



## Course guide

# 280665 - 280665 - Ship Power Plant

**Last modified:** 08/01/2025

**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:** 2024    **ECTS Credits:** 4.5    **Languages:** Catalan, Spanish

### LECTURER

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**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

MONTSERRAT MONTALÀ PALAU - 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

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Subjet 280641

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**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

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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 30% (Exams Lab., Practices Lab., Expositions, Tasks)

Partial Exam 30%

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

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### 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](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4297). ISBN 9781456218454.
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- 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](https://www-ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=193). ISBN 9788415214144.
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- Ogayar Fernández, Blas; López Valdivia, Andrés. Teoría de circuitos con OrCAD PSpice : 20 prácticas de laboratorio. Madrid: Ra-ma, 2000. ISBN 8478974148.
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- Ong, Chee-Mun. Dynamic simulation of electric machinery using matlab simulink. Upper Saddle River: Prentice Hall, 1998. ISBN 0137237855.
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- 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](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8572). ISBN 9788417969202.
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- 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](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6191). ISBN 9786073233286.

## RESOURCES

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### Computer material:

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