

## [GBB203] PHYSICS II

### GENERAL INFORMATION

<b>Studies</b>	DEGREE IN BIOMEDICAL ENGINEERING	<b>Subject</b>	PHYSICS
<b>Semester</b>	2	<b>Course</b>	2
<b>Character</b>	COMPULSORY	<b>Mention / Field of specialisation</b>	
<b>Plan</b>	2022	<b>Modality</b>	Face-to-face
<b>Credits</b>	3	<b>Language</b>	EUSKARA
		<b>Total hours</b>	44 class hours + 31 non-class hours = <b>75 total hours</b>

### 2030 AGENDA GOALS



### PROFESSORS

MARTINEZ DE MENDIVIL VARAS, JON

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
MATHEMATICS II	(No previous knowledge required)
PHYSICS II	

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>GBR213</b> - To apply the principles of electromagnetism to problems in the field of Biomedical Engineering		x		2,6
<b>G-RTR1</b> - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and/or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy		x		0,24
<b>G-RTR2</b> - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language		x		0,16

**Total:** 3

KC: Knowledge or Content / SK: Skills / AB: Abilities

### SECONDARY LEARNING RESULTS

#### 2RGB292 (2 sem)

#### LEARNING ACTIVITIES

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

**CH** 1 h. **NCH** 1 h. **TH** 2 h.

#### EVALUATION SYSTEM

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

**W** 100%

#### MAKE-UP MECHANISMS

(No mechanisms)

**CH - Class hours:** 1 h.

**NCH - Non-class hours:** 1 h.

**TH - Total hours:** 2 h.

#### 2RGB293 (2 sem)

#### LEARNING ACTIVITIES

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

**CH** 1 h. **NCH** 1 h. **TH** 2 h.

#### EVALUATION SYSTEM

**W**

#### MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

100%

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

**CH - Class hours:** 1 h.

**NCH - Non-class hours:** 1 h.

**TH - Total hours:** 2 h.

### **2RGB294 (2 sem)**

#### **LEARNING ACTIVITIES**

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

**CH**

1 h.

**NCH**

1 h.

**TH**

2 h.

#### **EVALUATION SYSTEM**

**W**

Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems

100%

#### **MAKE-UP MECHANISMS**

Observation (technical capacity, attitude and participation)

**CH - Class hours:** 1 h.

**NCH - Non-class hours:** 1 h.

**TH - Total hours:** 2 h.

### **2RGB290 (2 sem)**

#### **LEARNING ACTIVITIES**

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

**CH**

1 h.

**NCH**

1 h.

**TH**

2 h.

#### **EVALUATION SYSTEM**

**W**

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

100%

#### **MAKE-UP MECHANISMS**

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

**CH - Class hours:** 1 h.

**NCH - Non-class hours:** 1 h.

**TH - Total hours:** 2 h.

### **RGB228 [!] Comprende y aplica las ecuaciones de Maxwell**

#### **LEARNING ACTIVITIES**

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

**CH**

8 h.

**NCH**

4 h.

**TH**

12 h.

Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning

5 h.

5 h.

Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints

1 h.

1 h.

Computer simulation exercises, individually and/or in teams

1 h.

2 h.

3 h.

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects

14 h.

14 h.

Carrying out exercises and solving problems individually and/or in teams

5 h.

5 h.

**EVALUATION SYSTEM**

**W**

**MAKE-UP MECHANISMS**

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

5%

Individual written and/or oral tests or individual coding/programming tests

Individual written and/or oral tests or individual coding/programming tests

90%

Prototype / Product

5%

**CH - Class hours:** 24 h.

**NCH - Non-class hours:** 16 h.

**TH - Total hours:** 40 h.

**2RGB291 (2 sem)**

**LEARNING ACTIVITIES**

**CH**

**NCH**

**TH**

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

1 h.

1 h.

2 h.

**EVALUATION SYSTEM**

**W**

**MAKE-UP MECHANISMS**

Self-assessment

25%

Observation (technical capacity, attitude and participation)

Co-assessment

25%

Observation (technical capacity, attitude and participation)

50%

**CH - Class hours:** 1 h.

**NCH - Non-class hours:** 1 h.

**TH - Total hours:** 2 h.

**RGB229 [I] Comprende y aplica los fundamentos de propagación de ondas electromagnéticas**

**LEARNING ACTIVITIES**

**CH**

**NCH**

**TH**

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

5 h.

3 h.

8 h.

Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning

5 h.

5 h.

Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints

2 h.

2 h.

Computer simulation exercises, individually and/or in teams

1 h.

2 h.

3 h.

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects

7 h.

7 h.

**EVALUATION SYSTEM**

**W**

**MAKE-UP MECHANISMS**

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

5%

Individual written and/or oral tests or individual coding/programming tests

Individual written and/or oral tests or individual coding/programming tests

90%

Prototype / Product

5%

**CH - Class hours:** 15 h.

**NCH - Non-class hours:** 10 h.

**TH - Total hours:** 25 h.

**CONTENTS**

1. Vector analysis1.1. Gradient1.2. Divergence1.3. Rotational1.4. Laplacian2. Maxwell's equations2.1. Gaussian law for the electric field2.2. Gauss's law for the magnetic field2.3. Ampere's law2.4. Faraday's law3. Uhin elektromagnetikoen hedapena3.1. Propagation in vacuum3.2. Propagation in lossless media 3.3. Propagation in lossy media Fresnel equations3.5. Scattering4. FDTD (Finite Differences Time Domain)

## LEARNING RESOURCES AND BIBLIOGRAPHY

### Learning resources

- [!] *Plataforma Moodle*
- [!] *Presentaciones en clase*
- [!] *Apuntes de la asignatura*
- [!] *Consultas en páginas web relacionadas con el tema*

### Bibliography

David K. Cheng. Fundamentos de electromagnetismo para ingeniería  
Markus Zahn, Electromagnetic Field Theory: A Problem Solving Approach. (Massachusetts Institute of Technology: MIT OpenCourseWare)  
Rafael Boloix Tortosa. Problemas de ondas planas y medios de transmisión  
Rodrigo Chi Duran. Problemas Propuestos y Resueltos de Electromagnetismo