

1. BASIC INFORMATION

Course	Fluid mechanics I
Degree program	Degree in Aerospace Engineering of aircrafts
School	Arquitectura, Ingeniería y Diseño
Year	Third
ECTS	6
Credit type	Compulsory
Language(s)	English
Delivery mode	Face to face
Semester	Second
Academic year	2019-20
Coordinating professor	Jose Omar Martinez Lucci

2. PRESENTATION

This course belongs to the “Motopropulsion I” module:

- Thermodynamics and Propulsion 6 ECTS (second year)
- Fluid Mechanics I 6 ECTS (second year)

In the Fluid Mechanics I subject the following topics are covered: Basic introduction to fluid mechanics, conservation laws of mass, momentum and energy, Navier-Stoke equations, and introduction to computational fluid dynamics

The objectives of the course are:

- 1, to learn the basic principles and the fluid mechanics equations.
- 2, to learn and develop an intuitive understanding of the mechanics of fluids with emphasis physics with Visual examples to bolster you knowledge of physics.
- 3, the student participates in various real examples of engineering to see how the fluid mechanics is applied to engineering practice
- 4, to know the basics of the laws of conservation of mass, time and energy and its application in the study de the turbomachinery.
- 5, to know, by the laboratory, the importance of the computational fluid dynamics. Also, to know how to use this tool to solve complex problems of mechanics of fluids. The student will learn the use of the application of CFD rather than the use of algorithms to do the simulations.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB2: That students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
- CB4: To allow students to communicate information, ideas, problems and solutions both to a specialized and non-specialized audience

Cross-curricular competencies:

- CT14 (N3): Problem Solving with initiative, decision making, creativity, and critical thinking, professionally, and the preparation and defense of arguments (Troubleshooting).
- CT15 (N2): Compile and interpret data to make judgments that include relevant social, scientist, and ethical issues, taking fundamental rights respect into consideration, as well as the democratic principles, gender equality, solidarity, environment protection, universal accessibility and design for all, and culture of peace (consultancy).
- CT20 (N2): Take decisions, in advance, on what is need to be done, who should do it, and how it should be done.

Specific competencies:

- CE16: Appropriate knowledge applied to engineering of: concepts and laws that manage the processes of energy transfer, the movement of fluids, the mechanisms of heat transfer and mass exchange, and their influence on main systems of aerospace propulsion
- CE18: Appropriate knowledge applied to engineering of: basics of fluid mechanics; basic principles of flight control and automatitation; main characteristics and phisical and mechanical properties of materials.

Notes: UNIQUE LEVEL: Competence developed at one level. Level 1 (N1): awareness about the importance of competences and basic application of it to several situations. Level 2(N2): interiorization and skillful handling of competences. Level 3 (N3): Full interiorization and handling of competences at any needed situation.

Learning outcomes:

- LO24: To propose and design a set of models, as input data to fluid dynamics simulators.

- LO20. To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules
- LO21. From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module
- LO22. To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

The table below shows the relation between the competencies developed during the course and the envisaged learning outcomes:

Competencies	Learning outcomes
CB1, CT16(N3), CE8	LO20. To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules
CB3, CB5, CT12(N2), CT16(N3), CE8, CE19	LO21. From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module
CB3, CT12(N2), CT18(N2), CE8	LO22. To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

4. CONTENT

- Introduction to the mechanics of fluids.
- Kinematics
- Governing equations of fluid mechanics
- Fluid static
- Flow through turbomachinery
- Discontinuity surfaces
- Introduction to the turbulent motion
- Introduction to aerospace propulsion systems.
- Basics performs of fluid dynamics simulators

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Lecture-based class
- Integration of team work
- Self-study
- Mentoring, academic monitoring and assessment

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Type of educational activity	Number of hours
Lecture-based class	20 h
Integration of team work	60 h
Self-study	50 h
Mentoring, academic monitoring and assessment	20 h
TOTAL	150 h

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessment criteria	Weight (%)
• 1. Exam, test and other type of assessment.	30%-35%
• 2. Reports, articles and informs.	15%-30%
• 3. Alternative system of assessment.	15%-30%
• 4. Conferences, company-tour visit and experiences in situ	10%-10%
• 6. Transversal skills (rubric)	10%-15%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

- Exams, tests and other test and alternative techniques of assessment 35%
- Writing of articles, reports and project and Transversal skills 35% of the final grade
- Homework 30% of the final grade

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average). Minimums needed to pass:

- To obtain 5 points over 10 points of the final exam.
- To obtain 5 points over 10 points of the final project.
- To obtain 5 points over 10 points of the homework.
- In order to be evaluated you must have a minimum of 50% attendance (ATTENDANCE IS VALID ONLY REGISTERED IN THE GRP SYSTEM)

The failed assignments, homework or lab reports during academic year can be submitted on extraordinary session. To pass the course, each assignment shall have, at least, five points out of ten and it is mandatory to pass all assignments, activities and exams. If the student fails or does not submit some activities these activities will not be considered for the average of the final grade.

In the case, when the student do not reached the minimum required to pass any evaluable activity. The final grade will be:

- The mean average when the mean value is less than or equal to 4
- 4 if the value of the mean average is greater than 4

The grade will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of which they are part of the weighted average.

7.2. Second exam period

Assessment activities:

- Realization of different tasks, problems and practical exercises, individually 20%
- Realization of laboratory practices and report 10%
- Realization of a project 20%
- Oral presentations presentation of the project 15%.
- Final exam 35%

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In the case, when the student do not reached the minimum required to pass any evaluable activity. The final grade will be:

- The mean average when the mean value is less than or equal to 4
- 4 if the value of the mean average is greater than 4

The grade will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of which they are part of the weighted average.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Activity 1 .Self-study – I Introduction to fluid mechanics and fluid properties	Week 3-4
Activity 2 Self-study - Fluid static and hydrostatic forces.	Week 6-7
Activity 3 Self-study- Kinematic and dynamic of fluid and introduction to turbomachinery	Week 9-10
Activity 4 Integration of team work and Mentoring, academic monitoring and assessment - laboratories and team project	Week 13
Activity 5 Final exam	Last week

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

- Fluid Mechancs Fundamentals and applications. Yunus A. Çengel and John M. Cimbala, First edition, editorial Mc Graw Hill, 2006

10. DIVERSITY MANAGEMENT UNIT

Students with specific learning support needs:

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at unidad.diversidad@universidadeuropea.es at the beginning of each semester.

AMENDMENT 1 INSTITUTIONAL ASSESSMENT OF LEARNING OUTCOMES PLAN Covid-19 TEACHING AND EVALUATION ACTIVITIES

Course/Module Fluid Mechanics I

Degree Program Aerospace in Aircraft Engineering

Year (1º-6º) Second

Group (s) M21

Professor Jose Martinez Lucci

**Coordinating professor Alicia Paez
(Degree Coordinator, Internship coordinator, End of Degree Project, Master's Degree Program)**

Teaching Activity described in the syllabus	Adapated activity in distance learning
Lecture-based class	Lecture-based class. The lecture will be teaching in online mode
Integration of team work	Integration of team work. The team work will be done in online mode.
Self-study	Self-study.
Mentoring, academic monitoring and assessment	Mentoring, academic monitoring and assessment. These activities will be done in online mode.

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Activity 4 Integration of team work and Mentoring, academic monitoring and assessment - laboratories and team project	Description of new activity	Activity 4 Integration of team work and Mentoring, academic monitoring and assessment - These activities will be performed in online mode laboratories and team project. The activity will be developed by using the software of Fluent that is in MYLABS.
Content to be assessed	. Introduction to fluid mechanics Kinematic Governing equations of the Fluid Mechanics Fluid statics Fluid dynamics Basics performs of fluid dynamics simulators		
Learning Outcomes to be assessed <i>(Please check Syllabus of the course/module)</i>	LO20: To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it. LO22: -From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module		
Duration	15 minutes oral presentation of the final group	Approximate duration	15 minutes oral presentation of the final group
Weight in evaluation	35%	Weight in evaluation	35%
Please note:			

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Activity 5 Final exam	Description of new activity	Activity 5 Final exam. The final exam will be done by the students in online mode.
Content to be assessed	Introduction to the mechanics of fluids. Kinematics Governing equations of fluid mechanics Fluid static Flow through turbomachinery Discontinuity surfaces Introduction to the turbulent motion Introduction to aerospace propulsion systems		
Learning Outcomes to be assessed <i>(Please check Syllabus of the course/module)</i>	LO21. From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module LO22: To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules		
Duration	2 Hours	Approximate duration	2 Hours
Weight in evaluation	35%	Weight in evaluation	35%
Please note:			