

Course guide

280663 - 280663 - Naval Technology and Mechanics

Last modified: 26/05/2026

Unit in charge: Barcelona School of Nautical Studies

Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering.

Degree: BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2026

ECTS Credits: 9.0

Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: JORGE TORRALBO GAVILAN

Others:

Primer quadrimestre:

MANUEL RODRIGUEZ CASTILLO - DT, GESTN

JORGE TORRALBO GAVILAN - DT, GESTN

Segon quadrimestre:

MANUEL RODRIGUEZ CASTILLO - GSDT1, GSDT2, GSDT3

JORGE TORRALBO GAVILAN - GSDT1, GSDT2, GSDT3

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

2. Process and mechanical engineering.
3. Process and assembly machines onboard equipment and systems.

Transversal:

1. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

TEACHING METHODOLOGY

Expositive classes, interventions, group work, written work, problem solving, information search, visits and practices.
Incorporate the gender perspective.

LEARNING OBJECTIVES OF THE SUBJECT

To understand the processes of metal procurement, metallurgy, and iron and steel making.

To select the most suitable manufacturing and forming process for a specific naval component, justifying the choice based on technical and economic criteria.

To understand metal forming through casting, forging, rolling mills, and extrusion.

To program and simulate machining operations using Computer Numerical Control (CNC) for the manufacturing of precision parts.

To analyze the weldability of different types of naval steels and select the most efficient joining method (MIG-MAG, TIG, Electrode) according to the thickness and position of the structure.

To evaluate and supervise welding procedures in naval structures according to international standards (ISO, AWS, ASME), identifying potential defects and solutions.

To understand the main measuring instruments used for part verification.

To identify the possibilities of additive manufacturing in naval maintenance and construction, comparing its advantages and limitations with respect to conventional machining.

To understand FDM (Fused Deposition Modeling) technologies applied to the naval sector.

STUDY LOAD

Type	Hours	Percentage
Hours small group	36,0	16.00
Self study	135,0	60.00
Hours large group	54,0	24.00

Total learning time: 225 h

CONTENTS

Metals in the naval industry.

Description:

Classification and properties of metals. Extraction of iron (Fe). High furnaces. Steels and foundries. Refining of steel. Forging, forging process. Ferrous and non-ferrous metals used in the shipbuilding industry. Thermal, thermochemical and surface treatments of metals. Fe-C diagram. Hardness of metals.

Full-or-part-time: 14h

Theory classes: 12h

Practical classes: 2h

Basic tools and manual mechanical processes.

Description:

Basic tools in a mechanical workshop. Flat and air layout. Roughness and abrasives. Aspects related to work safety in mechanical workshops.

Full-or-part-time: 6h

Theory classes: 6h

Metrology

Description:

The nonius. Vernier caliper and micrometer. Verification devices. Marbles. Comparator. Goniometers. Sizing and tolerances. Mounts and measurements.

Full-or-part-time: 6h

Theory classes: 4h

Practical classes: 2h

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Description:

Welding concept Weldability of steels. Type of welding: homogeneous and heterogeneous. Electric arc welding techniques: Manual for coated electrode, MIG-MAG, TIG, Arcsubmergit. Gas welding: oxyacetylene. Welding by capillarity. Cold and contact welding. Type of joints. Symbolology. Tensions and deformations in the welds. Welding defects Welding positions. ASME code section IX. Welding processes in shipyards. ISO and AWS regulations.

Full-or-part-time: 30h

Theory classes: 20h

Practical classes: 10h

Metal cutting processes: Tooling machines

Description:

Metal cutting processes. Types of tooling machines. Lathe: jobs and tools. Milling machine: Jobs and tools. Conventional machines and numerical control machines. Tooling parameters. Introduction to Computer Numerical Control machines (CNC) - Lathe and milling machine. Controls FAGOR and SINUMERIK

Full-or-part-time: 24h

Theory classes: 16h

Practical classes: 8h

Detachable joints: Threads, screws and nuts.

Description:

Types of thread profiles: Whitworth thread and Metric thread: types. Screws: Types of screws and nuts. Security systems.

Full-or-part-time: 10h

Theory classes: 8h

Practical classes: 2h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

The final grade is the sum of the partial grades as follows:

$$N_{\text{final}} = 0,5 N_{\text{pf}} + 0,2 N_{\text{pp}} + 0,2 N_{\text{pr}} + 0,1 N_{\text{ad}}$$

NPF: Note-test final exam

PPN: Note-test partial exam

NPR: Practical Note

Nad: Note supervised activities

The test will be held on reevaluation and time specified by the Faculty. Consist of a single test may be submitted only the students who meet the requirements set out in the undergraduate academic regulations of the FNB.

EXAMINATION RULES.

Attendance at practices is mandatory. The subject cannot be passed without passing the practices. The minimum attendance at practices will be greater than 80% of the scheduled practices.

Attendance at theoretical classes will be taken into account at the time of the final evaluation.

It will be considered not presented (NP) when all the tests are not carried out.

The evaluation tests may contain theoretical, practical or problem-solving tests.

The reevaluation test will be carried out on the day and time indicated by the Faculty. It will consist of a single test, and only students who meet the requirements established in the academic regulations for FNB Degree studies will be able to take it.

BIBLIOGRAPHY

Basic:

- Coca Rebollero, Pedro; Rosique Jiménez, Juan. Tecnología mecánica y metrotecnica. 6a ed. Madrid: Pirámide, 1996. ISBN 843681663.
- Giachino, Joseph W.; Weeks, William R. Técnica y práctica de la soldadura. Barcelona: Reverté, 1981. ISBN 8429160531.
- Lasheras Esteban, José M^a. Tecnología mecánica y metrotecnica. San Sebastián: Donostiarra, 1984. ISBN 8470630873.
- Morral, F. R.; Jimeno, Emilio; Molera i Solà, Pere. Metalurgia general. Barcelona: Reverté, 1982-1985. ISBN 9788429160710.
- Rivas Arias, José María. Soldadura eléctrica y sistema T.I.G. y M.A.G. 9a ed. Madrid: Paraninfo Cengage learning, 2008. ISBN 9788428307420.
- ASM handbook, vol. 6, Welding, brazing and soldering. 9th ed. Metals Park, Ohio: American Society for Metals, [1978-1989?]. ISBN 0871700123.
- Miguélez Garrido, M Henar; Cantero Guisánchez, José Luís. Problemas resueltos de tecnología de fabricación. Madrid: International Thomson, 2005. ISBN 8497323459.
- Jeffus, Larry. Soldadura : principios y aplicaciones. 5a ed. Madrid: Paraninfo, 2009. ISBN 9788428329378.
- Mott, Robert L. Diseño de elementos de máquinas. 4a ed. México: Prentice Hall, 2006. ISBN 9702608120.
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- Alonso Marcos, Carlos. Interpretación de planos en soldadura : UF1640. Madrid: Paraninfo, 2021. ISBN 9788413660325.
- Roldán Viloria, José. Control y verificación de productos fabricados : UF0443. Madrid: Paraninfo, 2021. ISBN 9788413660691.
- Roldán Viloria, José. Operaciones básicas y procesos automáticos de fabricación mecánica : UF0442. Madrid: Paraninfo, 2021. ISBN 9788413660561.
- Luque Romera, Francisco Javier. Máquinas, herramientas y materiales de procesos básicos de fabricación. FMEE0108 [on line]. Antequera: IC Editorial, 2022 [Consultation: 21/05/2026]. Available on: <https://ebookcentral-proquest-com/lib/upcatalunya-ebooks/detail.action?pg-origsite=primo&docID=31130741>. ISBN 84-11-03227-2.
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Complementary:

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