

Academic Year/course: 2022/23

30180 - Avionics and aircraft general knowledge

Syllabus Information

Academic Year: 2022/23

Subject: 30180 - Avionics and aircraft general knowledge

Faculty / School: 179 - Centro Universitario de la Defensa - Zaragoza

Degree: 563 - Bachelor's Degree in Industrial Organisational Engineering

ECTS: 6.0

Year: 4

Semester: First semester

Subject Type: Optional

Module:

1. General information

1.1. Aims of the course

The subject Avionics and general knowledge of aircraft is framed within the module of Aviation, which includes two other related subjects.

This subject prepares the future pilots to understand and know the vehicles, the instrumentation and the environment in which they will develop their profession. In particular, the student is introduced to the terms and concepts used in the aeronautical environment, with special emphasis on their use in helicopters and drones. This includes, among others, the study of flight regimes, aircraft architecture and the fundamentals of atmospheric flight. Work is also done on the acquisition of a series of general management competencies, decision making, communication skills, teamwork and self-learning skills that must begin to be mastered in view of the proximity of the end of undergraduate studies.

Specialization in Defense: These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>): 9 "Industry, innovation and infrastructure", 15 "Life of terrestrial ecosystems" and 16 "Peace, justice and strong institutions". In such a way that the acquisition of the learning outcomes of the subject provides training and competence to contribute to some extent to their achievement. The aeronautical industry is a key sector in the Spanish economy both for its economic and technological impact and, on the other hand, without modern weapons systems it is impossible to guarantee peace and security for citizens. As for the future professional performance of a helicopter pilot, the usefulness of helicopters in the fight against environmental catastrophes such as forest fires cannot be forgotten.

1.2. Context and importance of this course in the degree

The subject of "Avionics and general knowledge of aircraft" is an optional one of 6 ECTS that is taught during the first semester of the fourth year. It is part of the Aviation Module, within the Elective Module of the Specialization in Defense. Its contents are designed both to serve as a basis for future training at the Army Aviation Academy of Colmenar Viejo, and to be applied in the future professional practice of graduates.

Specialization in Defense: This course contributes to the training of Army Officers, providing specific knowledge on the fundamental principles of the operation of rotary wing aircraft and developing part of the knowledge required to obtain the helicopter pilot's license needed by Army Officers of the fundamental specialty of Army Aviation to perform their mission and thus contribute to the development of their professional career.

To fulfill these purposes, extensive use is made of scientific-technical knowledge previously acquired in other subjects of Basic and Compulsory Training of the Degree. A list includes:

- 1) The ability to solve mathematical problems that may arise in Engineering (differential calculus and systems of equations) that has been achieved in the subjects "Mathematics I" "Mathematics II".
- 2) The understanding and mastery of the basic principles of mechanics, thermodynamics and electromagnetism that have been achieved in the subjects "Physics I" and "Physics II".
- 3) The basic knowledge of chemistry (thermodynamics and chemical kinetics) necessary to understand a combustion process that have been obtained in the subject of "Chemistry".
- 4) The capacity of abstraction to be able to view an object from different positions in space that is acquired in the subject "Graphic expression and computer-aided design".
- 5) The ability to apply the knowledge of optimization acquired in the subjects "Statistics" and "Operations Research".
- 6) The ability to identify the motion parameters of a mechanical system and its degrees of freedom, the understanding of the concepts of center of mass and inertia tensor and the application of vector theorems to mechanical systems acquired in the subject "Mechanics".

- 7) The identification of the applications and functions of electronics in engineering and the knowledge of the basic electronic components and devices, competences acquired in "Fundamentals of Electronics".
- 8) Knowledge of the fundamentals of automatisms and control methods acquired in "Automatic Systems".
- 9) The understanding of the concepts of stress and deformation acquired in "Strength of Materials".
- 10) The ability to handle technical literature written in English acquired in the different "English" subjects.

1.3. Recommendations to take this course

This is a fourth year subject, corresponding to the Fundamental Specialty of Aviation. As it is typical in most undergraduate curricula, when it comes to last year subjects, it makes use of a wide range of competences that the student has acquired in the previous subjects of the degree, so he should be able to successfully pass the evaluation activities. It is convenient to review the previous point (1.2. Context and sense of the subject in the degree) for a list of previous competences used in this subject and bear in mind that the use that will be made of those previous competences will be simplified and with a strongly applied character.

Given the organization of the syllabus, it will be necessary to introduce new concepts necessary for understanding the operation of a helicopter, corresponding to subjects that the student has not studied, especially in relation to Fluid Mechanics and Aerodynamics. But this will not be a problem, since the concepts will be clarified and reinforced in class.

2. Learning goals

2.1. Competences

After successfully passing the subject, students will be more competent to:

- Plan, budget, organize, lead, and control tasks, people and resources (C02).
- Solve problems and make decisions with initiative, creativity and critical thinking (C04).
- Communicate knowledge, skills and abilities in Spanish (C06).
- Work in a multidisciplinary team in a multilingual environment (C09).
- Develop long-life learning and continuous assessment skills (C11).
- Know and identify the terminology, technology and specific environment of aeronautics (C69).

2.2. Learning goals

The course combines a theoretical basis with an applied focus in order for the student to acquire the basic competences and knowledge for the decision making in their future career.

2.3. Importance of learning goals

The learning outcomes contain the competences that students should acquire in the module of Aviation as a part of their specialization in the Army. The learning outcomes are key for their later training as well as their future career as pilots.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he has achieved the expected learning outcomes by means of the following assessment activities

FIRST CALL

Continuous assessment:

The students will be able to pass the total of the subject by the continuous assessment procedure. To do this, they must demonstrate that they have achieved the expected learning results by passing the following assessment instruments, which will be carried out throughout the semester:

1. A short exam of objective and short answer tests on the contents of the first three topics that will weigh 20% of the final grade.
2. A long exam of development and problem-solving tests on the contents of the whole course, which will be weighted 50% of the final grade.
3. A theoretical-practical study carried out as a team, with final report and minutes of the work meetings included, on the structure, performance and operation of a military helicopter, which will be weighted 20% of the final grade.
4. The participation of the student in the elaboration of an English-Spanish glossary of aeronautical terms, which will be weighted 10% of the final grade.

The final grade of continuous evaluation (100%) will be calculated according to the specific weight of each continuous evaluation activity. In order to pass the subject, the student must obtain a final grade higher or equal to five and not have obtained a grade lower than three in any of the continuous evaluation activities.

Global test:

Students who do not pass the subject by continuous assessment or who would like to improve their grade will have the right to sit for the Global Test set in the academic calendar; prevailing, in any case, the best of the grades obtained. This global test will be equivalent to the continuous evaluation tests described above and will have a weight of 100% in the final grade. It will consist of an oral examination about all the contents of the subject to which the student will be able to go with the written materials he wants to prepare his answer during half an hour, once the questions to be answered are known. In order to pass the subject, the student must obtain a final grade higher or equal to five.

In the case that the average for continuous evaluation of the subject exceeds five, but there is some activity whose grade does not reach three, the student may request that the global test be limited to a repetition of the continuous evaluation tests in which he had not reached a grade of three.

SECOND CALL**Global test:**

Students who do not pass the subject in the first call may sit for a Global Test set in the academic calendar for the second call. This global test will consist of an exam of questions which need a developed answer and problem solving about all the contents of the subject whose weight will be 100% of the final grade.

EVALUATION CRITERIA.

In the objective tests, no marks will be deducted for wrong answers.

In the short answer exams, not only the correctness of the answer will be valued, but also the capacity of synthesis to approach it.

In the development exams, in addition to the cognitive competences, the communicative skills will be valued: writing with a fluent style, without spelling mistakes and with a good use of punctuation and logical reasoning.

In problem-solving exams, explanations given as to why each step is followed will be especially valued. A simple collection of formulas and numbers, completely correct but without any explanation, corresponds to a maximum grade of 6 out of 10 in the corresponding problem.

The theoretical-practical study will be evaluated by means of the minutes of the meetings of the work team that has carried out the study (20% of the grade of this activity) and the quality of the final report evaluated with criteria similar to those of the Final Degree Project; although without oral exposition: content 60% of the grade of the activity and presentation 20% of the grade of the activity (spelling, good structure of the work, sensible logical reasoning, use of connectors, ...; but not decorative aspects).

The development of the glossary will be evaluated by the quality of the student's contributions; to avoid duplication, several subsystems will be assigned to each student to inquire about the terms of application in that field. The following will be assessed as quality parameters: giving the translation of the word, a succinct explanation of the function of the component referred to, a couple of examples of use in a sentence and, if the teacher so indicates, the addition of an image that facilitates the understanding of the mechanism described. The translation will be added to a glossary created through the Moodle virtual course; the other elements (explanation, examples and images if requested) will be laid in a shared text document.

In the oral tests, if they took place, a dialogue between the teacher and the student would be established and the student's ability to communicate and respond to unforeseen events would be assessed, in addition to the specific knowledge of the subject. The SOLO (Structure of Observed Learning Outcome) method will be applied with questions aimed at evaluating the level of acquisition of competencies according to this scale: very deficient, numerical score 1, (the tasks are not correctly posed and the answers are usually irrelevant comments), insufficient, numerical score 3, (the student only focuses on one aspect and gives relevant answers but without depth), sufficient, numerical score 6, (the student identifies the fundamental aspects but is not able to relate them and has difficulties of expression), remarkable, numerical score 8, (knowledge has been integrated as a whole and there is the ability to analyze the same issue from different points of view) and outstanding, numerical score 10, (a level of abstraction has been reached that allows applying the concepts learned to situations different from those raised in the classroom, including real life).

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The approach, methodology and evaluation of this guide are prepared to be the same in any teaching scenario. They will be adjusted to the socio-sanitary conditions of each moment, as well as to the indications given by the competent authorities.

The teaching methodologies detailed below have been taken from among those proposed in the "Degree Verification Report", section 5.3.

The learning process that has been designed for this course is based on the following

There will be **lectures** in which the professor will explain the contents of the course. Students will be provided with notes in advance and it would be advisable that they had read, without the need of a deep study, those corresponding to the given session beforehand. It is essential that these sessions are used to raise doubts and that students have developed their ability to take notes. Competences C6, C11 and C69 will be worked on.

There will be **practical classes** of resolution of **exercises and problems** in which the student's participation will be promoted. The teacher will announce in advance the problems to be solved so that the students can work on them. It is fundamental to try and solve the problems in an autonomous way before the sessions. Even if a correct result has not been achieved, it is of great benefit to identify the points where a mistake was made. After the sessions, try to solve more problems independently. Remember that all problems can be solved by making use of the skills you have acquired or are in the process of acquiring. If you feel that, after a couple of days of seriously trying to solve a problem, you are stuck, go to **tutoring**. Skills C2, C4, C11 and C69 are worked on.

There will be a **group work** activity dedicated to the theoretical and practical study of the characteristics of a military helicopter. The teams will be formed by between three and five students who, in their work meetings, will have to rotate the roles of moderator and secretary who takes minutes of the progress and discussions that have taken place, these minutes will be subject to evaluation. The group constitution meeting will be a half-hour tutorial session with the professor and, from there on, further work will be autonomous, with the possibility of requesting additional **tutoring** if deemed necessary. It should be remembered that this is a group activity in which "everyone is responsible for everything". An organization of the activity in which each member is in charge of only one topic and neglects the rest will result in the final report being uneven in style and quality, which will be reflected in a low grade for all members of the group. In case of internal problems in the functioning of the group, a **tutoring** can be requested so that the teacher may help in the search for a solution. Competences C2, C4, C6, C9 and C69 are worked on.

The **theoretical study** of the contents of the course and the **practical study** of its application to the resolution of exercises and problems, in an autonomous way by the student, is fundamental in the learning process and to be able to pass the evaluation tests. It can be done individually or in small groups. Students can request support from the teacher through **tutoring** or consultations in the virtual course of the subject in the Moodle platform. It is advisable to keep some kind of record (notebook, diary, blog, ...) in which to note the doubts and achievements to facilitate a later review and to reflect on the learning strategies that are most profitable for each student. Competences C2, C4, C11 and C69 will be worked on.

A complementary activity of writing a glossary of English-Spanish technical terms related to the parts and components of a helicopter. Most of the technical literature and flight manuals are written in English, so it is desirable that future pilots master both English terminology and that used by Spanish flight mechanics. The competences C6, C9 and C69 will be worked.

4.2. Learning tasks

The proposed learning activities are realized inside the classroom (60 hours).

- Presentation of the contents of the course in lectures.
- Problem solving and case studies using theoretical contents and bibliographical references in practical classes.

and outside the classroom (90 hours)

- Autonomous work of the student of resolution of exercises and study of the theoretical documentation available to consolidate the acquired knowledge.
- The elaboration of a report as a result of the collaboration of a group of between three and five students.
- The elaboration of a glossary of aeronautical terms English-Spanish, through the Moodle platform as a joint activity of all students and the teacher.

4.3. Syllabus

The course will address the following topics:

1. Classification of aircraft.
2. The atmosphere.
3. Aircraft architecture.
4. Introduction to fluid dynamics.
5. Aerodynamic and control surfaces.
6. Power plant.
7. Aircraft performance and maneuvers.

4.4. Course planning and calendar

Teaching organization of the course in hours. Schedule of classroom sessions and presentation of assignments

	Classroom hours	Autonnmous hours	Total hours
Lectures	39	-	39
Problems/exercises solving	11	-	11
Tutoring	2	-	2
Continuous assessment tests	7	-	7
Group work	-	10	10
Autonomous theoretical study	-	51	53
Autonomous practical estudy	-	26	24
Preparation of an aeronautical english-spanish glossary	1	3	4

TOTAL HOURS

60

90

150

(*) The data that appear in the table of planning by hours are for guidance purposes, considering the homogeneity of the students.

(**) In the last three years the pass rate has been 100%, with the global evaluation test reduced to the last of the continuous evaluation tests. This year, with 100% of the grade available through continuous evaluation, it is not expected that any student who does not want to improve his/her grade will take the global test. Due to the extraordinary nature of this test, it has not been included in the timetable.

Schedule of classroom sessions and handing in of assignments

It will be announced by the teacher, both in class and through the moodle support platform, <https://moodle2.unizar.es/add/>.

To consult and expand on all topics related to the course, please visit: <http://moodle2.unizar.es> and <http://cud.unizar.es>.

In these addresses you can obtain information about:

- Academic calendar.
- Schedules and classrooms.
- Exam dates.

In addition, the professor will inform about any other matter that may arise related to the subject.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30180>