

Course guide

280665 - 280665 - Ship Power Plant

Last modified: 26/06/2025

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 709 - DEE - Department of Electrical Engineering.

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

Academic year: 2025 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JOAN NICOLAS APRUZZESE

Segon quadrimestre:

JOAN NICOLAS APRUZZESE - Grup: GSDT1, Grup: GSDT2, Grup: GSDT3, Grup: GSDT4,
Grup: GSDT5, Grup: GSDT6, Grup: GSDT7

Others:

Segon quadrimestre:

JOAN NICOLAS APRUZZESE - Grup: GSDT1, Grup: GSDT2, Grup: GSDT3, Grup: GSDT4,
Grup: GSDT5, Grup: GSDT6, Grup: GSDT7

VICENÇ RODRIGUEZ BARRAGUER - Grup: GSDT1, Grup: GSDT2, Grup: GSDT3, Grup:
GSDT4, Grup: GSDT5, Grup: GSDT6, Grup: GSDT7

CARANDELL WIDMER, MATIAS - Grup: GSDT1, Grup: GSDT2, Grup: GSDT3, Grup: GSDT4,
Grup: GSDT5, Grup: GSDT6, Grup: GSDT7

REQUIREMENTS

Subjet 280641

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

2. Knowledge of electrical machines and marine electrical systems.

Transversal:

1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

TEACHING METHODOLOGY

Real applications analysis.

Application of theoretical knowledge to the laboratory practices.

Attitude and skills development for power plants operation.

Case studies and articles on the subject.

Perform work individually.

LEARNING OBJECTIVES OF THE SUBJECT

- Understanding the basics of electrical machines.
- Understand the schemes and connections of different types of machines and applications.
- Understand the regulatory systems of V, f, P, Q in synchronous generators in island and parallel.
- Having the ability to do calculations and solve problems of electrical machines, using the corresponding equivalent circuits.
- Perform calculations for electrical installations of the ship.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	26.67
Hours small group	15,0	13.33
Self study	67,5	60.00

Total learning time: 112.5 h

CONTENTS

DC machine

Description:

Having knowledge about the operation of electrical distribution systems, generation plant, generators, motors and starter. Construction and operational systems and DC electrical equipment on board properties. Having the basic knowledge for the maintenance of electrical machines and their control systems. Competences in accordance with STCW Code Section A-III / 1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4

Full-or-part-time: 4h

Theory classes: 2h

Laboratory classes: 2h

Energy balance

Description:

Having knowledge about the operation of electrical distribution systems, power plant. Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment.

Full-or-part-time: 3h

Theory classes: 3h

Synchronous machine

Description:

Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, associated control circuits. Operational and construction in the AC electrical systems and equipment onboard features. Having the basic knowledge for the maintenance of electrical machines and their control systems.

Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment and

7. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4

Full-or-part-time: 7h

Theory classes: 5h

Laboratory classes: 2h

Asynchronous machine

Description:

Having knowledge about the operation of electrical distribution systems, motors and starters, associated control circuits. Operational and construction in the AC electrical systems and equipment onboard features. Having the basic knowledge for the maintenance of electrical machines and their control systems.

Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment and

7. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4

Full-or-part-time: 8h

Theory classes: 2h

Laboratory classes: 6h

Start systems

Description:

Having knowledge about the operation of electrical distribution systems, motors and starters, associated control circuits. Operational and construction in the AC electrical systems and equipment onboard features. Having the basic knowledge for the maintenance of electrical machines and their control systems.

Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment and

7. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4

Full-or-part-time: 4h

Theory classes: 2h

Laboratory classes: 2h

Static converters

Description:

Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, and start motors. Electronic converters (static), controlled and not controlled, for the regulation of motor speed.

Competences in accordance with STCW Code Section A-III/1:

6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment

Full-or-part-time: 4h

Theory classes: 3h

Laboratory classes: 1h

Harmonic and transient

Description:

Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, and start motors. Rates of Harmonic Distortion (HD) and Total Harmonic Distortion (THD), for current and voltage.

Competences in accordance with STCW Code Section A-III/1:

6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment

Full-or-part-time: 2h

Theory classes: 2h

Protections

Description:

Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, motors and starting associated control circuits. Protection and Measuring Equipment.

Competences in accordance with STCW Code Section A-III/1:

6. Operate electrical, electronic and control systems. KUPs 6.1 Electrical equipment and

7. Maintenance and repair of electrical and electronic equipment. KUP 7.1 to 7.4

Full-or-part-time: 4h

Theory classes: 3h

Laboratory classes: 1h

Industrial automation

Description:

Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, motors and starting associated control circuits. Automation.

Competences in accordance with STCW Code Section A-III/1:

6. Operate electrical, electronic and control systems. KUPs 6.1 Electrical equipment and

7. Maintenance and repair of electrical and electronic equipment. KUP 7.1 to 7.4

Full-or-part-time: 4h

Theory classes: 4h

GRADING SYSTEM

During the course there will be evaluations, according to the following percentages:

Continuous evaluations 20% (Lab exams, Lab sessions)

Partial Exam 40%

Final Exam 40%

Reevaluation: Test that includes the concepts and objectives set for the final test.

EXAMINATION RULES.

Attendance and completion of the hands-on labs, is a compulsory requirement.

BIBLIOGRAPHY

Basic:

- Casals Torrens, Pau; Bosch Tous, Ricard. Máquinas eléctricas: aplicaciones de ingeniería eléctrica a instalaciones navales y marinas. Prácticas [on line]. Barcelona: Edicions UPC, 2005 [Consultation: 06/10/2020]. Available on: <http://hdl.handle.net/2099.3/36708>. ISBN 8483018136.
- Wildi, Théodore. Electrical machines, drives, and power systems. 6th ed. Essex: Pearson Education, 2014. ISBN 9781292024585.

Complementary:

- Boix, Oriol [et al.]. Tecnología eléctrica. Barcelona: Ceysa, 2002. ISBN 9788486108236.
- Fitzgerald, A.E.; Kingsley, C.; Umans, S.D. Máquinas eléctricas. 6a ed. México: McGraw-Hill, 2004. ISBN 970104052X.
- Chapman, Stephen J. Máquinas eléctricas [on line]. 4a ed. México: McGraw-Hill Education, 2012 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4297. ISBN 9781456218454.
- Fraile Mora, Jesús. Máquinas eléctricas. 8a ed. Madrid: Ibergarceta, 2016. ISBN 9788416228669.
- Sanjurjo Navarro, R. Máquinas eléctricas [on line]. Madrid: García-Maroto, 2011 [Consultation: 29/07/2024]. Available on: https://www-ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=193. ISBN 9788415214144.
- Weedy, B.M. Electric power systems [on line]. 5th ed. Chichester: John Wiley & Sons, 2012 [Consultation: 01/09/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pg-origsite=primo&docID=978379>. ISBN 9781118361092.
- Ogayar Fernández, Blas; López Valdivia, Andrés. Teoría de circuitos con OrCAD PSpice : 20 prácticas de laboratorio. Madrid: Ra-ma, 2000. ISBN 8478974148.
- Rashid, Muhammad H. SPICE for power electronics and electric power [on line]. 3rd ed. Boca Raton: CRC Press, Taylor & Francis Group, 2012 [Consultation: 11/07/2025]. Available on: <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/b12105/spice-power-electronics-electric-power-muhammad-rashid>. ISBN 9781439860472.
- Ong, Chee-Mun. Dynamic simulation of electric machinery using matlab simulink. Upper Saddle River: Prentice Hall, 1998. ISBN 0137237855.
- Sanjurjo Navarro, Rafael. Máquinas eléctricas : 51 problemas útiles [on line]. Edición estudiante (EEES). Madrid: García-Maroto Editores, [2019] [Consultation: 29/07/2024]. Available on: https://www-ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8435. ISBN 9788417969073.
- Sanjurjo Navarro, Rafael. Instalaciones eléctricas : 26 problemas útiles [on line]. Edición estudiante (EEES). Madrid: García Maroto Editores, [2019] [Consultation: 13/09/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8572. ISBN 9788417969202.
- López Melendo, Jacinto. Calidad de potencia : armónicos y factor de potencia [on line]. [Barcelona]: Marcombo, 2018 [Consultation: 13/09/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=11376. ISBN 9788426725714.
- Pozo Ruz, Ana. Convertidores Conmutados de Potencia : Test de Autoevaluación [on line]. Second edition. Barcelona: Marcombo, 2017 [Consultation: 13/09/2024]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pg-origsite=primo&docID=31307067>. ISBN 9788426734341.
- Rashid, Muhammad H; Navarro Salas, Rodolfo; El Filali, Brahim. Electrónica de potencia [on line]. Cuarta edición. México, D.F.: Pearson, 2015 [Consultation: 13/09/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6191. ISBN 9786073233286.

RESOURCES

Computer material:

- Apunts, articles tècnics i models de simulació aportats pels professor en ATENEA.