

Course guide

250722 - 250722 - Advanced Technics in Construction

Last modified: 22/05/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: NIKOLA TOSIC

Others: GONZALO RAMOS SCHNEIDER, NIKOLA TOSIC, JOSE TURMO CODERQUE

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.

LEARNING OBJECTIVES OF THE SUBJECT

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

STUDY LOAD

Type	Hours	Percentage
Hours large group	25,5	20.38
Hours medium group	9,8	7.83
Hours small group	9,8	7.83
Self study	80,0	63.95

Total learning time: 125.1 h



CONTENTS

Digital and additive manufacturing

Description:

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

Full-or-part-time: 24h

Theory classes: 3h
Laboratory classes: 7h
Self study : 14h

Demolition and blasting

Description:

Demolition of large structures

Full-or-part-time: 7h 11m

Theory classes: 3h
Self study : 4h 11m

Geotechnics applied to structures

Description:

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

Full-or-part-time: 14h 23m

Theory classes: 6h
Self study : 8h 23m

Underground works

Description:

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.

Full-or-part-time: 24h

Theory classes: 6h
Practical classes: 4h
Self study : 14h



Bridges

Description:

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

Full-or-part-time: 31h 12m

Theory classes: 6h
Laboratory classes: 7h
Self study : 18h 12m

Maritime works

Description:

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.

Full-or-part-time: 7h 11m

Theory classes: 3h
Self study : 4h 11m

GRADING SYSTEM

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 $NFA = \max(0.20 NA + 0.80 NE; NE)$

EXAMINATION 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.



BIBLIOGRAPHY

Basic:

- Harris, F. Modern construction and ground engineering equipment and methods. 2nd ed. Essex: Longman Scientific & Technical, 1994. ISBN 0582236576.
- Rosignoli, M. Bridge Construction Equipment. London: ICE Publishing, 2013. ISBN 072775808X.
- Cashman, P. M.; Preece, M. Groundwater lowering in Construction: a Practical Guide to Dewatering. 3a. Boca Raton: CRC Press, 2021. ISBN 9780367504755.
- Thomas, A. Sprayed concrete lined tunnels [on line]. 2nd ed. London: CRC Press, Taylor & Francis Group, 2020 [Consultation: 15/01/2025]. Available on: <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/9780429264566/sprayed-concrete-lined-tunnels-alu-n-thomas>. ISBN 9780429264566.
- Hemphill, Gary B. Practical Tunnel Construction [on line]. Hoboken, New Jersey: Wiley, 2013 [Consultation: 15/01/2025]. Available on: <https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9781118350270>. ISBN 9781118350270.
- Verfel, J. Rock Grouting and Diaphragm Wall Construction. Amsterdam: Elsevier, 1989. ISBN 0444988904.
- Chapman, D.; Metje, N.; Stark, A. Introduction to Tunnel Construction [on line]. 2nd ed. Boca Raton ; London ; New York: Applied Geotechnics, 2018 [Consultation: 15/01/2025]. Available on: <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/9781315120164/introduction-tunnel-construction-david-chapman-nicole-metje-alfred-stark>. ISBN 9781315120164.
- Gerwick, B. Construction of Marine and Offshore Structure. Boca Raton, FL: CRC Press, 2007. ISBN 9780849330520.
- Gerwick, B. C. Construction Of Prestressed Concrete Structures. 2nd ed. New York: Wiley, 1993. ISBN 9780471181132.
- Chew, M. Y. L.. Construction Technology For Tall Buildings [on line]. 5th ed. Singapore: World Scientific, 2017 [Consultation: 15/01/2025]. Available on: <https://www-worldscientific-com.recursos.biblioteca.upc.edu/worldscibooks/10.1142/10465#t=toc>. ISBN 9789813220690.