

Advanced Technics in Construction (250722)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA) Departament d'Enginyeria de Projectes i de la Construcció (EPC)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA ESTRUCTURAL I DE LA CONSTRUCCIÓ (pla 2015)
Course	2024/25

Main teaching language at each group

- Group 10ES1 Spanish (Q1)

Faculty

Responsible Faculty: Nikola Tasic

Faculty: Gonzalo Ramos Schneider, Nikola Tasic, Jose Turmo Coderque

Objectives of Education

Subject to deepen in modern construction techniques

- Knowledge of the most modern and with more future construction techniques in the field of civil engineering, building and industrial constructions .

Prefabrication . Application of prefabrication in building construction, industrial construction and civil works. Conception, processes , advantages and disadvantages, implementation on workshop and on site. Tunnelling . Cut and cover tunnels and underground tunnels (NMA , TBM) . Conception, equipment, processes , performance, advantages and disadvantages, control. Construction of viaducts. Long length viaducts (push, span by span) or long span bridges (cantilever, cable-stayed, suspension, arcs) . Conception, processes , equipment and auxiliary equipment (cranes , cable cranes , special formwork , roller units). Construction of dams . RCC dams and HV dams. Conception. Manufacturing, transportation and laying of concrete. Construction of harbour docks. Vertical breakwaters and levees of loose materials . Drawers . Manufacture and placement of blocks. Construction of shoulders . Dredging

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

Digital and additive manufacturing

3D printing for structural elements
Visit to the CIM UPC institute

Demolition and blasting

Demolition of large structures

Geotechnics applied to structures

Introduction to geotechnics applied to structures
Ground treatment techniques and ground anchors

Underground works

Construction of tunnels with underground excavation: TBM (types, stackability, performance, design and execution of voussoir linings, auxiliary elements, corralitos), NATM (concept, execution, support and lining, waterproofing), blasting (procedure, execution, safety, support and ventilation).
examples

Construction of tunnels using screens, open and submerged. Construction of large wells, underground stations, techniques to avoid flotation, bottom plugs, pumping. Affects to neighboring structures: vibrations in blasting, settlements in urban tunnels, damage estimation, instrumentation, determination of thresholds, control. Quality control, typical coating problems, verticality, tightness, screen/piling cuts.

Bridges

Construction of prestressed structures
Construction of Long-Span Bridges
Virtual visit to the construction of a bridge

Maritime works

Foundations in rivers or sea by means of artificial peninsulas, sheet pile enclosures, caissons, pile caps above water level. Drainage, bottom plugs, piles in the sea, submerged concrete. Vertical docks using port caissons (floating dock and construction procedure). Corrosion. Sacrificial anode protection systems.

Teaching Methodology

The communication of the teachers will be mostly in Spanish. Workshops and interventions by speakers other than the teachers of the subject are planned for the course. These will be held in Spanish and very exceptionally in Catalan or English. Student queries may be answered in Spanish, Catalan or English. The exam can be answered in Spanish or Catalan. Support material is used through the virtual campus: contents and bibliography. The material can be in Spanish, Catalan and English. Site visits made within the framework of the subject, if applicable, will be in Spanish or Catalan.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

Grading Rules

() The evaluation calendar and grading rules will be approved before the start of the course.*

The grade for the subject is obtained from the continuous assessment grades. The evaluation of the subject is done based on attendance at the different sessions and an exam on the content of the sessions of the subject. NA class attendance has a weight of up to 20% of the final grade for the subject (NFA). The NE exam grade has a weight of between 80% and 100% of the NFA, which is obtained according to the following formula $NFA = \max(0.20 NA + 0.80 NE; NE)$

Test Rules

Non-attendance at one of the sessions, whatever the cause, supposes a grade of zero in the evaluation of the attendance of that session. If you do not take the exam, you will not be able to pass the subject.

Office Hours

Request

Bibliography

Basic

- Harris, F. [Modern construction and ground engineering equipment and methods](#). 2nd ed. Essex: Longman Scientific & Technical, 1994. ISBN 0582236576.
- MARCO ROSIGNOLI. Bridge Construction Equipment. ICE Publishing, 2013. ISBN 072775808X.
- PAT CASHMAN, MARTIN PREENE. Groundwater: Lowering in Construction: A Practical Guide to Dewatering (Applied Geotechnics). 3a. CRC Press, 2020. ISBN 036750474X.
- ALUN THOMAS. Sprayed Concrete Lined Tunnels (Applied Geotechnics). 1a. CRC Press, 2008. ISBN 978-0415368643.
- HEMPHILL G.B. Practical Tunnel Construction. Wiley, 2017. ISBN 8126564083.
- J. VERFEL. Rock Grouting and Diaphragm Wall Construction. Elsevier Science, 2012. ISBN 978-0444564351.
- DAVID N. CHAPMAN, NICOLE METJE, ALFRED STARK ROUTLEDGE. Introduction to Tunnel Construction. 2a. Applied Geotechnics, 2017. ISBN 978-1498766241.
- BEN C. GERWICK Jr. Construction of Marine and Offshore Structure. CRC Press, 2007. ISBN 978-0849330520.
- BEN C. GERWICK Jr. Construction Of Prestressed Concrete Structures. Wiley, 2014. ISBN 978-8126552450.
- MICHAEL YIT LIN CHEW. Construction Technology For Tall Buildings. WSPC, 2017. ISBN 978-9813220683.