COREP
Consorzio per la Ricerca e l'Educazione Permanente





WHY THIS POST GRADUATE MASTER COURSE?

The need of experts involved in D&B and in TBM tunnelling as well as tunnel work site management is rapidly increasing throughout the world. The necessary qualifications to cover these roles cannot be supplied by the first and second level University Courses, but a specially drawn up course is needed.

Politecnico di Torino has developed and organized this Post-Graduate Master Course, endorsed by ITA/AITES (International Tunnelling Association) and SIG (Italian Tunnelling Association). In this Course University lectures are merged with lectures and presentations by experts from construction companies, machines producers, design companies and professional to provide the multidisciplinary knowledge that is necessary to work in the tunnelling sector.



PROGRAMME

The Post-Graduate Master Course on "Tunnelling and Tunnel Boring Machines" will be held **from November 2007 to October 2008**. It involves about 450 hours of face-to-face lessons and classroom exercises, 2 months of stage in a tunnel construction site or in a tunnelling design company and a thesis work. This Course is worth **60 academic credits**.

The class lessons last 6/8 hours a day, 5 days a week.

The official language of the course is English.

The Post-Graduate Master Course is organized in 3 main modules.

● Module 1: "Tunnel design and construction methods"

1.1 Tunnel construction

1.1.1 General tunnelling aspects

1.1.2 Guidelines for underground structures design

1.2 Rock mass characterization and "geo" investigations

1.2.1 General criteria for "geo" studies

1.2.5 Hydrogeological aspects and water inflow into the tunnel

1.2.2 Rock and soil mechanics outline

1.2.6 Geophysical investigations

1.2.3 Rock mechanical classifications

1.2.7 Risk assessment in tunnelling: definition and management

1.2.4 Geological and geotechnical surveys

1.3 Conventional tunnelling and support design

1.3.1 Selection of tunneling method

1.3.4 Monitoring

1.3.2 Conventional tunnelling methods

1.3.5 Numerical modelling

1.3.3 Supports

1.4 Ground reinforcing for tunnelling

1.4.1 General overview

1.4.3 Grouting

1.4.2 Forepoling

1.4.4 Case histories

● Module 2: "Mechanized tunnelling"

2.1 General aspects of mechanized tunnelling

2.1.1 Design of bored tunnels in urban area

2.1.3 Face stability design and face counterpressure

2.1.2 Subsidence

2.2 Hard rock mechanized tunnelling

2.2.1 TBM types

2.2.4 Tunnelling in difficult conditions

2.2.2 Excavability and performance forecast

2.2.5 Choice between open and close TBM

2.2.3 Worksites organization

2.2.6 Relevant case histories

2.3 Soft rock and ground mechanized tunnelling

2.3.1 TBM EPB and HS

2.3.5 Worksites organization in urban area

2.3.2 Tunnelling in mixed conditions: mixed face TBMs, dual TBMs

2.3.6 Soil conditioning and tail injection

2.3.3 Construction management of bored tunnel machinery and equipment, delivery problems, training period, machine monitoring

2.3.7 Lining design in mechanized tunnelling

2.3.4 Monitoring and machine control with EPB

2.3.8 Ground and surface monitoring in urban environment

2.3.9 Ahead investigation and probing in TBM tunnelling

2.3.10 Relevant case histories

2.4 Microtunnelling

2.4.1 Description of machines

2.4.2 Relevant case histories

2.5 Plants

2.5.1 Mucking

2.5.4 Facilities

2.5.2 Compressed air

2.5.5 Water treatment plants

2.5.3 Ventilation

● Module 3: "Management and safety of job sites"

3.1 Contractual and legislative aspects, work sites management, quality

3.1.1 Contractual and legislative aspects

3.1.3 Italian legislation

3.1.2 Claims

3.1.4 Quality management

3.2 Safety of work site and equipments

3.3 Fire protection

3.4 Environmental issues in bored tunnels


3.4.1 Environmental aspects

3.4.2 Reuse and management of excavated material

3.4.3 Portals

In order to improve the training activities, the Master Course programme also includes:


- Technical visits
- Written exams are foreseen at the end of each module
- Two - months stage (direct work experience)
- Final Thesis


-  **WHO CAN ATTEND**
 Graduate MSc in Engineering and Geology, Company and Public Administration Employees involved in tunnelling design and management of job sites.
 The selection of the students is based on the curricula.

 **STAFF**
Lectures

Airoldi S.	Atlas Copco CMT	Iabichino G.	CNR - IGAG (Italian National Research Council)
Amberg F.	Amberg Engineering Ltd, ITA WG 14 "Mechanized Tunnelling", (Switzerland)	Innaurato N.	Professor, Politecnico di Torino
Anagnostou G.	Professor, ETH Zurich (Swiss Federal Institute of Technology) (Switzerland)	Knights M.	Jacobs Ltd v - Vice President ITA/AITES (UK)
Arrigoni G.A.	Consultant, FICÉ (Fellow Chartered Institute of Arbitrarians)	Kovari K.	Professor, ETH & Consultant (Switzerland)
Artigiani E.	Golder Associates srl	Marchionni M.	Herrenknecht Italia
Assis A.	Professor, University of Brasilia - Past President ITA/AITES (Brasil)	Morino A.	Gdtest S.p.A.
Barla G.	Professor, Politecnico di Torino - Former Vice President Europe ISRM (International Society for Rock Mechanics) - Former President AGI (Italian Geotechnical Society)	Narvaez G.	Golder Associates srl
Bertino E.	Cifa S.p.A.	Nicola A.	Impregilo S.p.A.
Bilgin N.	Professor, Istanbul Technical University, Faculty of Mines (Turkey)	Oggeri C.	Researcher, Politecnico di Torino - ITA/AITES WG 16 Animateur
Borgonovo G.	Golder Associates srl	Oreste P.	Professor, Politecnico di Torino
Brino L.	Lyon - Turin Ferroviaire	Palmieri S.	Palmieri S.p.A.
Campo S.	Atlas Copco CMT	Patrucco M.	Professor, Politecnico di Torino
Cardu M.	Professor, Politecnico di Torino	Peila D.	Professor, Politecnico di Torino - ITA/AITES WG 18 Animateur
Chiaia B.	Professor, Politecnico di Torino	Pelizza S.	Professor, Politecnico di Torino - Former President ITA/AITES - Former President SIG (Italian Tunnelling Association)
Chiorboli M.	Metropolitana Milanese	Pescara M.	Geodata S.p.A.
Chiriotti E.	Geodata S.p.A.	Pettinaroli A.	Studio Ing. Balossi
Concilia M.	Todini Costruzioni Generali S.p.A.	Pistolesi C.	Mapei S.p.A.
Crova R.	GTT (Gruppo Trasporti Torinesi)	Plizzari G.	Professor, University of Bergamo
Dal Negro E.	Underground Technology Team Manager Mapei S.p.A.	Rhem U.	Herrenknecht (Germany)
Della Valle N.	Consultant - Technical Director L9 Metro Barcellona (Spain)	Roberds B.	Golder Associates Inc.
Eusebio A.	Geodata S.p.A.	Russo G.	Geodata S.p.A.
Forchino F.	P.M. & E. srl (Project Management & Engineering)	Salminen P.	Sandvik Mining and Construction (Finland)
Gecchele G.	Professor, Politecnico di Torino	Sambuelli L.	Professor, Politecnico di Torino
Grasso G.	Geodata S.p.A. - ITA/AITES Executive Council Member	Schmalzbauer S.	Timeco S.p.A.
Gruebl F.	Professor, Stuttgart University - PSP Consulting Engineers - ITA/AITES Executive Council Member (Germany)	Schulkins R.	Mapei Far East (Singapore)
Guardini C.	Research Assistant, Politecnico di Torino	Smirnov T. P.	Parsons Brinckerhoff Quade & Douglas, Inc. (USA)
Guglielmetti V.	Consultant	Soldo L.	Geodata S.p.A.
		Sorlini A.	Geodata S.p.A.
		Sterling R.	Professor, Louisiana Tech. University (USA)
		Suarez J.	Zitron (Spain)
		Torta P.	P.M. & E. Project Management & Engineering srl
		Valente A.	ANAS S.p.A. (Italian Road Administration)
		Wagner H.	D2 consult, Vice President ITA/AITES (Austria)

Other experts of Construction and Design Companies.

-  **VENUE**
 Didactical Activities: Politecnico di Torino / COREP, Turin, Italy
 Stage location: Italy and/or abroad

-  **CERTIFICATION**
 Students who attend the course and pass the examinations will receive the official certification by the Politecnico di Torino for the Post-Graduate Master Course on "Tunnelling and Tunnel Boring Machines".

-  **ENROLMENT**
 The deadline to apply is:
14th October 2007 for NOT Italian students

5th October 2007 for the Italian students

The enrolment of Not Italian students are evaluated on arrival.

The tuition fee is **4.200 Euro**. Participants are responsible for the journey and accomodation while in Torino.

- It will be also possible to follow single modules, whose fees are:
- 1st module (Tunnel design and construction methods): 1.200 Euro
 - 2nd module (Mechanized tunnelling): 2.000 Euro
 - 3rd module (Management and safety of job sites): 1.200 Euro

The Master Course will be activated on condition there are at least 10 students.
 Scholarships will be made available on the basis of the sponsorships. For information see the web site.

