Information about the subject

Degree: Bachelor of Degree in Marine Sciences

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 271107 **Name:** Fluid Mechanics

Credits: 6,00 **ECTS Year:** 1 **Semester:** 2

Module: Fundamental Science

Subject Matter: Physics **Type:** Basic Formation

Field of knowledge: Sciences

Department: Basic and Cross-disciplinary Sciences

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

Fundamental Science

Subject Matter	ECTS	Subject	ECTS	Year/semester
Physics	12,00	Fluid Mechanics	6,00	1/2
		Physics	6,00	1/1
Mathematics	6,00	Mathematics	6,00	1/1
Chemistry	12,00	Chemistry	6,00	1/1
		Chemistry of Aqueous Solutions	6,00	1/2
Biology	12,00	Biochemistry	6,00	1/2
		Biology	6,00	1/1
Geology	6,00	Geology	6,00	1/2

Recommended knowledge

Mathematics and Physics.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1 The student is capable of solving problems about the content of the subjects through a well-founded approach, a clear development and a resolution coinciding with the expected result.

R2 The students knows the concept of fluid, its properties, dimensions and units.

R3 The student knows the fundamentals of fluid statics and the situations which includes.

R4 The student correctly uses equations and physical formulas of primary interest in fluid mechanics.

R5 The student is capable of resolving problems which show how flows are described and classified.

R6 The student is capable of seeking information form different sources and knows how to analyse it.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students acquire and understand knowledge in their field of study based on general secondary education but usually reaching a level that, although supported on advanced text books, also includes aspects involving state-of-the-art knowledge specific to their area.			x	
CB2	Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study.			x	
CB5	Students develop the necessary learning skills to undertake further studies with a high level of autonomy.				x

GENERAL		Weighting			
		1	2	3	4
CG1	Capacity to analyze and synthesize				x
CG2	Capacity to organize and plan				x
CG3	Mastering Spanish oral and written communication				x
CG5	Knowing and applying Basic ITC skills related to marine science				x
CG6	Capacity to manage information (capacity to look for and analyze information coming from different types of sources)				x
CG7	Decision making			x	
CG8	Capacity to work in interdisciplinary and multidisciplinary team			x	
CG10	Critical and self-critical capacity		x		

CG11	Capacity to learn				x
CG12	Capacity to adapt to new situations			x	
CG13	Capacity to produce new ideas (creativity)			x	
CG16	Capacity to apply theoretical knowledge				x

SPECIFIC		Weighting			
		1	2	3	4
CE8	Identifying and analyzing new problems and proposing solution strategies				x
CE9	Knowing how to carry out experiments and measurements both in the laboratory and during sample collection			x	
CE11	Knowing how to do fieldwork and laboratory experiments in a safe and responsible way, promoting teamwork			x	

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R5	45,00%	Written test with theoretical and practical questions
R1, R2, R3, R4, R5, R6	30,00%	Delivery of guided assignments, whose objectives and contents will be proposed by the teacher
R1, R2, R3, R4, R5	15,00%	Problem-solving and issues related to the use of specific software
R2, R3, R4, R5	10,00%	Oral presentation

Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation. Continuous assessment will be applied in the item " Delivery of guided assignments, whose objectives and contents will be proposed by the teacher". At the end of each lesson, students will submit a problem that will be corrected by the students following the rubric set by the teacher.

In order to pass the course, it will be necessary to obtain, at least, a grade equal or higher to 5.0 in each of the evaluation systems. If a final grade of 5 points is not obtained in each item and only one of them has been passed, the course will be failed, even if the weighted average is equal to or higher than 5. The weighted average will also depend on the presentation of all the work requested. The oral presentation should be delivered to teacher previously, on the date specified, for approval. Spelling mistakes may lower the mark by up to 10%. This, however, shall not apply to international exchange students.

MENTION OF DISTINCTION:
In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1	Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.
M2	Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.
M5	Application of multidisciplinary knowledge.
M6	Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.
M8	Set of oral and/or written tests used in initial, formative or additive assessment of the student.
M9	Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical , practical and/or small-group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es)
M10	Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es).

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
ON-CAMPUS CLASS M1	R1, R2, R3, R4, R5	39,00	1,56
PRACTICAL CLASSES M2	R1, R2, R3, R4, R5, R6	14,00	0,56
GROUP PRESENTATION OF ASSIGNMENTS M5	R2, R3, R4, R6	2,00	0,08
TUTORIAL M6	R1, R2, R3, R4, R5	2,00	0,08
ASSESSMENT M8	R1, R2, R3, R4, R5	3,00	0,12
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
GROUP WORK M9	R1, R2, R3, R4, R5, R6	20,00	0,80
INDEPENDENT WORK M10	R1, R2, R3, R4, R5, R6	70,00	2,80
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
UNIT 1. FLUID STATICS	Lesson 1. Introduction to Fluid Mechanics 1.1 Fluid definition 1.2 Basic properties of a fluid 1.3 Flow classification 1.4 Conservation laws Lesson 2. Fluid statics 2.1 Pressure 2.2 Pascal Principle 2.3 Fluid static equation 2.4 Hydrostatic buoyancy 2.5 Buoyancy and submergence

UNIT 2. FLUID DYNAMICS

Lesson 3. Introduction to fluid motion
3.1 Fluid motion
3.2 Description of the fluid motion
3.2.1 Lagrangian and eulerian description
3.2.2 Flow lines
3.3 Acceleration
3.4 Angular velocity and vorticity

Lesson 4. Ideal fluids
4.1 Continuity equation
4.2 Bernoulli equation
4.3 Torriceli theorem
4.4 Flow discharge
4.5 Differential equations of flow
4.5.1 Differential form of the continuity equation
4.5.2 Equation of motion
4.5.3 Euler equation

Lesson 5. Real fluid
5.1 Viscosity
5.2 Reynolds number
5.3 Navier Stokes equation
5.4 Ekman layer
5.5 Poiseuille's Law

UNIT 3. SURFACE TENSION Y CAPILARITY. EXTERNAL FLOWS

Lesson 6.Surface tension and capillarity
6.1 Surface tension
6.2 Tate's Law
6.3 Capillarity phenomena
6.4 External flows
6.4.1 Drag Force
6.4.1.1 Pressure and friction drag force
6.4.1.2 Stokes' Law
6.4.1.3 Fluid velocity limit
6.4.2 Lift

Organization of the practical activities:

	Content	Place	Hours
PR1.	Exercises: fluid properties	Lecture room	1,00
PR2.	Density and sound velocity calculation using TEOS-10 equation. Profiles representation.	Computer	2,00
PR3.	Seawater properties (salinity, density and speed velocity)	Marine station	1,00
PR4.	Exercises: hydroestatic force on a plance surface.	Lecture room	1,00
PR5.	Exercises: hydroestatic force on a curve surface.	Lecture room	1,00
PR6.	Exercises: bouyancy and stability.	Lecture room	1,00
PR7.	Exercises: aceleration, vorticity and angular momentum.	Lecture room	1,00
PR8.	Exercises: Bernouilli's equation.	Lecture room	1,00
PR9.	Exercises: Euler's equation.	Lecture room	2,00
PR10.	Exercises: Navier-Stokes's equation.	Lecture room	1,00
PR11.	Exercises: Poiseuille's Law.	Lecture room	1,00
PR12.	Exercises: surface tension and external flow.	Lecture room	2,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
UNIT 1. FLUID STATICS	10,00	20,00
UNIT 2. FLUID DYNAMICS	15,00	30,00
UNIT 3. SURFACE TENSION Y CAPILARITY. EXTERNAL FLOWS	5,00	10,00

References

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