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Democratic and Popular Republic of Algeria

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Ministry of Higher Education and Scientific Research

University

LOGO

TRAINING OFFER
LMD

ACADEMIC LICENSE

NATIONAL PROGRAM
2018 – 2019

Establishment	Faculty / Institute	Department

Domain	Sector	Speciality
Sciences and Technologies	Aeronautics	Aeronautics

License Title: AERONAUTICS

Year: 2018-2019

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Educational Committee
National Domain
Science and Technology

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License Title: AERONAUTICS

Year: 2018-2019

Summary

I – License Identity Card

1 - Location of the training :

Faculty (or Institute):

Department :

References of the license authorization order (attach a copy of the order)

2 - External partners :

Other partner establishments:

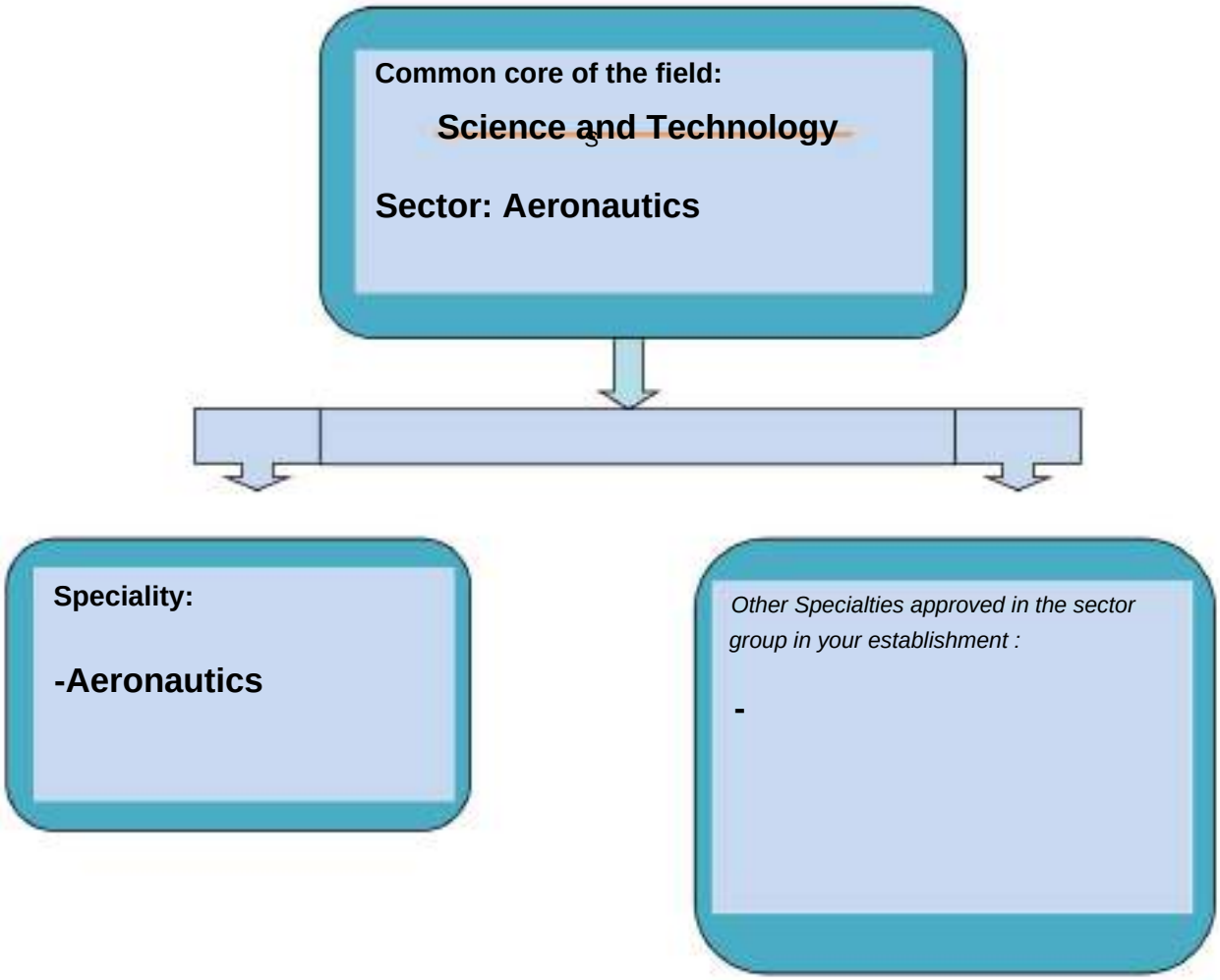
Businesses and other socio-economic partners:

International partners:

3 – Context and objectives of the training

A – General organization of the training : position of the project

If several licenses are offered or already supported at the establishment level (same training team or other training teams), indicate in the following diagram the position of this project in relation to the other courses.



B - Training objectives:

The objective of this **aeronautics** degree course is to train professional staff capable of mastering the structure and design of aircraft and their equipment in relation to the various stakeholders in the sector.

C – Targeted profiles and skills:

At the end of the training, graduates with a Bachelor's degree in **Aeronautics** will have the opportunity to:

ÿ to continue their training in a Master's degree,

ÿ to integrate the professional world to exercise and promote their expertise in the **Aeronautics** profession

D – Regional and national employability potential:

At the national level, graduates of **Aeronautics** can exercise one of the many activities in which these executives are in high demand:

- Assistant to the project manager in an R&D or marketing department of a company manufacturing of **aeronautical equipment.**
- Manager in a company in the **Aeronautics** maintenance and exploitation.

E – Gateways to other specialties:

Semesters 1 and 2 common	
Sector	**Specialties**
Aeronautics	Aeronautics
Civil engineering	Civil engineering
Climate engineering	Climate engineering
Maritime engineering	Naval Propulsion and Hydrodynamics
	Naval construction and architecture
Mechanical Engineering	Energy
	Mechanical construction
	Materials Engineering
Hydraulic	Hydraulic
Transportation Engineering	Transportation Engineering
Metallurgy	Metallurgy
Optics and precision mechanics	Optics and photonics
	Precision mechanics
Public works	Public works
Automatic	Automatic
Electromechanics	Electromechanics
	Industrial maintenance
Electronic	Electronic
Electrical engineering	Electrical engineering
Biomedical Engineering	Biomedical Engineering
Industrial engineering	Industrial engineering
Telecommunication	Telecommunication
Process engineering	Process engineering
Mining engineering	Mining
	Valorization of mineral resources
Hydrocarbons	Hydrocarbons
Industrial hygiene and safety	Industrial hygiene and safety
Petrochemical industries	Refining and petrochemicals

Table of sectors and specialties in the Science and Technology field

Sector group A	Common semester 3
Sector	**Specialties**
Automatic	Automatic
Electromechanics	Electromechanics Industrial maintenance
Electronic	Electronic
Electrical engineering	Electrical engineering
Biomedical Engineering	Biomedical Engineering
Industrial engineering	Industrial engineering
Telecommunication	Telecommunication

Group of streams B	Common semester 3
Sector	**Specialties**
Aeronautics	Aeronautics
Civil engineering	Civil engineering
Climate engineering	Climate engineering
Maritime engineering	Naval Propulsion and Hydrodynamics Naval construction and architecture
Mechanical Engineering	Energy Mechanical construction Materials Engineering
Hydraulic	Hydraulic
Transportation Engineering	Transportation Engineering
Metallurgy	Metallurgy
Optics and precision mechanics	Optics and photonics Precision mechanics
Public works	Public works

Sector group C	Common semester 3
Sector	**Speciality**
Process engineering	Process engineering
Mining engineering	Mining Valorization of mineral resources
Hydrocarbons	Hydrocarbons
Industrial hygiene and safety	Industrial hygiene and safety
Petrochemical industries	Refining and petrochemicals

The courses which present common basic teachings between them (semester 3) have been grouped into 3 groups: A, B and C. These groups correspond schematically to the families of Electrical Engineering (Group A), Mechanical Engineering and Civil Engineering (Group B) and finally Process Engineering and Mining Engineering (Group C).

This degree offers multidisciplinary and cross-disciplinary teaching programs:

Multidisciplinary, in the sense that the courses in this specialty are 100% identical for semesters 1 and 2 with all the specialties in the Science and Technology field. On the other hand, the courses in semester 3 for all the specialties in the same group of sectors are also 100% identical.

Half	Group of sectors	Common lessons
Semester 1	A - B - C	(30/30) Credits
Semester 2	A - B - C	(30/30) Credits
Semester 3	A – B	(18 / 30) Credits
	A – C	(18 / 30) Credits
	B – C	(24 / 30) Credits

In a transversal manner, this Licence offers the student the choice of joining, if he expresses the desire and depending on the teaching places available:

- All other specialties in the ST field at the end of semester 2.

- All specialties in the same group of courses at the end of semester 3.

- All specialties from another group of courses at the end of semester 3 (Subject to conditions of equivalence and opinion of the training team).

- All specialties in the same group of courses at the end of semester 4 (Subject to conditions of equivalence and opinion of the training team).

F – Expected performance indicators of the training:

All training must meet the quality requirements of today and tomorrow. As such, to better assess the expected performance of the training offered on the one hand and by exploiting the flexibility and adaptability of the LMD system on the other hand, a number of mechanisms are proposed, for information purposes, for this degree to evaluate and monitor the progress of teaching, the training programs, student/teacher and student/administration relationships, the future of graduates of this degree as well as the assessments of the university's partners regarding the quality of the graduates recruited and/or the teaching provided. It is up to the training team to enrich this list with other criteria according to its own means and objectives.

Evaluation methods can be implemented through surveys, on-site monitoring of students in training, and surveys of recruited graduates and their employers. To achieve this, a report must be prepared, archived, and widely disseminated.

1. Evaluation of the training progress:

In addition to the regular meetings of the teaching committee, a meeting is held at the end of each semester. It brings together teachers and students from the class to discuss any problems encountered, possible improvements to teaching methods in particular, and the quality of training in general.

To this end, a more or less exhaustive list of indicators and methods envisaged for the evaluation and monitoring of this training project by the educational committee is proposed below:

Before the training:

ÿ Evolution of the rate of students who have chosen this degree (supply/demand ratio). ÿ Rate and quality of students who choose this degree.

During training:

ÿ Regularity of educational committee meetings. ÿ Conformity of the themes of the End of Cycle Projects with the nature of the training.
ÿ Quality of the relationship between students and the administration.
ÿ Support provided to students in difficulty.
ÿ Student satisfaction rate with teaching and methods teaching.

Downstream of the training:

ÿ Student success rate per semester in this degree. ÿ Student dropout rate (failures and dropouts).
ÿ Identification of the causes of student failure.
ÿ Reorientation alternatives are offered to students who fail.
ÿ Rate of students who graduate on time. ÿ Rate of students who continue their studies after the bachelor's degree.

2. Evaluation of the progress of the lessons:

The teaching in this course is subject to regular evaluation (once a year) by the training team which will be made available, upon request, to the various institutions: National Educational Committee for the Field of Science and Technology, Regional Conferences, Vice-rectorate responsible for education, Faculty, etc.

Therefore, a system for evaluating programs and teaching methods can be established based on the following indicators:

ÿ Equipping teaching rooms and laboratories with materials and supports necessary for improving teaching (projection systems (data shows), Wi-Fi connection, etc.).

ÿ Existence of a communication and teaching platform in which courses, tutorials and practical work are accessible to students and their questions are answered.
ÿ Equipping educational laboratories with materials and equipment in adequacy with the content of the lessons.

- ÿ Number of actual teaching weeks provided during a semester. ÿ Rate of completion of teaching programs.
- ÿ Digitization and conservation of End of Studies and/or End of Cycle dissertations.
- ÿ Number of practical work carried out as well as the multiplication of the type of practical work per subject (diversity of practical work).
- ÿ Quality of the establishment's documentary collection in relation to the specialty and its accessibility.
- ÿ Support from the socio-economic sector for training (company visits, company internships, courses and seminars given by professionals, etc.).

3. Integration of graduates:

A coordination committee is created, composed of training managers and members of the Administration, which is mainly responsible for monitoring the integration of graduates of the sector into professional life, for creating a monitoring file of graduates of the sector, for identifying and/or updating existing economic and industrial potential at regional and national level, for anticipating and encouraging new professions related to the sector in association with the chamber of commerce, the various employment support agencies, public and private operators, etc., for participating in any action concerning the professional integration of graduates (organization of events with socio-economic operators).

To carry out these missions, this committee has full discretion to conduct or commission any study or survey on the employment and post-employment of graduates. Below is a list of indicators and methods that could be considered to evaluate and monitor this operation:

- ÿ Recruitment rate of graduates in the socio-economic sector in a position in direct relationship with training.
- ÿ Nature of jobs held by graduates.
- ÿ Diversity of outlets.
- ÿ Establishment of an association of former graduates of the sector.
- ÿ Creation of small businesses by graduates of the specialty.
- ÿ Degree of employer satisfaction.

G- Student assessment through continuous assessment and personal work:

G1- Evaluation by Continuous Assessment:

The importance of continuous assessment methods on student training in terms of educational outcomes is no longer in doubt. In this regard, Articles 20, 21 and 22 of Order 712 of 3 November 2011 define and specify the methods and organization of continuous assessment of students according to the training course. The calculation of continuous assessment averages (supervised work and practical work) is done based on a weighting of all the elements that make up this assessment. These articles specify that this weighting is left to the discretion of the teaching team.

A survey conducted by the CPND-ST among all teachers in the different university establishments showed heterogeneity in the implementation of

the continuous assessment of students. We are therefore led to admit a real deficit in the effective management of this educational activity, which required serious reflection on our part on this subject which, combined with proposals from several establishments, resulted in the recommendations below.

The analysis of the various proposals from these establishments showed that, indeed, Articles 21 and 22 of Order 712 of 3 November 2011 are not explicit enough and deserve more clarification. These articles could be enriched by taking into account the following points, which represent a summary of the proposals collected.

1. Proposals relating to subjects with supervised work:

0.0. Preparation of the exercise series:

The teacher responsible for the subject must organize himself by proposing a series of exercises for each chapter of the course. This series must be exhaustive, with exercises for understanding the course and standard exercises to be solved during tutorial sessions.
These exercises must be prepared by the student before attending the tutorial. This preparation may be assessed. The assessment method is left to the discretion of the instructor in charge of the tutorial.

Exercises not resolved in TD can be the subject of personal work to be completed by groups of 3 to 4 students and submitted for assessment (deadline: 1 week).

1.2. Written questions:

Each end of a series of exercises *(i.e.* each end of a chapter) will be marked by a short written test. This test must be organized in collaboration with the subject head in order to ensure a fair assessment for all students (essentially when several teachers are involved in the tutorials).

1.3. Student participation in tutorials:

This participation must be assessed. The assessment method is left to the discretion of the teacher in charge of the tutorial.

1.4. Student attendance:

Student attendance is mandatory for tutorials and practical work. It is difficult to monitor attendance in lectures for undergraduate students, where class sizes are very large (lectures in lecture halls).
For master's programs where numbers are reduced, attendance must be compulsory in lectures and tutorials.

2. Case of methodological units (Practical work):

Just like the tutorials, the practical work must be prepared by the student. A test to check this preparation must be organized by the teacher before each manipulation (in the form of short comprehension questions, multiple choice questions, diagram of the manipulation, etc.). A report (by working group) must be submitted at the end of the practical work session. As such, the teacher must prepare a standard report (outline) to facilitate the work for the students so that they can actually submit it at the end of the practical work session.

At the end of the semester, the teacher organizes a practical test which summarizes all of the manipulations carried out by the student.

3. Regarding cross-curricular and discovery subjects that do not have tutorials or practical work:

It is very difficult to carry out continuous assessments in these subjects due to the absence of tutorial sessions and the very large number of students in most cases, particularly for universities with very large numbers of students.

However, the teacher in charge of this subject may, if he/she wishes, inform the students that he/she may possibly assess them (ongoing) by asking them to prepare presentations, to make reports, to research the course supplement, to use free software, to ask the students to watch at home a popular science film related to the subject (after having given them either the film on electronic media or having given them the internet link to this film) and then asking them to submit a written report or to make an oral presentation of the summary of this film, etc. The bonus for these activities is left to the discretion of the teacher and the training team who alone are able to define the best way to take this personal work into account in the overall mark of the final exam.

Along the same lines, and in the case where the number of students in this subject is reasonable (20 to 30 students), which may be the case for many masters, the head of the subject may consider continuous assessments of the student similar to what is done in subjects with tutorials. The only obligation to respect is that students should be informed of this procedure and validated during the first Academic Council.

In any case, the teacher and the teaching team are free to include any type of assessment they deem appropriate to encourage students to take better charge of their course and, at the same time, combat the phenomenon of student absenteeism.
to the courses.

4. Harmonization of continuous monitoring:

Using a common assessment grid would promote the harmonization of these practices from one teacher to another, from one department to another, and from one institution to another. It would also provide a structuring and reassuring benchmark for students.
To do this, we propose below an indicative assessment grid which presents the different continuous assessments allowing us to evaluate the degree of acquisition of students' skills, whether in terms of knowledge, analytical skills or synthesis abilities.

It should be noted that these assessments are not intended to "trap" students by imposing very difficult continuous assessments on them. On the contrary, it is a matter of "honestly" assessing the degree of assimilation of the various skills and knowledge taught to the student in complete objectivity. In the same spirit, we would gain by promoting the contractualization of the assessment of learning by specifying, for example, the success criteria and good practices that would lead to correct and precise answers to the questions. Thus, the assessment would mainly focus on the acquired knowledge that has been the subject of training by giving exercises related to what has been prepared in TD without forgetting, however, to assess the ability of students to mobilize their skills in more complex situations.

4-1 Practical work:

Preparation of exercise series and personal work (homework to be submitted, presentations, etc.)	30%	06 points
Written questions (minimum 2 questions including one proposed by the subject manager)	50%	10 points
Student participation in tutorials	20%	04 points
Total	**100%**	**20 points**

4.2 Practical work:

Practical work preparation tests Report	20%	04 points
(must be submitted at the end of the practical work session)	40%	08 points
Practical test at the end of the semester on all the manipulations carried out by the student.	40%	08 points
Total	**100%**	**20 points**

G2- Student's personal work:

The student's personal work is part of the LMD spirit. A very substantial amount of time has been allocated to it each week: approximately 50% of the total training time (see the "Overall Training Summary" table in this training offer).
A survey conducted by the CPND-ST among training teams across all university establishments indicated that time spent on student personal work could be used wisely, under good teacher supervision, rationally and in various forms. The tasks that would then be completed by volunteer students would be evaluated and counted (as a bonus) in their overall continuous assessment grade. The rate of this bonus is left to the discretion of the teaching teams.

The synthesis of the different proposals can be summarized in the following points:

1. Homework :

In order to enrich the knowledge and strengthen the training of students, they will be asked to carry out additional homework guided by their course or tutorial teachers. This type of work will involve, for example, encouraging students to do research to answer specific and/or conflicting questions raised during the course, solving a difficult exercise, reviewing in detail the demonstration of a theorem, researching the complement to a course, using free software or a CAD-CAM tool to make applications and simulations related to the course, etc. These activities can be evaluated, graded and registered as a bonus for the students who complete them.

2. Mini course project:

The mini-course project (1 to 3 weeks) is an effective way to prepare students for the methodology of expression, writing, and documentary research. It allows them to put into practice the techniques learned in cross-curricular subjects. It also allows them to develop a teamwork spirit.

The theme of the mini course project must be well targeted and decided by the teacher for a group of students (2 to 5 maximum), sanctioned by a single report (10 pages maximum) and a short collective oral presentation (preferably with audio-visual support). A mark, common to the group, is awarded according to an evaluation grid (presentation of the document and use of bibliographic resources, oral presentation, respect for time, answers to questions, etc.) and will then be counted, as a bonus, in the continuous assessment mark.

3. Report of a visit, an educational outing or a discovery and/or immersion course:

Visits, educational outings, discovery and/or immersion courses are opportunities for students that can help them better understand the reality of the working world and help them achieve better professional integration later on.
Administrative managers and teachers must encourage, as much as possible, this very important aspect of training and ensure the organization of educational visits and outings throughout the training course.
They must also help/encourage students to prospect in economic institutions with the aim of finding (in L3 and M1) discovery and/or immersion internships of one to two weeks in the industrial environment during the winter and spring holidays.

In this context, teachers must ensure that students take notes during these outings and require reports (reports of a few pages). This activity can be evaluated, graded, and recorded as a bonus for the student who completes it. Students can be offered templates *to* help them present their internship report effectively.

4. Participation in scientific events:

In order to instill a scientific spirit in students (especially for higher education students), they should be guided and encouraged to participate in round tables, laboratory seminars and conferences organized within their faculty and/or institution. It is even advisable to encourage these students to attend conferences related to their specialty outside their university at exhibitions, fairs and other events.
This activity can be assessed, graded and entered as a bonus for the student who completes it.

5. Use of New Information and Communication Technologies:

ICTs are very attractive to students. Teachers should encourage them to use these technologies to create spaces for exchange among themselves (promotion pages, discussion forums on a specific course issue, etc.). The teacher can also participate in the group as an online evaluator. This activity can be evaluated, graded, and recorded as a bonus for students who participate.

Conclusion :

Student autonomy, considered a lever for success, is largely based on the personal work that the student is required to do, by appropriating the resources and tools made available to them. All of this must, of course, be supervised and formalized within the framework of the educational monitoring and support that must be provided jointly by the university teacher and the administrative manager throughout the training course.

This autonomy will allow him to build his professional identity based on his aspirations, his abilities and his achievements or even to build his academic career in the pursuit of higher education.

4 - Human resources available:

A: Supervision capacity (expressed in number of students that can be supported):

Number of students:

B: Internal teaching team mobilized for the specialty: (To be completed and endorsed by the faculty or institute)

First and last name	Graduation Diploma	Specialty diploma (Master, doctorate)	Grade	Subjects to be taught	Signing in

Departmental visa

Faculty or institute visa

C: External teaching team mobilized for the specialty: (To be completed and endorsed by the faculty or institute)

First and last name	Establishment of attachment	Graduation Diploma	Specialty diploma (Master, doctorate)	Grade	Subjects to be taught	Signing in

Departmental visa

Faculty or institute visa

D: Overall summary of human resources mobilized for the specialty (L3) :

Grade	Internal Staff	External Staff	Total
Teachers			
Lecturers (A)			
Lecturers (B)			
Assistant Professor (A)			
Assistant Professor (B)			
Other (*)			
Total			

(*) Technical and support staff

5 - Material resources specific to the specialty

A- Educational Laboratories and Equipment: **Sheet of existing educational equipment for the practical work of the planned training (1 sheet per laboratory)**

Lab title:

Student capacity:

No.	Equipment designation	Number	Observations

B- Internships and company training: (see agreements/conventions section)

Internship location	Number of students	Duration of the internship

C- Documentation available at the establishment level specific to the training offered (Mandatory field):

D- Personal work and ICT spaces available at department and faculty level :

II – Half-yearly organization sheets for the specialty courses

Semester 1

Unit teaching	Materials Titled	Credits	Coefficient	Hourly volume weekly Course	TD	TP		Volume Hourly Biannual (15 weeks)	Work Complementary in consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 1.1 Credits: 18 Coefficients: 9	Mathematics 1	6	3	3h00	1h30			67h30	82h30	40%	60%
	Physics 1	6	3	3h00	1h30			67h30	82h30	40%	60%
	Structure of matter	6	3	3h00	1h30			67h30	82h30	40%	60%
Methodological EU Code: UEM 1.1 Credits: 9 Coefficients: 5	Physics 1 Practical Work	2	1				1h30	10:30 p.m.	27:30	100%	
	Chemistry 1 practical work	2	1				1h30	10:30 p.m.	27:30	100%	
	Computer Science 1	4	2	1h30			1h30	45h00	55h00	40%	60%
	Writing methodology	1	1	1h00				3:00 p.m.	10:00 a.m.		100%
EU Discovery Code: UED 1.1 Credits: 1 Coefficients: 1	Careers in science and technologies 1	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 1.1 Credits: 2 Coefficients: 2	Foreign language 1 (French and/or English)	2	2	3h00				45h00	5:00 a.m.		100%
Total semester 1		**30**	**17**	**4:00 p.m.**	**4:30 a.m.**		**4:30 a.m.**	**375 hours**	**375 hours**		

Semester 2

Unit teaching	Materials Titled	Credits	Coefficient	Hourly volume weekly Course	TD	TP		Volume Hourly Biannual (15 weeks)	Work Complementary in consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 1.2 Credits: 18 Coefficients: 9	Mathematics 2	6	3	3h00	1h30			67h30	82h30	40%	60%
	Physics 2	6	3	3h00	1h30			67h30	82h30	40%	60%
	Thermodynamics	6	3	3h00	1h30			67h30	82h30	40%	60%
Methodological EU Code: UEM 1.2 Credits: 9 Coefficients: 5	Physics 2 Practical Work	2	1				1h30	10:30 p.m.	27:30	100%	
	Chemistry 2 practical work	2	1				1h30	10:30 p.m.	27:30	100%	
	Computer Science 2	4	2	1h30			1h30	45h00	55h00	40%	60%
	Presentation methodology	1	1	1h00				3:00 p.m.	10:00 a.m.		100%
EU Discovery Code: UED 1.2 Credits: 1 Coefficients: 1	Careers in science and technologies 2	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 1.2 Credits: 2 Coefficients: 2	Foreign language 2 (French and/or English)	2	2	3h00				45h00	5:00 a.m.		100%
Total semester 2		**30**	**17**	**4:00 p.m.**	**4:30 a.m.**		**4:30 a.m.**	**375 hours**	**375 hours**		

Semester 3

Unit teaching	Materials Titled	Credits	Coefficient	Hourly volume weekly Course	TD	TP	Volume Hourly Biannual (15 weeks)	Work Complementary in consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 2.1.1 Credits: 10 Coefficients: 5	Mathematics 3	6	3	3h00	1h30		67h30	82h30	40%	60%
	Waves and vibrations	4	2	1h30	1h30		45h00	55h00	40%	60%
Fundamental EU Code: UEF 2.1.2 Credits: 8 Coefficients: 4	Fluid mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Rational mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
Methodological EU Code: UEM 2.1 Credits: 9 Coefficients: 5	Probabilities and statistics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Computer Science 3	2	1			1h30	10:30 p.m.	27:30	100%	
	Technical drawing	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Waves and vibrations	1	1			1 hour	3:00 p.m.	10:00 a.m.	100%	
EU Discovery Code: UED 2.1 Credits: 2 Coefficients: 2	Basic technology	1	1	1h30			10:30 p.m.	2:30 a.m.		100%
	Metrology	1	1	1h30			10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 2.1 Credits: 1 Coefficients: 1	Technical English	1	1	1h30			10:30 p.m.	2:30 a.m.		100%
Total semester 3		**30**	**17**	**1:30 p.m.**	**7:30 a.m.**	**4:00 a.m.**	**375 hours**	**375 hours**		

Semester 4

Unit teaching	Titled	Credits	Coefficient	Hourly volume weekly			Volume Hourly Biannual (15 weeks)	Work Complementary in consultation (15 weeks)	Assessment method	
				Course	TD	TP			Control Continuous	Exam
Fundamental EU Code: UEF 2.2.1 Credits: 6 Coefficients: 3	Electronics and Avionics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Construction Aeronautics	2	1	1h30			10:30 p.m.	27:30		100%
Fundamental EU Code: UEF 2.2.2 Credits: 8 Coefficients: 4	Mathematics 4	4	2	1h30	1h30		45h00	55h00	40%	60%
	Numerical methods	4	2	1h30	1h30		45h00	55h00	40%	60%
Fundamental EU Code: UEF 2.2.3 Credits: 4 Coefficients: 2	Resistance of materials	4	2	1h30	1h30		45h00	55h00	40%	60%
EU Methodological Code: UEM 2.2 Credits: 9 Coefficients: 5	Drawing Assisted by Computer	2	1			1h30	10:30 p.m.	27:30	100%	
	Practical work on fluid mechanics	2	1			1h30	10:30 p.m.	27:30	100%	
	Numerical Methods Practical Work	2	1			1h30	10:30 p.m.	27:30	100%	
	Practical work on resistance of materials	1	1			1 hour	3:00 p.m.	10:00 a.m.	100%	
	Electronics TP	2	1			1h30	10:30 p.m.	27:30	100%	
EU Discovery Code: UED 2.2 Credits: 2 Coefficients: 2	Air Navigation	1	1	1h30			10:30 p.m.	2:30 a.m.		100%
	Regulation Aeronautics	1	1	1h30			10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 2.2 Credits: 1 Coefficients: 1	Expression and communication techniques	1	1	1h30			10:30 p.m.	2:30 a.m.		100%
Total semester 4		**30**	**17**	**12:00**	**6:00**	**7:00**	**375 hours**	**375 hours**		

Semester 5

Unit teaching	Materials Titled	Credits	Coefficient	Hourly volume weekly Course	TD	TP		Volume Hourly Biannual (15 weeks)	Work Complementary in consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 3.1.1 Credits: 10 Coefficients: 5	Aerodynamic	4	2	1h30	1h30			45h00	55h00	40%	60%
	Digital electronics	4	2	1h30	1h30			45h00	55h00	40%	60%
	Flight mechanics	2	1	1h30				10:30 p.m.	27:30		100%
Fundamental EU Code: UEF 3.1.2 Credits: 8 Coefficients: 4	Aeronautical structure	4	2	1h30	1h30			45h00	55h00	40%	60%
	Mechanics of the Environment Continues	4	2	1h30	1h30			45h00	55h00	40%	60%
Methodological EU Code: UEM 3.1 Credits: 9 Coefficients: 5	Aerodynamics TP	2	1				1h30	10:30 p.m.	27:30	100%	
	Digital Electronics TP	2	1				1h30	10:30 p.m.	27:30	100%	
	Aeronautical equipment and circuits	2	1				1h30	10:30 p.m.	27:30	100%	
	Aircraft CAD	3	2	1h30			1 hour	37h30	37h30	40%	60%
EU Discovery Code: UED 3.1 Credits: 2 Coefficients: 2	Light aviation	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
	Air transport	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 3.1 Credits: 1 Coefficients: 1	Environment and sustainable development	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Total semester 5		**30**	**17**	**1:30 p.m.**	**6:00 a.m.**		**5:30 a.m.**	**375 hours**	**375 hours**		

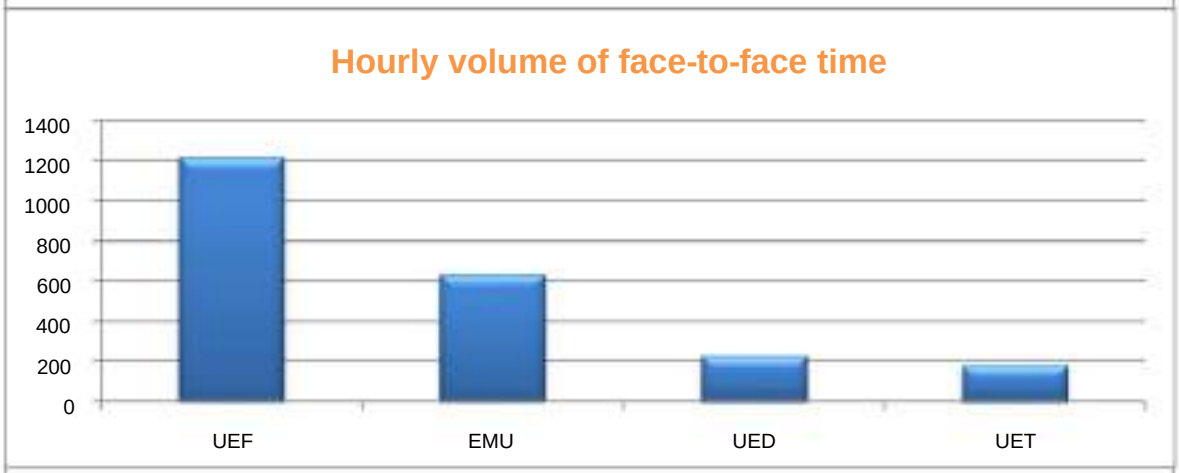
Semester 6

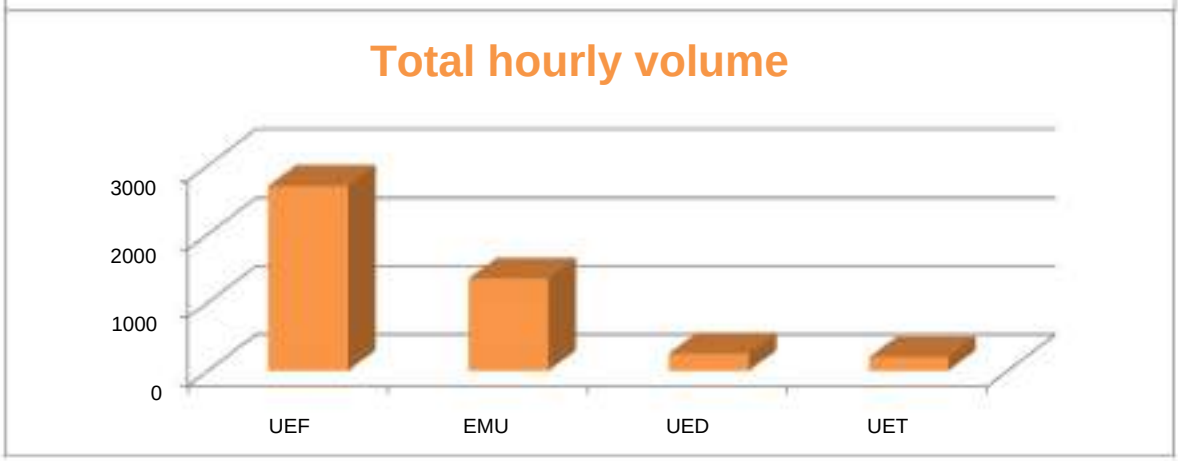
Unit teaching	Materials Titled	Credits	Coefficient	Hourly volume weekly Course	TD	TP		Volume Hourly Biannual (15 weeks)	Work Complementary in consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 3.2.1 Credits: 12 Coefficients: 6	Propulsion	4	2	1h30	1h30			45h00	55h00	40%	100%
	Aircraft engines	4	2	1h30	1h30			45h00	55h00	40%	100%
	Aircraft maintenance	4	2	1h30	1h30			45h00	55h00		
Fundamental EU Code: UEF 3.2.2 Credits: 6 Coefficients: 3	Air operations	4	2	1h30	1h30			45h00	55h00	40%	100%
	Air traffic and control	2	1	1h30				10:30 p.m.	27:30		100%
Methodological EU Code: UEM 3.2 Credits: 9 Coefficients: 5	End of Cycle Project	4	2				3:00 a.m.	45h00	55h00	100%	
	TP Propulsion and aircraft engines	2	1				1h30	10:30 p.m.	27:30	100%	
	On-site visit	3	2				2h30	37h30	37h30	100%	
EU Discovery Code: UED 3.2 Credits: 2 Coefficients: 2	Airport infrastructure	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
	Human factors in aeronautics	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 3.2 Credits: 1 Coefficients: 1	Professional Project and Business Management	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Total semester 6		**30**	**17**	**12:00**	**6:00**	**7:00**		**375 hours**	**375 hours**		

The assessment methods presented in these tables are given for information purposes only; the establishment's training team may suggest other weightings.

Overall training summary:

VH \ EU	UEF	EMU	UED	UET	Total
Course	720h00	120h00	225h00	6:00 p.m.	1245h00
TD	495h00	10:30 p.m.	---	---	5:17 p.m.
TP	---	487h30	---	---	487h30
Personal work	1485h00	720h00	25h00	8:00 p.m.	2250h00
Other (specify)	---	---	---	---	---
Total	2700h00	1350h00	250h00	8:00 p.m.	4500h00
Credits	108	54	10	8	180
% in credits for each EU	60%	30%	10%		100%





III - Detailed program by subject

Semester: 1

Teaching unit: UEF 1.1

Subject 1: Mathematics 1

VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)

Credits: 6

Coefficient: 3

Teaching objectives

This first mathematics subject is particularly dedicated to standardizing the level of students entering university. The first new elements are taught progressively in order to lead students towards more advanced mathematics. The concepts covered in this subject are fundamental and among the most used in the field of Science and Technology.

Recommended prior knowledge

Basic concepts of mathematics for final year classes (sets, functions, equations, etc.).

Content of the material:

Chapter 1. Methods of Mathematical Reasoning 1-1 Direct Reasoning. 1-2 Reasoning by Contraposition. 1-3 Reasoning by Absurdity. 1-4 Reasoning by Contraexample. 1-5 Reasoning by Recurrence. **(1 Week)**

Chapter 2. Sets, Relations and Applications 2.1 Set Theory. 2-2 Order Relation, Equivalence Relations. 2-3 Injective, Surjective, Bijective Application: Definition of an Application, Direct Image, Reciprocal Image, Characteristic of an Application. **(2 Weeks)**

Chapter 3. Real functions with one real variable (3 Weeks)
3-1 Limit, continuity of a function. 3-2 Derivative and differentiability of a function.

Chapter 4. Application to Elementary Functions 4-1 Power Function. 4-2 Logarithmic Function. 4-3 Exponential Function. 4-4 Hyperbolic Function. 4-5 Trigonometric Function. 4-6 Inverse Function **(3 Weeks)**

Chapter 5. Limited Development 5-1 Taylor's Formula. 5-2 Limited Development. 5-3 Applications. **(2 Weeks)**

Chapter 6. Linear Algebra 6-1 Laws and internal composition. 6-2 Vector space, basis, dimension (definitions and elementary properties). 6-3 Linear application, kernel, image, rank. **(4 Weeks)**

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1- K. Allab, Elements of analysis, Function of a real variable, 1st & 2nd years of university, Office of University Publications.

2- J. Rivaud, Algebra: Preparatory Classes and University Volume 1, Exercises with Solutions, Vuibert.

3- N. Faddeev, I. Sominski, Collection of exercises in higher algebra, Moscow Edition

4- M. Balabne, M. Duflo, M. Frish, D. Guegan, Geometry – 2e first cycle year classes preparatory, Vuibert University.

5- B. Calvo, J. Doyen, A. Calvo, F. Boshet, Algebra exercises, 1st scientific cycle preparation for the grandes écoles 2nd year, Armand Colin – Collection U.
6- J. Quinet, Elementary course in higher mathematics 1- Algebra, Dunod.
7- J. Quinet, Elementary course in higher mathematics 2- Usual functions, Dunod.
8- J. Quinet, Elementary course in higher mathematics 3- Integral calculus and series, Dunod.
9- J. Quinet, Elementary course in higher mathematics 4- Differential equations, Dunod.

Semester: 1

Teaching unit: UEF 0.0
Subject 2: Physics 1
VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives

Introduce the student to the basics of Newtonian physics through three main parts: Kinematics, Dynamics and Work and Energy.

Recommended prior knowledge

Notions of mathematics and physics.

Content of the material:

Mathematical reminders (2 Weeks)

1- Dimensional equations
2- Vector calculus: scalar product (norm), vector product, multivariate functions, derivation. Vector analysis: gradient, rotational operators, etc.

Chapter 1. Cinematics (5 Weeks)

1- Position vector in coordinate systems (Cartesian, cylindrical, spherical, curvilinear) - law of motion - Trajectory. 2- Velocity and acceleration in coordinate systems. 3- Applications: Movement of the material point in different coordinate systems. 4- Relative movement.

Chapter 2. Dynamics: (4 Weeks)

1- General: Mass - Force - Moment of force - Absolute and Galilean reference frame. 2- Newton's laws. 3- Principle of conservation of momentum. 4- Differential equation of motion. 5- Angular momentum. 6- Applications of the fundamental law for forces (constant, time-dependent, speed-dependent, central force, etc.).

Chapter 3. Work and Energy (4 Weeks)

1- Work of a force. 2- Kinetic energy. 3- Potential energy – Examples of potential energy (gravity, gravitational, elastic). 4- Conservative and non-conservative forces - Total energy theorem.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. A. Gibaud, Mr. Henry; Physics course - Mechanics of the point - Course and corrected exercises; Dunod, 2007.
2. P. Fishbane et al. ; Physics For Scientists and Engineers with Modern Physics, 3rd Ed.; 2005.
3. PA Tipler, G. Mosca; Physics For Scientists and Engineers, 6th Ed., WH Freeman Company, 2008.

Semester: 1

Teaching unit: UEF 1.1

Subject 3: Structure of matter

VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)

Credits: 6

Coefficient: 3

Teaching objectives

Teaching this subject allows students to acquire basic chemistry formalisms, particularly in the subject describing the atom and chemical bonding, chemical elements and the periodic table with energy quantification. Making students better able to solve chemistry problems.

Recommended prior knowledge

Basic concepts of mathematics and general chemistry.

Content of the material:

Chapter 1: Fundamental notions **(2 Weeks)**

States and macroscopic characteristics of the states of matter, changes of states of matter, notions of atom, molecule, mole and Avogadro's number, atomic mass unit, atomic and molecular molar mass, molar volume, Law of mass: Conservation of mass (Lavoisier), chemical reaction, Qualitative aspect of matter, Quantitative aspect of matter.

Chapter 2: Main constituents of matter Introduction: **(3 Weeks)**

Faraday's experiment: relationship between matter and electricity, Highlighting the constituents of matter and therefore of the atom and some physical properties (mass and charge), Rutherford's planetary model, Presentation and characteristics of the atom (Symbol, atomic number Z, mass number A, number of protons, neutrons and electrons), Isotopy and relative abundance of different isotopes, Separation of isotopes and determination of the atomic mass and the average mass of an atom: Mass spectrometry: Bainbridge spectrograph, Binding and cohesion energy of nuclei, Stability of nuclei.

Chapter 3: Radioactivity – Nuclear reactions **(2 Weeks)**

Natural radioactivity (ÿ, ÿ and ÿ radiation), Artificial radioactivity and nuclear reactions, Kinetics of radioactive decay, Applications of radioactivity.

Chapter 4: Electronic structure of the atom **(2 Weeks)**

Wave-particle duality, Interaction between light and matter, Bohr's atomic model: hydrogen atom, The hydrogen atom in wave mechanics, Polyelectronic atoms in wave mechanics.

Chapter 5: Periodic Classification of Elements D. Mendeleev's **(3 Weeks)**

Periodic Classification, Modern Periodic Classification, Evolution and Periodicity of Physicochemical Properties of Elements, Calculation of Radii (Atomic and Ionic), Successive Ionization Energies, Electronic Affinity and Electronegativity (Mulliken Scale) by Slater's Rules.

Chapter 6: Chemical Bonds **(3 Weeks)**

Covalent bonding in Lewis theory, Polarized covalent bonding, dipole moment and partial ionic character of the bond, Geometry of molecules: Gillespie theory or VSEPR, Chemical bonding in the quantum model.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references 1.

Ouahes, Devallez, General Chemistry, OPU.
2. SS Zumdhal & coll., General Chemistry, De Boeck University.
3. Y. Jean, Electronic structure of molecules: 1 from the atom to simple molecules, 3rd edition, Dunod, 2003.

4. F. Vassaux, Chemistry in IUT and BTS.
5. A. Casalot & A. Durupthy, Inorganic Chemistry 2nd cycle course, Hachette.
6. P. Arnaud, Course in Physical Chemistry, Ed. Dunod.
7. M. Guymont, Structure of matter, Belin Coll., 2003.
8. G. Devore, General Chemistry: T1, study of structures, Coll. Vuibert, 1980.
9. M. Karapetiantz, Constitution of Matter, Ed. Mir, 1980.

Semester: 1

Teaching unit: UEM 0.0 Subject 1: Physics

1 VHS: 22h30 (TP: 1h30)

Credits: 2
Coefficient: 1

Teaching objectives

Consolidate the theoretical knowledge provided in the course through a number of practical exercises.

Recommended prior knowledge: Notions of mathematics and physics.

Content of the material:

5 manipulations minimum (3 hours / 15 days):

- Methodology for presenting practical work reports and calculating errors.
- Verification of Newton's 2nd law - Free fall -
Simple
pendulum - Elastic
collisions - Inelastic collisions
- Moment of inertia - Centrifugal
force

Assessment method:

Continuous assessment: 100%.

Semester: 1

Teaching unit: UEM 1.1

Subject 2: Chemistry 1 Practical Work

VHS: 10:30 p.m. (TP: 1:30 p.m.)

Credits: 2

Coefficient: 1

Teaching objectives

Consolidate the theoretical knowledge provided during the structure of matter course through a number of practical exercises.

Recommended prior knowledge

Basic Chemistry Concepts.

Content of the material:

1. Laboratory safety

2. Preparation of solutions

3. Notions on uncertainty calculations applied to chemistry.

4. Acid-base dosage by colorimetry and pH-metry.

5. Acid-base dosage by conductivity meter.

5. Oxidation-reduction assay

6. Determination of water hardness

7. Determination of ions in water: determination of chloride ions by the Mohr method.

Assessment method:

Continuous assessment: 100%

Semester: 1

Teaching unit: UEM 1.1

Subject 3: Computer Science 1

VHS: 45h00 (Lecture: 1h30, Practical work: 1h30)

Credits: 4

Coefficient: 2

Objective and recommendations:

The objective of the subject is to enable students to learn to program using a high-level language (Fortran, Pascal, or C). The choice of language is left to the discretion of each institution.
The notion of algorithm must be taken into account implicitly during language learning.

Recommended prior knowledge

Basic concepts of web technology.

Content of the material:

Part 1. **Introduction to Computer Science** 1- Definition of Computer Science **(5 Weeks)**

2- Evolution of computing and computers
3- Information coding systems
4- Operating principle of a computer
5- Hardware part of a computer
6- System part
Basic systems (operating systems (Windows, Linux, Mac OS, ...)
Programming languages, application software

Part 2. **Concepts of algorithm and program** 1- **(10 Weeks)**

Concept of an algorithm
2- Organizational chart representation
3- Structure of a program
4- The approach and analysis of a problem
5- Data structure: Constants and variables, Data types
6- Operators: assignment operator, relational operators, logical operators, arithmetic operations, priorities in operations
7- Input/output operations
8- Control structures: Conditional control structures, Repetitive control structures

Computer Science 1:

The practical exercises are intended to illustrate the concepts taught during the course. These exercises should begin with the lessons according to the following schedule:
• Introductory and familiarization work with the computer machine from a hardware and operating system point of view (exploration of the different functionalities of the OS)
• Introductory practical work on using a programming environment (Editing, Assembly, Compilation, etc.)

• Practical work on applying programming techniques seen in class.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references 1-

John Paul Mueller and Luca Massaron, Algorithms for Dummies large format, 2017.

2- Charles E. Leiserson, Clifford Stein and Thomas H. Cormen, Algorithmics: course with 957 exercises and 158 problems, 2017.
3- Thomas H. Cormen, Algorithms: Basic Notions, 2013.

Semester: 1

Teaching unit: UEM 1.1

Subject 4: Writing Methodology

VHS: 3:00 p.m. (Class: 1 hour)

Credits: 1

Coefficient: 1

Teaching objectives

To familiarize and train students with current concepts of writing methodology in force in the Science and Technology profession. Among the skills to be acquired: Knowing how to present oneself; Knowing how to write a CV and a cover letter; Knowing how to position oneself in writing or orally in relation to an opinion or an idea; Mastering syntax and spelling in writing.

Recommended prior knowledge

Basic French. Basic principles of writing a document.

Content of the material:

Chapter 1. Concepts and generalities on writing techniques - Definitions, standards **(2 Weeks)**

- Applications: writing a summary, a letter, a request

Chapter 2. Information retrieval, synthesis and exploitation - Information retrieval in libraries (Paper format: Books, Journals) **(3 Weeks)**

-Researching information on the Internet (Digital: Databases; Search engines, etc.).

- Applications

Chapter 3 Techniques and Procedures of Writing **(3 Weeks)**

- Basic Principles of Writing - Punctuation, Syntax, Sentences
- The length of sentences
- Division into paragraphs
- The use of a neutral style and writing in the third person
- Readability
- Objectivity
- Intellectual rigor and plagiarism

Chapter 4 Writing a Report **(4 Weeks)**

Cover pages, Summary, Introduction, Method, Results, Discussion, Conclusion, Bibliography, Appendices, Summary and Keywords

Chapter 5. Applications **(3 Weeks)**

Report of a practical work

Assessment method:

Control Exam: 100%.

Bibliographic references:

1. J.-L. Lebrun, Practical guide to scientific writing, EDP Sciences, 2007.
2. M. Fayet, Successful Reporting, 3rd edition, Eyrolles, 2009.
3. M. Kalika, Master's thesis - Managing a thesis, Writing a report, Preparing a defense, Dunod, 2016.

4. M. Greuter, Succeeding in your dissertation and internship report, l'Etudiant, 2014
5. F. Cartier, Written and oral communication, Edition GEP- Groupe Eyrolles, 2012.

6. M. Fayet, Methods of written and oral communication, 3rd edition, Dunod, 2008.
7. E. Riondet, P. Lenormand, The big book of letter models, Eyrolles, 2012.
8. R. Barrass, Scientist must write – A guide to better writing for scientists, engineers and students, 2d edition, Routledge, 2002.
9. G. Andreani, The Practice of Correspondence, Hachette, 1995.
10. Ph. Rubens, Science & Technical Writing, A Manual of Style, 2d edition, Routledge, 2001.
11. A. Wallwork, User Guides, Manuals, and Technical Writing – A Guide to Professional English, Springer, 2014.

Semester: 1

Teaching unit: UED 1.1

Subject 1: Careers in Science and Technology 1

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Objective of the subject:

To introduce the student, in a first step, to all the sectors covered by the Science and Technology Field and in a second step to a range of careers that these sectors lead to. In the same context, this subject introduces the new challenges of sustainable development as well as the new careers that can result from it.

Recommended prior knowledge

None.

Content of the subject:

1. What are engineering sciences? (2 weeks)

The engineering profession, history and challenges of the 21st century, Search for a profession/recruitment advertisement by keyword, develop a simple job description (job title, company, main activities, skills required (knowledge, know-how, interpersonal skills)

2. Electronics, Telecommunications, Biomedical Engineering, Electrotechnics, Electromechanics, Optics & Precision Mechanics sectors: - Definitions, **(2 weeks)**

areas of application (Home automation, embedded applications for automobiles, Video surveillance, Mobile telephony, Optical fiber, Advanced scientific instrumentation, Imaging

and Medical Instrumentation , Giant Mirrors, Contact Lenses, Transport and Distribution of Electrical Energy, Power Generation Plants, Energy Efficiency, Maintenance of Industrial Equipment, Elevators, Wind Turbines, etc.

- Role of the specialist in these areas.

3. Automation and Industrial Engineering sectors: - **(1 week)**

Definitions, areas of application (Automated industrial chains, Numerical Control Machine Tools, Robotics, Inventory Management, Goods Traffic Management, Quality, - Role of the specialist in these areas.

4. Process Engineering, Hydrocarbons and Petrochemical Industries:

(2 weeks)

- Definitions, Pharmaceutical industry, Food industry, Leather and textile industry, Biotechnologies, Chemical and petrochemical industry, Plastics industry, Energy sector (oil, gas), etc.

- Role of the specialist in these areas.

5. Sustainable development (SD): (4 weeks)

Definitions, Global issues (climate change, Demographic transitions, Depletion of resources (oil, gas, coal, etc.), Biodiversity loss, etc.), SD diagram (Sustainable = Viable + Livable + Equitable), SD actors (governments, citizens, socio-economic sector, international organizations, etc.), Global nature of SD challenges

6. Sustainable engineering: Definition, Principles of sustainable engineering (definitions of: sustainable energy/energy efficiency, sustainable mobility/ecomobility, resource recovery (water, metals and minerals, etc.), production **(4 weeks)**

sustainable), Relevance of sustainable engineering in ST sectors, Relationship between sustainability and engineering, Responsibility of engineers in carrying out sustainable projects, …

Student's personal work for this subject:

The teacher in charge of this subject can let his students know that he can always assess them by asking them to prepare job descriptions. Ask students to watch a popular science film at home related to the chosen job (after giving them either the film electronically or giving them the internet link to this film) and then ask them to submit a written report or make an oral presentation of the summary of this film, etc. The bonus for these activities is left to the discretion of the teacher and the training team who alone are able to define the best way to take this personal work into account in the overall grade of the final exam.

Group work: Development of job descriptions for professions in each sector based on recruitment advertisements found on job application sites (e.g. **http://www.onisep.fr/Decouvrir-les-metiers,** www.indeed.fr, **www.pole-emploi.fr)** (1 sector / group).

Depending on the capacity of the establishments, recommend calling on doctoral students and former graduates of the establishment in a tutoring/mentoring system where each group can call on its tutor/mentor to develop the job description/ discover the different ST professions.

Assessment method:

100% exam

Bibliographic references:

1- What jobs for tomorrow? Publisher: ONISEP, 2016, Collection: Les Dossiers.
2- J. Douënel and I. Sédès, Choosing a career according to your profile, Editions d'Organisation, Collection: Employment & career, 2010.
3- V. Bertereau and E. Ratière, What Job Are You Made For? Publisher: L'Étudiant, 6th edition, Collection: Métiers, 2015.

4- The great book of professions, Publisher: L'Étudiant, Collection: Métiers, 2017.
5- Careers in the aeronautics and space industry, Collection: Parcours, Edition: ONISEP, 2017.
6- Careers in electronics and robotics, Collection: Parcours, Edition: ONISEP, 2015.
7- Environmental and sustainable development professions, Collection: Parcours, Edition: ONISEP, 2015.

8- Construction and public works trades, Collection: Parcours, Edition: ONISEP, 2016.
9- Transport and logistics professions, Collection: Parcours, Edition: ONISEP, 2016.
10- Energy professions, Collection: Parcours, Edition: ONISEP, 2016.
11- Mechanical professions, Collection: Parcours, Edition: ONISEP, 2014.
12- Careers in chemistry, Collection: Parcours, Edition: ONISEP, 2017.
13- Web professions, Collection: Parcours, Edition: ONISEP, 2015.
14- Careers in biology, Collection: Parcours, Edition: ONISEP, 2016.

Semester: 1

Teaching unit: UET 1.1

Subject 1: French language1

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives:

This subject aims to develop the following four skills: Oral comprehension, Written comprehension, Oral expression and Written expression through reading and studying texts.

Recommended prior knowledge:

Basic French.

Content of the material:

Below we offer a set of themes that cover fundamental sciences, technologies, economics, social issues, communication, sports, health, etc. The teacher can choose texts from this list to develop them during the course. Otherwise, they are free to address other themes of their choice. The texts can be borrowed from various communication media: daily newspapers, sports or entertainment magazines, specialized or popular magazines, books, websites, audio and video recordings, etc.

For each text, the teacher helps the student develop their linguistic skills: listening, comprehension, and oral and written expression. In addition, they must use this text to identify the grammatical structures they will develop during the same class session. Here, for illustration purposes, we recall a set of grammatical structures that can be developed as examples. Of course, it is not a question of developing them all or in the same way. Some can be recalled and others in great detail.

Examples of themes	Grammatical structures
Climate change Pollution The electric car The robots Artificial intelligence The Nobel Prize The Olympic Games Sports at school The Sahara The currency Assembly line work Ecology Nanotechnologies Optical fiber The engineering profession The power plant Energy efficiency The smart building Wind energy Solar energy	Punctuation. Proper nouns, Articles. Grammatical functions: The noun, The verb, The pronouns, The adjective, The adverb. The complement pronoun "le, la, les, lui, leur, y, en, me, te, … The agreements. The negative sentence. Don't…, Don't… yet, Don't… anymore, Don't… ever, Don't… point, … The interrogative sentence. Question with "Who, What, What", Question with "When, Where, How much, Why, How, Which, Which". The exclamatory sentence. Reflexive verbs. Impersonal verbs. The indicative tenses: Present, Future, Past Perfect, Simple Past, Imperfect. …

Assessment method:

Review: 100%.

Bibliographic references:

1. M. Badefort, Objective: International French Test, Edulang, 2006.
2. O. Bertrand, I. Schaffner, Passing the TCF, Exercises and training activities, Les éditions de l'école polytechnique, 2009.
3. M. Boulares, J.-L. Frerot, Progressive French Grammar with 400 exercises, Advanced Level, CLE International.
4. Collective, Besherelles: Grammar for all, Hatier.
5. Collective, Besherelles: Conjugation for all, Hatier.
6. Mr. Grégoire, Progressive French Grammar with 400 exercises, Beginner Level, CLE International, 1997.
7. A. Hasni et al., Training in teaching science and technology in secondary schools, University of Quebec Press, 2006.
8. J.-L. Lebrun, Practical guide to scientific writing, EDP Sciences, 2007.
9. JM Robert, Difficulties of French, Hachette, 10.
C. Tisset, Teaching the French language at school: Grammar, Spelling and Conjugation, Hachette Education, 2005.
11. J. Bossé-Andrieu, Summary of the Rules of Grammar and Spelling, University Press Quebec, 2001.
12. J.-P. Colin, French made simple, Eyrolles, 2010.
13. Collective, French Assessment Test, Hachette, 2001.
14. Y. Delatour et al., Practical French grammar in 80 cards with corrected exercises, Hachette, 2000.
15. Ch. Descotes et al., The Exerciser: French Expression for the Intermediate Level, Presses Grenoble University, 1993.
16. H. Jaraush, C. Tufts, On the Vif, Heinle Cengage Learning, 2011.
17. J. Dubois et al, The Essentials – Spelling, Larousse, 2009.

Semester: 1

Teaching Unit: UET 1.1 Subject 1: English Language 1 VHS: 10:30 p.m. (Course: 1.5 hours)
Credit: 1
Coefficient: 1

Objective:
Develop the reading, writing, listening and speaking abilities of the students.

Recommended prior Knowledge: Basic English.

Contents:
The English syllabus consists of a set of texts containing scientific and technical parts. The chosen texts must be used to study scientific and technical English and Grammar acquisition.
The texts must be selected according to the vocabulary built up, familiarization with both scientific and matters in English for further understanding. Therefore, each text will be defined by a set of vocabulary concepts, a set of special sentences (idioms) and comprehension questions.
The texts must also contain a terminology which means the translation of some words from English to French one. , the activity at the end of each session must include a translation of long statements which are selected from the texts.

Examples for some readings: Examples of Word Study: Patterns Iron and Steel Make +
Noun + Adjective Heat Treatment of Steel.
Quantity, Contents
Lubrication of Bearings.
Enable, Allow, Make, etc. + Infinitive The Lathe.
Comparative, Maximum and Minimum Welding.
The Use of Will, Can and May Steam
Boilers.
Prevention, Protection, etc., Steam Locomotives
Classification.
The Impersonal Passive
Condensation and Condensers.
Passive Verb + By + Noun (agent)
Centrifugal Governors.
Too Much or Too Little
Impulse Turbines.
Instructions (Imperative)
The Petro Engine.
Requirements and Necessity Means
The Carburetion System.
(by + Noun or –ing)
The Jet Engine.
Time Statements
The Turbo-Prop Engine.
Function, Duty
Aerofoil.
Alternatives

Evaluation mode:
Exam: 100%.

References:

1. J. Upjohn, S. Blattes, V. Jans, Minimum Competence in Scientific English, Office of University Publications, 1994.
2. AJ Herbert, The Structure of Technical English, Longman, 1972.
3. S. Berland-Delepine, Methodical grammar of modern English with exercises, Ophrys, 1982.
4. Test of English as a Foreign Language – Preparation Guide, Cliffs, 1991.
5. R. Fowler, The Little, Brown Handbook, Little, Brown Company, 1980.
6. Cambridge – First Certificate in English, Cambridge books, 2008.
7. K. Wilson, Th. Healy, First Choice, Oxford, 2007.

8. M. Mann, S. Tayore-Knowles, Destination: Grammar & Vocabulary with Answer Key, MacMillan, 2006.
9. E. Hamby, Ph. Bedford Robinson, Special English Computer Applications, Cassell, 1980.
10. P. Charles Brown, Norma D. Mullen, English for Computer Science, Oxford University Press, 1989.
11. Graeme Kennedy, Structure and Meaning in English: A Guide for Teachers, Pearson, 2004.
12. Anne M. Hanson, Brain-Friendly Strategies for Developing Student Writing Skills, 2nd Edition, Corwin Press, 2008.
13. Ann Bridges, How to Pass Higher English, Hodder Gibson-Hachette, 2009.
14. Claude Renucci, English: 1000 Words and Expressions from the Press: Vocabulary and Expressions from the Economic, Social and Political World, Fernand Nathan, 2006.

Semester: 2

Teaching unit: UEF 1.2

Subject 1: Mathematics 2

VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)

Credits: 6

Coefficient: 3

Teaching objectives

Students are led, step by step, towards understanding mathematics useful for their university studies. At the end of the course, the student should be able to: solve first and second degree differential equations; solve integrals of rational, exponential, trigonometric and polynomial functions; solve systems of linear equations using several methods.

Recommended prior knowledge

Basic concepts of mathematics (differential equation, integrals, systems of equations, etc.)

Content of the material:

Chapter 1: Matrices and Determinants **(3 Weeks)**

1-1 Matrices (Definition, Operation). 1-2 Matrix associated with a linear map. 1-3 Linear map associated with a matrix. 1-4 Change of basis, transition matrix.

Chapter 8: Systems of Linear Equations **(2 Weeks)**

2-1 Generalities. 2-2 Study of the Solution Set. 2-3 Methods for Solving a Linear System. Solving by Cramer's Method. Solving by the Inverse Matrix Method.
Resolution by the Gauss method

Chapter 3: Integrals 3-1 **(4 Weeks)**

Indefinite Integral, Property. 3-2 Integration of Rational Functions. 3-3 Integration of Exponential and Trigonometric Functions. 3-4 Integral of Polynomials. 3-5 Definite Integration

Chapter 4: Differential Equations 4-1 **(4 Weeks)**

Ordinary Differential Equations. 4-2 First-Order Differential Equations. 4-3 Second-Order Differential Equations. 4-4 Second-Order Ordinary Differential Equations
constant coefficient.

Chapter 5: Functions of Several Variables 5-1 **(2 Weeks)**

Limit, Continuity, and Partial Derivatives of a Function. 5-2 Differentiability. 5-3 Double and Triple Integrals.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1- F. Ayres Jr, Theory and Applications of Differential and Integral Calculus - 1175 corrected exercises, McGraw-Hill.

2- F. Ayres Jr, Theory and Applications of Differential Equations - 560 corrected exercises, McGraw-Hill.

3- J. Lelong-Ferrand, JM Arnaudiès, Mathematics Course - Differential Equations, Multiple Integrals, Volume 4, Dunod University.

4- M. Krasnov, Collection of problems on ordinary differential equations, Moscow Edition

5- N. Piskunov, Differential and Integral Calculus, Volume 1, Moscow Edition
6- J. Quinet, Elementary course in higher mathematics 3- Integral calculus and series, Dunod.
7- J. Quinet, Elementary course in higher mathematics 4- Differential equations, Dunod.
8- J. Quinet, Elementary course in higher mathematics 2- Usual functions, Dunod.
9- J. Quinet, Elementary course in higher mathematics 1- Algebra, Dunod.
10- J. Rivaud, Algebra: Preparatory Classes and University Volume 1, Exercises with Solutions, Vuibert.

11- N. Faddeev, I. Sominski, Collection of exercises in higher algebra, Moscow Edition.

Semester: 2
Teaching unit: UEF 0.8
Subject 2: Physics 2
VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives

To introduce the student to the physical phenomena underlying the laws of electricity in general.

Recommended prior knowledge

Mathematics 1, Physics 1.

Subject content: Mathematical reminders: (1 week)

1- Elements of length, surface, volume in Cartesian, cylindrical, spherical coordinate systems. Solid angle, Operators (gradient, rotational, Nabla, Laplacian and divergence).

2- Multiple derivatives and integrals.

Chapter I. Electrostatics: (6 Weeks)

1- Electrostatic charges and fields. Electrostatic interaction force - Coulomb's law.
2- Electrostatic potential. 3- Electric dipole. 4- Electric field flux. 5- Gauss's theorem. 6- Conductors in equilibrium. 7- Electrostatic pressure. 8- Capacitance of a conductor and a capacitor.

Chapter II. Electrokinetics: (4 Weeks)

1- Electrical conductor. 2- Ohm's law. 3- Joule's law. 4- Electrical circuits. 5- Application of Ohm's Law to networks. 6- Kirchhoff's Laws. Thevenin's Theorem.

Chapter III. Electromagnetism: (4 Weeks)

1- Magnetic field: Definition of a magnetic field, Biot and Savart's law, Ampere's theorem, Calculation of magnetic fields created by permanent currents.
2- Induction phenomena: Induction phenomena (circuit in a variable magnetic field and moving circuit in a permanent magnetic field), Lorentz force, Laplace force, Faraday's law, Lenz's law, Application to coupled circuits.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. J.-P. Perez, R. Carles, R. Fleckinger; Electromagnetism Foundations and Applications, Ed. Dunod, 2011.
2. H. Djelouah; Electromagnetism; Office of University Publications, 2011.
3. P. Fishbane et al. ; Physics For Scientists and Engineers with Modern Physics, 3rd ed. ; 2005.
4. PA Tipler, G. Mosca; Physics For Scientists and Engineers, 6th ed., WH Freeman Company, 2008.

Semester: 2

Teaching unit: UEF 1.2

Subject 3: Thermodynamics

VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)

Credits: 6

Coefficient: 3

Teaching objectives

Provide the necessary foundations of classical thermodynamics for applications to combustion and thermal machines. Homogenize students' knowledge. The skills to be acquired are: The acquisition of a scientific basis of classical thermodynamics; The application of thermodynamics to various systems; The statement, explanation and understanding of the fundamental principles of thermodynamics.

Recommended prior knowledge

Basic mathematics.

Content of the material:

Chapter 1: Generalities on thermodynamics 1- **(3 Weeks)**
Fundamental properties of state functions. 2- Definitions of thermodynamic systems and the external environment. 3- Description of a thermodynamic system. 4- Evolution and thermodynamic equilibrium states of a system. 5- Possible transfers between the system and the external environment. 6-
Transformations of the state of a system (operation, evolution). 7- Reminders of the laws of ideal gases.

Chapter 2: The 1st principle of thermodynamics: 1. Work, **(3 weeks)**
heat, internal energy, concept of conservation of energy. 2. The 1st principle of thermodynamics: statement, concept of internal energy of a system, application to ideal gas, enthalpy function, heat capacity, reversible transformations (isochoric, isobaric, isothermal, adiabatic).

Chapter 3: Applications of the first principle of thermodynamics to thermochemistry
(3 weeks)

Heats of reaction, standard state, standard enthalpy of formation, enthalpy of dissociation, enthalpy of change of physical state, enthalpy of a chemical reaction, Hess's law, Kirchoff's law.

Chapter 4: The 2nd Law of Thermodynamics 1- The 2nd law **(3 weeks)**
for a closed system. 2. Statement of the 2nd law: Entropy of a closed isolated system. 3. Calculation of the variation of entropy: reversible isothermal transformation, reversible isochoric transformation, reversible isobaric transformation, adiabatic transformation, during a change of state, during a chemical reaction.

Chapter 5: The 3rd Principle and Absolute Entropy **(1 week)**

Chapter 6: Free Energy and Enthalpy – Criteria for the Evolution of a System (2 weeks)
1- Introduction. 2- Free energy and enthalpy. 3- Chemical equilibria

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. C. Coulon, S. Le Boiteux S. and P. Segonds, Thermodynamics Physics - Course and exercises with solutions, Dunod Edition.

2. HB Callen, Thermodynamics, Course, Edition John Wiley and Sons,
1960 3. R. Clerac, C. Coulon, P. Goyer, S. Le Boiteux & C. Rivenc, Thermodynamics, Course and tutorials in thermodynamics, University of
Bordeaux 1, 2003 4. O. Perrot, Thermodynamics Course, IUT of Saint-Omer, Dunkirk, 2011
5. CL Huillier, J. Rous, Introduction to thermodynamics, Dunod Edition.

Semester: 2

Teaching unit: UEM 0.8

Subject 1: Physics 2 Practical Work

VHS: 45h00 (TP: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives

Consolidate through practical work sessions the theoretical concepts covered in the Physics 2 course.

Recommended prior knowledge

Mathematics 1, Physics 1.

Content of the material:

5 manipulations minimum (3h00 / 15 days)

- Presentation of measuring instruments and tools (Voltmeter, Ammeter, Rheostat, Oscilloscopes, Generator, etc.).
- Kirchhoff's laws (mesh law, knot law).
- Thévenin's theorem.
- Association and Measurement of inductances and capacities
- Charging and discharging a capacitor
- Oscilloscope
- Practical work on magnetism

Assessment method:

Continuous assessment: 100%

Semester: 2

Teaching unit: UEM 1.2

Subject 2: Chemistry 2 VHS:

10:30 p.m. (practical work: 1.5 hours)

Credits: 2

Coefficient: 1

Teaching objectives

Consolidate the theoretical concepts covered in the Thermodynamics course through practical work sessions.

Recommended prior knowledge

Thermodynamics.

Content of the material:

1. Ideal gas laws.
2. Water value of the calorimeter.
3. Specific heat: specific heat of liquid and solid bodies.
4. Latent heat: Latent heat of fusion of ice
5. Heat of reaction: Determination of the energy released by a chemical reaction (HCl/NaOH)
6. Hess's Law
7. Vapor pressure of a solution.

Assessment method:

Continuous assessment: 100%

Semester: 2

Teaching unit: UEM 1.2

Subject 3: Computer Science 2

VHS: 45h00 (Lecture: 1h30, Practical work: 1h30)

Credits: 4

Coefficient: 2

Teaching objectives

Master basic programming and algorithmic techniques. Acquire fundamental computer science concepts. The skills to be acquired are: Programming with a certain degree of autonomy; Designing algorithms from the simplest to the relatively complex.

Recommended prior knowledge

Know how to use the university website, file systems, Windows user interface, programming environment.

Content of the material:

Chapter 1: Indexed Variables **(4 Weeks)**

1- One-dimensional arrays: Representation in memory, Operations on arrays

2- Two-dimensional arrays: Representation in memory, Operations on two-dimensional arrays

Chapter 2: Functions and Procedures **(6 Weeks)**

1- Functions: Types of functions, declaration of functions, function calls

2- Procedures: Concepts of global variables and local variables, simple procedure, procedure with arguments

Chapter 3: Recordings and Files **(5 Weeks)**

1- Heterogeneous data structure

2- Structure of a record (notion of fields)

3- Manipulation of record structures

4- Concept of file

5- File access modes

6- Reading and writing to a file

Computer Science 2:

Plan a certain number of practical exercises to put into practice the programming techniques seen during the course.

- Practical work on applying programming techniques seen in class.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1- Algorithms for Dummies large format Book by John Paul Mueller (Informatiker, USA) and Luca Massaron 2017

2- Algorithmics: course with 957 exercises and 158 problems Book by Charles E. Leiserson, Clifford Stein and Thomas H. Cormen 2017

3- Algorithms: Basic Notions Book by Thomas H. Cormen 2013.

Semester: 2

Teaching unit: UEM 1.2

Subject 4: Presentation Methodology

VHS: 3:00 p.m. (Class: 1 hour)

Credits: 1

Coefficient: 1

Teaching objectives

Provide the basics for a successful oral presentation. Skills to acquire include: Knowing how to prepare a presentation; Knowing how to deliver a presentation; Knowing how to capture the audience's attention; Understanding the pitfalls of plagiarism and understanding intellectual property regulations.

Recommended prior knowledge

Expression and communication techniques and writing methodology.

Content of the material:

Chapter 0: The Oral Presentation Communication. Preparing an Oral Presentation. Different Types of Plans. **(3 Weeks)**

Chapter 2: Presenting an Oral Presentation **(3 Weeks)**
Structure of an Oral Presentation. Presenting an Oral Presentation.

Chapter 3: Plagiarism and Intellectual Property 1- **(3 Weeks)**
Plagiarism: Definitions of plagiarism, sanctions for plagiarism, how to borrow the work of other authors, quotes, illustrations, how to be sure to avoid plagiarism?
2- Writing a bibliography: Definition, objectives, how to present a bibliography, writing the bibliography

Chapter 4: Presenting Written Work - **(6 Weeks)**
Presenting Written Work. Applications: Presenting an Oral Presentation.

Assessment method:

Review: 100%.

Bibliographic references:

1. M. Fayet, Methods of written and oral communication, 3rd edition, Dunod, 2008.
2. M. Kalika, Master's thesis – Managing a thesis, Writing a report, Preparing a defense, Dunod, 2016.

3. M. Greuter, Succeeding in your dissertation and internship report, l'Etudiant, 2014
4. B. Grange, How to Make a Successful Presentation. How to Prepare Powerful Slides and Communicate Effectively in Public. Eyrolles, 2009.
5. H. Biju-Duval, C. Delhay, All speakers, Eyrolles, 2011.
6. C. Eberhardt, Practical work with PowerPoint. Creating and laying out slides, Dunod, 2014.

7. F. Cartier, Written and oral communication, Edition GEP- Groupe Eyrolles, 2012.
8. L. Levasseur, 50 exercises for public speaking, Eyrolles, 2009.
9. S. Goodlad, Speaking technically – A Handbook for Scientists, Engineers, and Physicians on How to Improve Technical Presentations, Imperial College Press, 2000.
10. M. Markel, Technical communication, eleventh edition, Bedford/St Martin's, 2015.

Semester: 2

Teaching unit: UED 1.2

Subject 1: Careers in Science and Technology 2

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Objective of the subject:

To introduce the student, in a first step, to all the sectors covered by the Science and Technology Field and in a second step to a range of careers that these sectors lead to. In the same context, this subject introduces the student to the new challenges of sustainable development as well as the new careers that can result from it.

Recommended prior knowledge

None.

Content of the subject:

1. Industrial Hygiene and Safety (IHS) and Mining Engineering sectors : - **(2 weeks)**

Definitions and areas of application (Safety of property and people, Environmental problems, Exploration and exploitation of mining resources, etc.)

- Role of the specialist in these areas.

2. Climate Engineering and Transport Engineering sectors: (2 weeks)

- Definitions, areas of application (Air conditioning, Intelligent buildings, Transport safety, Traffic management and road, air, naval transport, etc.)

- Role of the specialist in these areas.

3. Civil Engineering, Hydraulics and Public Works sectors: - **(2 weeks)**

Definitions and areas of application (Construction materials, Major road and railway infrastructures, Bridges, Airports, Dams, Drinking water supply and sanitation, Hydraulic flows, Water resources management, Public works and land use planning, Smart cities, etc.)

- Role of the specialist in these areas.

4. Aeronautics, Mechanical Engineering, Maritime Engineering and Metallurgy: (2 weeks)

- Definitions and fields of application (Aeronautics, Avionics, Automotive industry, Ports, Dikes, Production of industrial equipment, Steel industry, Metal transformation, etc.)

- Role of the specialist in these areas.

5. Approaches to sustainable production: (2 weeks)

Industrial ecology, Remanufacturing, Ecodesign.

6. Measuring the sustainability of a process/product/service: (2 weeks)

Environmental analysis, Life cycle analysis (LCA), Carbon footprint, case studies/applications.

7. Sustainable Development and Business: (3 weeks)

Definition of the business as an economic entity (notions of profit, costs, performance) and social entity (notion of corporate social responsibility), Impact of economic activities on the environment (examples), Challenges/benefits of sustainable development for the business, Means of engagement in a sustainable development approach (e.g. ISO 14001 certification, labeling (e.g. energy labeling, Ecolabel, Organic/AB Label, FSC Label, etc.), strategic sustainable development plan, Global Reporting Initiative (GRI)…), World rankings of the most sustainable companies (Dow Jones Sustainable Index, Global 100, etc.), Studies of

cases of successful/eco-responsible companies in the ST sectors (e.g. SIEMENS, Cisco, Henkel AG & Co, TOTAL, Peugeot, Eni SPA ...).

Personal work of the student for this subject: - Work in groups/ pairs: Reading articles on sustainable development and/or reports from successful and sustainable companies and preparation of summaries of the main actions undertaken in the field of sustainable development.

Examples of documents for reading and summarizing:

- Case of ONA and ENIEM: Kadri, Mouloud, 2009, Sustainable development, business and ISO 14001 certification, Market and organizations vol. 1 (No. 8), p. 201-215 (free online access: http://www.cairn.info/revue-marche-et-organisations-2009-1-page-201.htm)
- Mireille Chiroleu-Assouline. Sustainable development strategies for businesses. Ideas, The Review of Economic and Social Sciences, CNDP, 2006, pp. 32-39 (free online access: http://halshs.archives-ouvertes.fr/hal-00306217/document)
- Web page on TOTAL 's environmental and societal commitments : https://www.total.com/fr/engagement
- Sustainable mobility innovations from the PSA group: http://www.rapportannuel.groupe-psa.com/rapport-2015/engagements/dessolutions-innovantes-pour-des-transports-durables/

Assessment method:

100% exam.

Bibliographic references:

1- V. Maymo and G. Murat, The Sustainable Development and CSR Toolbox - 53 tools and methods, Edition: Dunod, 2017.

2- P. Jacquemot and V. Bedin, The encyclopedic dictionary of sustainable development, Edition: Sciences Humaines, 2017.

3- Y. Veyret, J. Jalta and M. Hagnerelle, Sustainable development: All the issues in 12 lessons, Edition: Autrement, 2010.

4- L. Grisel and Ph. Osset, Life Cycle Analysis of a Product or Service: Applications and Practical Implementation, 2nd Edition: AFNOR, 2008.

5- Sh. Shaked, N. Jolliet-Gavin, P. Crettaz, M. Saadé-Sbeih and O. Jolliet, Life Cycle Analysis: Understanding and Carrying Out an Eco-Assessment, 3rd Edition: PPUR, 2017.

6- G. Pitron and H. Védrine, The rare metal war: The hidden face of the energy and digital transition, Edition: Liens qui libèrent, 2018.

7- Environmental and sustainable development professions, Collection: Parcours, Edition: ONISEP, 2015.

Semester: 2

Teaching unit: UET 1.2

Subject 1: French language 2

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives:

This subject aims to develop the following four skills: Oral comprehension, Written comprehension, Oral expression and Written expression through reading and studying texts.

Recommended prior knowledge:

Basic French.

Content of the material:

Below we offer a set of themes that cover fundamental sciences, technologies, economics, social issues, communication, sports, health, etc. The teacher can choose texts from this list to develop them during the course. Otherwise, they are free to address other themes of their choice. The texts can be borrowed from various communication media: daily newspapers, sports or entertainment magazines, specialized or popular magazines, books, websites, audio and video recordings, etc.

For each text, the teacher helps the student develop their linguistic skills: listening, comprehension, and oral and written expression. In addition, they must use this text to identify the grammatical structures they will develop during the same class session. Here, for illustration purposes, we recall a set of grammatical structures that can be developed as examples. Of course, it is not a question of developing them all or in the same way. Some can be recalled and others in great detail.

Examples of themes	Grammatical structures
The pharmaceutical industry	The subjunctive. The conditional. The imperative.
The food industry	The past participle. The passive form.
The National Employment Agency ANEM	Possessive adjectives, possessive pronouns.
Sustainable development	Demonstratives, Demonstrative pronouns.
Renewable energies	The expression of quantity (several, a few, enough, many, more, less, as much, etc.).
Biotechnology	Numbers and measurements.
Stem cells	The pronouns "who, that, where, whose".
Road safety	Subordinate preposition of time.
The dams	The cause, The consequence.
Water – Water resources	The goal, the opposition, the condition.
Avionics	Comparatives, superlatives.
Automotive electronics	…
Electronic newspapers	
Carbon 14 dating	
Violence in stadiums	
Drugs: a social scourge	
Smoking	
School failure	
The Algerian War	
Social networks	
China, an economic power	
Superconductivity	
Cryptocurrency	
Advertising	
Autism	

Assessment method:

Review: 100%.

Bibliographic references:

1. M. Badefort, Objective: International French Test, Edulang, 2006.
2. O. Bertrand, I. Schaffner, Passing the TCF, Exercises and training activities, Les éditions de l'école polytechnique, 2009.
3. M. Boulares, J.-L. Frerot, Progressive French Grammar with 400 exercises, Advanced Level, CLE International.
4. Collective, Besherelles: Grammar for all, Hatier.
5. Collective, Besherelles: Conjugation for all, Hatier.
6. Mr. Grégoire, Progressive French Grammar with 400 exercises, Beginner Level, CLE International, 1997.
7. A. Hasni et al., Training in teaching science and technology in secondary schools, University of Quebec Press, 2006.
8. J.-L. Lebrun, Practical guide to scientific writing, EDP Sciences, 2007.
9. JM Robert, Difficulties of French, Hachette, 10.
C. Tisset, Teaching the French language at school: Grammar, Spelling and Conjugation, Hachette Education, 2005.
11. J. Bossé-Andrieu, Summary of the Rules of Grammar and Spelling, University Press Quebec, 2001.
12. J.-P. Colin, French made simple, Eyrolles, 2010.
13. Collective, French Assessment Test, Hachette, 2001.
14. Y. Delatour et al., Practical French grammar in 80 cards with corrected exercises, Hachette, 2000.
15.Ch. Descotes et al., The Exerciser: French expression for the intermediate level, Presses Grenoble University, 1993.
16. H. Jaraush, C. Tufts, On the Vif, Heinle Cengage Learning, 2011.
17. J. Dubois et al., The Essentials – Spelling, Larousse, 2009.

Semester: 2

Teaching unit: UET 1.2 Subject 1: English Language 2 VHS: 10:30 p.m. (Course: 1.5 hours)
Credits: 1
Coefficient: 1

Objective:
Develop the reading, writing, listening and speaking abilities of the students.

Recommended prior Knowledge: Basic English.

Contents:
The English syllabus consists of a set of texts containing scientific and technical parts. The chosen texts must be used to study scientific and technical English and Grammar acquisition.
The texts must be selected according to the vocabulary built up, familiarization with both scientific and matters in English for further understanding. Therefore, each text will be defined by a set of vocabulary concepts, a set of special sentences (idioms) and comprehension questions.
The texts must also contain a terminology which means the translation of some words from English to French one. , the activity at the end of each session must include a translation of long statements which are selected from the texts.

Examples for some lectures: Examples of Word Study: Patterns Radioactivity.	
Chain Reaction.	Explanation of Cause Result
Reactor Cooling System.	Conditions (if), Conditions (Restrictive)
Conductor and Conductivity.	Eventuality
Induction Motors.	Manner
Electrolysis.	When, Once, If, etc. + Past Participle Liquid
Flow and Metering.	It is + Adjective + to
Liquid Pumps.	As
Petroleum.	It is + Adjective or Verb + that…
Road Foundations.	Similarity, Difference In
Rigid Pavements.	Spite of, Although
Piles for Foundations.	Formation of Adjectives Phrasal
Suspension Bridges.	Verbs

Evaluation mode:
Exam: 100%.

References:

1. J. Upjohn, S. Blattes, V. Jans, Minimum Competence in Scientific English, Office of University Publications, 1994.
2. AJ Herbert, The Structure of Technical English, Longman, 1972.
3. S. Berland-Delepine, Methodical grammar of modern English with exercises, Ophrys, 1982.
4. Test of English as a Foreign Language – Preparation Guide, Cliffs, 1991.
5. R. Fowler, The Little, Brown Handbook, Little, Brown Company, 1980.
6. Cambridge – First Certificate in English, Cambridge books, 2008.
7. K. Wilson, Th. Healy, First Choice, Oxford, 2007.
8. M. Mann, S. Tayore-Knowles, Destination: Grammar & Vocabulary with Answer Key, MacMillan, 2006.
9. E. Hamby, Ph. Bedford Robinson, Special English Computer Applications, Cassell, 1980.

10. P. Charles Brown, Norma D. Mullen, English for Computer Science, Oxford University Press, 1989.
11. Graeme Kennedy, Structure and Meaning in English: A Guide for Teachers, Pearson, 2004.
12. Anne M. Hanson, Brain-Friendly Strategies for Developing Student Writing Skills, 2nd Edition, Corwin Press, 2008.
13. Ann Bridges, How to Pass Higher English, Hodder Gibson-Hachette, 2009.
14. Claude Renucci, English: 1000 Words and Expressions from the Press: Vocabulary and Expressions from the Economic, Social and Political World, Fernand Nathan, 2006.

Semester: 3

Teaching unit: UEF 2.1.1

Subject 1: Mathematics 3

VHS: 67h30 (Lecture: 3h00, Tutorial: 1h30)
Credits: 6

Coefficient: 3

Teaching objectives:

At the end of this course, the student should be able to know the different types of series and their conditions of convergence as well as the different types of convergence.

Recommended prior knowledge

Mathematics 1 and Mathematics 2

Content of the subject:

Chapter 1: Simple and Multiple Integrals 1.1 **3 weeks**
Reminders on the Riemann integral and the calculation of primitives. 1.2 Double and Triple Integrals.
1.3 Application to the calculation of areas, volumes, etc.

Chapter 2: Improper Integrals 2.1 **2 weeks**
Integrals of functions defined on an unbounded interval. 2.2 Integrals of functions defined on a bounded interval, infinite at one end.

Chapter 3: Differential Equations 3.1 **2 weeks**
Review of ordinary differential equations. 3.2 Partial differential equations. 3.3 Special functions.

Chapter 4: Series **3 weeks**
4.1 Numerical series. 4.2 Sequences and series of functions. 4.3 Power series, Fourier series.

Chapter 5: Fourier Transform 5.1 Definition **3 weeks**
and properties. 5.2 Application to the resolution of differential equations.

Chapter 6: Laplace Transform 6.1 Definition **2 weeks**
and properties. 6.2 Application to the resolution of differential equations.

Assessment method:

Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1- F. Ayres Jr, Theory and Applications of Differential and Integral Calculus - 1175 corrected exercises, McGraw-Hill.

2- F. Ayres Jr, Theory and Applications of Differential Equations - 560 corrected exercises, McGraw-Hill.

3- J. Lelong-Ferrand, JM Arnaudiès, Mathematics Course - Differential Equations, Multiple Integrals, Volume 4, Dunod University.
4- M. Krasnov, Collection of problems on ordinary differential equations, Moscow Edition
5- N. Piskunov, Differential and Integral Calculus, Volume 1, Moscow Edition
6- J. Quinet, Elementary course in higher mathematics 3- Integral calculus and series, Dunod.
7- J. Quinet, Elementary course in higher mathematics 4- Differential equations, Dunod.
8- MR Spiegel, Laplace Transforms, Course and Problems, 450 Corrected Exercises, McGraw-Hill.

Semester: 3

Teaching unit: UEF 8.0.0
Subject 2: Waves and Vibrations VHS:

45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4

Coefficient: 2

Teaching objectives

Introduce the student to the phenomena of mechanical vibrations restricted to low amplitude oscillations for 1 or 2 degrees of freedom as well as to the study of the propagation of mechanical waves.

Recommended prior knowledge

Mathematics 2, Physics 1 and Physics 2

Content of the subject:

Preamble : *This subject is divided into two parts, the Waves part and the Vibrations part, which can be approached independently of each other. In this regard and due to the consistency of this subject in terms of content, it is advisable to approach this subject in this order: Waves and then Vibrations for students in the Electrical Engineering (Group A) streams. While for students in Groups B and C (Civil Engineering, Mechanical Engineering and Process Engineering), it is advisable to start with Vibrations. In any case, the teacher is called upon to do his best to cover both parts. We remind you that this subject is intended for engineering professions in the Science and Technology field. Also, the teacher is requested to skim over all parts of the course that require demonstrations or theoretical developments and to focus only on the applied aspects. Moreover, demonstrations can be the subject of an auxiliary work to be requested from students as activities within the framework of the student's personal work. For this purpose, consult paragraph "G- Student Assessment through Continuous Assessment and Personal Work" present in this training offer.*

Part A: Vibrations

Chapter 1: Introduction to Lagrange's equations 1.1 Lagrange's equations for a particle 1.1.1 Lagrange's equations 1.1.2 Case of conservative systems 1.1.3 Case of velocity-dependent friction forces 1.1.4 Case of a time-dependent external force 1.2 System with several degrees of freedom. — **2 weeks**

Chapter 2: Free Oscillations of One-Degree-of-Freedom Systems 2.1 Undamped Oscillations 2.2 Free Oscillations of Damped Systems — **2 weeks**

Chapter 3: Forced Oscillations of One-Degree-of-Freedom Systems 3.1 Differential Equation 3.2 Mass-Spring-Damper System 3.3 Solution of the Differential Equation 3.3.1 Harmonic excitation 3.3.2 Periodic excitation 3.4 Mechanical impedance — **1 week**

Chapter 4: Free Oscillations of Two-Degree-of-Freedom Systems 4.1 Introduction 4.2 Two-Degree-of-Freedom Systems **1 week**

Chapter 5: Forced Oscillations of Two-Degree-of-Freedom Systems 2 weeks 5.1 Lagrange Equations 5.2 Mass-Spring-Damper System 5.3 Impedance 5.4 Applications

5.5 Generalization to systems with n degrees of freedom

Part B: Waves

Chapter 1: One-dimensional propagation phenomena 1.1 Generalities and basic definitions 1.2 Propagation equation 1.3 Solution of the propagation equation 1.4 Progressive sinusoidal wave 1.5 Superposition of two progressive sinusoidal waves **2 weeks**

Chapter 2: Vibrating Strings 2.1 Wave Equation 2.2 Harmonic Progressive Waves 2.3 Free Oscillations of a String of Finite Length 2.4 Reflection and Transmission **2 weeks**

Chapter 3: Acoustic Waves in Fluids 3.1 Wave Equation **1 week**

3.2 Speed of sound

3.3 Progressive sinusoidal wave
3.4 Reflection-Transmission

Chapter 4: Electromagnetic Waves 4.1 Wave Equation **2 weeks**
4.2 Reflection-Transmission

4.3 Different types of electromagnetic waves

Assessment method:

Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1. H. Djelouah; Vibrations and Mechanical Waves – Courses & Exercises (USTHB University website: perso.usthb.dz/~hdjelouah/Coursvom.html)
2. T. Becherrawy; Vibrations, waves and optics; Hermes science Lavoisier, 2010
3. J. Brac; Propagation of acoustic and elastic waves; Hermès science Publ. Lavoisier, 2003.
4. R. Lefort; Waves and Vibrations; Dunod, 2017
5. J. Bruneaux; Vibrations, waves; Ellipses, 2008.
6. J.-P. Perez, R. Carles, R. Fleckinger; Electromagnetism Foundations and Applications, Ed. Dunod, 2011.
5. H. Djelouah; Electromagnetism; Office of University Publications, 2011.

Semester: 3

Teaching unit: UEF 8.0.8

Subject 1: Fluid mechanics VHS:

45h00 (Lecture: 1h30, Tutorial: 1h30)

Credits: 4

Coefficient: 2

Teaching objective:

To introduce the student to the field of fluid mechanics, fluid statics will be detailed in the first part. Then in the second part the study of the movement of inviscid fluids will be considered at the end it is the movement of the real fluid that will be studied.

Recommended prior knowledge:

Content of the material:

Chapter 1: Properties of fluids 1. **3 weeks**

Physical definition of a fluid: States of matter, divided matter (dispersion, suspensions, emulsions)

2. Perfect fluid, real fluid, compressible fluid and incompressible fluid.
3. Density, volumetric mass
4. Rheology of a fluid, Viscosity of fluids, surface tension of a fluid

Chapter 2: Fluid Statics 1. **4 weeks**

Definition of pressure, pressure at a point in a fluid

2. Fundamental law of fluid statics
3. Level surface
4. Pascal's Theorem
5. Calculation of pressure forces: Flat plate (horizontal, vertical, oblique), center of thrust, static pressure measuring instruments, atmospheric pressure measurement, barometer, Torricelli's law
2. Pressure for superimposed immiscible fluids

Chapter 3 Dynamics of perfect incompressible fluids 1. Steady **4 weeks**

flow

2. Continuity equation
3. Mass flow rate and volume flow rate
4. Bernoulli's theorem, cases without labor exchange and with labor exchange
5. Applications to flow and speed measurements: Venturi, Diaphragms, tubes of Pitot…
6. Euler's Theorem

Chapter 4: Dynamics of real incompressible fluids 1. Flow **4 weeks**

regimes, Reynolds experiment

2. Dimensional analysis, Vashy-Buckingham theorem, Reynolds number
3. Linear pressure losses and singular pressure losses, Moody diagram.
4. Generalization of Bernoulli's theorem to real fluids

Assessment method: Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

(Depending on the availability of documentation at the establishment level, websites, etc.)

1- Fundamentals of fluid mechanics 6th Edition, 2009, BR Munson, DF Young TH Okiishi, WW Huebsch 6th Edition John Wiley & Sons

2- Fluid mechanics, YA Cengel - 2010 - Tata McGraw-Hill Education

3- Fluid Mechanics Frank M. White Fourth Edition 2003 McGraw-Hill

4- Fluid Mechanics and Hydraulics 2nd Edition, Ronald v. Giles, Jack B Evett, Cheng Liu, McGraw-Hill

5- S. Amiroudine, JL Battaglia, 'Fluid Mechanics Course and Corrected Exercises' Ed. Dunod

6- R. Comolet, 'Experimental Fluid Mechanics', Volumes 1, 2 and 3, Ed. Masson et Cie.

7- R. Ouziaux, 'Applied Fluid Mechanics', Ed. Dunod, 1978

8- BR Munson, DF Young, TH Okiishi, 'Fundamentals of fluid mechanics', Wiley & Sons. RV Gilles, 'Fluid mechanics and hydraulics: Courses and problems', Schaum series, Mc Graw Hill, 1975.

Semester: 3

Teaching unit: UEF 8.0.8

Subject 2: Rational Mechanics VHS:

45h00 (Lecture: 1h30, Tutorial: 1h30)

Credits: 4

Coefficient: 2

Teaching objectives :

The student will be able to grasp the nature of a problem (static, kinematic or dynamic) in solid mechanics, he will have the tools allowing him to solve the problem within the framework of classical mechanics. This subject constitutes a prerequisite for the subjects: RDM and analytical mechanics.

Recommended prior knowledge The student must first assimilate the physics subject 1 which deals with the mechanics of the point. Also, the mathematics subject 2 includes essential tools.

Content of the subject:

Chapter 1: Mathematical reminders (elements of vector calculation). **1 week**

Chapter 2: Generalities and basic definitions 2.1 Definition and physical meaning of force **2 weeks**
2.2 Mathematical representation of force
2.3 Operations on force (composition, decomposition, projection)
2.4 Type of force: point, linear, surface, volume
2.5 Classification of forces: internal forces, external forces.
2.6 Mechanical models: the material point, the solid body

Chapter 3: Static. **3 weeks**
3.1 Axioms of statics
3.2 Connections, supports and reactions
3.3 Axiom of Bonds
3.4 Equilibrium conditions:
3.4.1 Concurrent forces
3.4.2 Parallel forces
3.4.3 Plane forces

Chapter 4: kinematics of the rigid solid. **3 weeks**
4.1 Brief reminders on the kinematic quantities for a material point.
4.2 Solid Body Kinematics
4.2.1 Translational movement
4.2.2 Rotational movement around a fixed axis
4.2.3 Plane movement
4.2.4 Compound movement.

Chapter 5: Mass Geometry. **3 weeks**
5.1 Mass of a material system

5.1.1 Continuous
system 5.1.2 Discrete
system 5.2 Integral formulation of the center of mass
5.2.1. Definitions (linear, surface and volume cases)
5.2.2 Discrete formulation of the center of mass
5.2.3 GULDIN's Theorems

5.3. Moment and product of inertia of solids 5.4.
Inertia tensor of a solid 5.4.1 Special

cases
5.42 Principal axes of inertia
5.5. Huyghens' theorem 5.6.
Moment of inertia of solids with respect to any axis.

Chapter 6: Dynamics of the rigid solid. **3 weeks**

6.1 Brief reminders on dynamic quantities for a material point.
6.2 Rigid body kinetics element:
6.2.1 Quantity of movement
6.2.2 Angular momentum
6.2.3 Kinetic energy
6.3 Equation of dynamics for a solid body
6.4 Angular Momentum Theorem 6.5
Kinetic Energy Theorem
6.6 Applications:
6.6.1 Pure translation case
6.6.2 Case of rotation around a fixed axis
6.6.3 Combined case of translation and rotation.

Assessment method: continuous assessment: 40%; final exam: 60%.

Bibliographic references:
(Depending on the availability of documentation at the establishment level, websites, etc.)

1. Elements of Rational Mechanics. S. Targ. Mir Publishing House,
Moscow 2. Mechanics for Engineers. STATICS. Russell Publishing. Ferdinand P. Beer
3. General mechanics. Course and corrected exercises. Sylvie Pommier. Yves Berthaud. DUNOD.
4. General Mechanics - Theory and Application, Series Editions. MURAY R. SPIEGEL schaum,
367p.
5. General mechanics – Exercises and solved problems with course reminders, Office of
University Publications, Tahar HANI 1983, 386p.

Semester: 3

Teaching unit: UEM 8.0

Subject 1: Probability & Statistics

VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)

Credits: 4

Coefficient: 2

Subject objectives

This module allows students to see the essential notions of probability and statistics, namely: statistical series with one and two variables, probability on a finite universe and random variables.

Recommended prior knowledge

Mathematics 1 and Mathematics 2

Content of the material:

Part A: Statistics

Chapter 1: Basic definitions A.1.1 **(1 week)**

Concepts of population, sample, variables, modalities A.1.2 Different types of statistical variables: qualitative, quantitative, discrete, continuous.

Chapter 2: Single-variable statistical series A.2.1 **(3 weeks)**

Number, Frequency, Percentage.

A.2.2 Cumulative workforce, Cumulative frequency.

A.2.3 Graphical representations: bar chart, pie chart, stick chart.

Polygon of numbers (and frequencies). Histogram. Cumulative curves.

A.2.4 Position characteristics A.2.5

Dispersion characteristics: range, variance and standard deviation, coefficient of variation.

A.2.6 Shape characteristics.

Chapter 3: Two-variable statistical series A.3.1 Data **(3 weeks)**

tables (contingency table). Scatter plot.

A.3.2 Marginal and conditional distributions. Covariance.

A.3.3 Linear correlation coefficient. Regression line and Mayer line.

A.3.4 Regression curves, regression corridor and correlation ratio.

A.3.5 Functional adjustment.

Part B: Probabilities

Chapter 1: Combinatorial Analysis **(1 Week)**

B.1.1 Arrangements

B.1.2 Combinations

B.1.3 Permutations.

Chapter 2: Introduction to Probability B.2.1 **(2 weeks)**

Algebra of Events

B.2.2 Definitions

B.2.3 Probability spaces

B.2.4 General probability theorems

Chapter 3: Conditioning and Independence B.3.1 **(1 week)**

Conditioning,

B.3.2 Independence,

B.3.3 Bayes formula.

Chapter 4: Random Variables B.4.1 **1 Week**
Definitions and Properties, B.4.2
Distribution Function, B.4.3
Mathematical Expectation,
B.4.4 Covariance and moments.

Chapter 5: Common discrete and continuous probability laws **3 Weeks**
Bernoulli, binomial, Poisson, ...; Uniform, normal, exponential, ...

Assessment method:
Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1. D. Dacunha-Castelle and M. Duflo. Probability and Statistics: Fixed-Time Problems. Masson, 1982.

2. J.-F. Delmas. Introduction to probability calculus and statistics. ENSTA handout, 2008.
3. W.Feller. an Introduction to Probability Theory and its Applications, Volume 1. Wiley & Sons, Inc., 3rd edition, 1968.
4. G. Grimmett, D. Stirzaker, Probability and Random Processes, Oxford University Press, 2nd edition, 1992.

5. J. Jacod and P. Protter, Probability Essentials, Springer, 2000.
6. A. Montfort. Course in mathematical statistics. Economica, 1988.
7. A. Montfort. Introduction to Statistics. Ecole Polytechnique, 1991

Semester: 3

Teaching unit: UEM 8.0

Subject 2: Computer Science 3

VHS: 10:30 p.m. (TP: 1:30 p.m.)

Credits: 2

Coefficient: 1

Subject objectives

Teach the student programming using easy-to-access software (mainly: Matlab, Scilab, Mapple, etc.). This subject will be a tool for carrying out practical work on numerical methods in S4.

Recommended prior knowledge

The basics of programming acquired in computer science 1 and 2

Content of the subject:

TP 0: Presentation of a scientific programming environment (Matlab, Scilab, etc.)	**1 week**
TP 2: Script files and Data and variable types	**2 weeks**
TP 3: Reading, displaying and saving data	**2 weeks**
TP 4: Vectors and matrices	**2 weeks**
TP 5: Control instructions (for and while loops, if and switch instructions)	**2 weeks**
TP 6: Function files	**2 weeks**
TP 7: Graphics (Management of graphic windows, plot	**2 weeks**
TP 8: Using toolbox	**2 weeks**

Assessment method: Continuous assessment: 100%.

Bibliographic references:

(Depending on the availability of documentation at the establishment level, websites, etc.)

1- Computer science: Programming and simulation in Scilab 2014 - Authors: Arnaud Bégyn, Jean-Pierre Attic, Hervé Gras.

2- Scilab: From theory to practice - I. The fundamentals. Book by Philippe Roux 2013.

Semester: 3

Teaching unit: UEM 8.0

Subject 3: Technical drawing VHS:

10:30 p.m. (practical work: 1:30 p.m.)

Credits: 2

Coefficient: 1

Teaching objectives

This course will allow students to acquire the principles of representing parts in industrial design. Furthermore, this subject will allow the student to represent and read plans.

Recommended prior knowledge (brief description of the knowledge required to follow this course – Maximum 2 lines).

In order to follow this course, basic knowledge of the general principles of drawing is required.

Content of the material

Chapter 1: General Information. **2 weeks**

1.1 Usefulness of technical drawings and different types of drawings.

1.2 Drawing materials.

1.3 Standardization (Types of lines, Writing, Scale, Drawing format and folding, Title block, etc.).

Chapter 2: Elements of descriptive geometry 2.1 **6 Weeks**

Notions of descriptive geometry.

2.2 Orthogonal projections of a point - Drawing of a point - Orthogonal projections of a straight line (any and particular) - Drawing of a straight line - Traces of a straight line- Projections of a plane (Any and particular positions) - Traces of a plane.

2.3 Views: Choice and arrangement of views – Dimensioning – Slope and taper – Determination of the 3rd view from two given views.

2.4 Method of executing a drawing (layout, 45° line, etc.)

Application exercises and assessment (TP)

Chapter 3: Perspectives **2 weeks**

Different types of perspectives (definition and purpose).

Application exercises and assessment (TP).

Chapter 4: Sections and Cuts **2 weeks**

4.1 Sections, standardized representation rules (hatching).

4.2 Projections and sections of simple solids (Projections and sections of a cylinder, a prism, a pyramid, a cone, a sphere, etc.).

4.3 Half-cut, Partial cuts, Broken cuts, Sections, etc.

4.4 Technical vocabulary (terminology of machined shapes, profiles, piping, etc.

Application exercises and assessment (TP).

Chapter 5: Quotation **2 weeks**

5.1 General principles.

5.2 Quotation, tolerance and adjustment.

Application exercises and assessment (TP).

Chapter 6: Concepts on definition and assembly drawings and nomenclatures.

1 Week

Application exercises and assessment (TP).

Assessment method: Continuous assessment: 100%.

Bibliographic references:

(Depending on the availability of documentation at the establishment level, websites, etc.)

1. Industrial designer's guide Chevalier A. Hachette Technique Edition;
2. Technical drawing 1st part descriptive geometry Felliachi d. and Bensaada s. Edition OPU Algiers;
3. Technical drawing 2nd part industrial drawing Felliachi d. and bensaada s. Edition OPU Algiers;
4. First notions of technical drawing Andre Ricordeau Edition Andre Casteilla;

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Recommendation : A large part of the practical work should be in the form of personal work at home.

Semester: 3

Teaching unit: UEM 8.0

Subject 4: Practical work on Waves and Vibrations

VHS: 3:00 p.m. (TP: 1:00 p.m.)

Credits: 1

Coefficient: 1

Teaching objectives

The objectives assigned by this program focus on introducing students to putting into practice the knowledge received on the phenomena of mechanical vibrations restricted to low amplitude oscillations for one or two degrees of freedom as well as the propagation of mechanical waves.

Recommended prior knowledge

Vibrations and waves, Mathematics 2, Physics 1, Physics 2.

Content of the subject:

TP.1 Mass – spring

TP.2 Simple pendulum

TP.3 Torsion pendulum

TP.4 Oscillating electric circuit in free and forced mode

TP.5 Coupled pendulums

TP.6 Transverse oscillations in vibrating strings

TP.7 Grooved pulley according to Hoffmann

TP.8 Electromechanical systems (The electrodynamic loudspeaker)

TP.9 The Pohl pendulum

TP.10 Propagation of longitudinal waves in a fluid.

Note : It is recommended to choose at least 5 TPs from the 10 offered.

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

(Depending on the availability of documentation at the establishment level, websites, etc.)

Semester: 3

Teaching Unit: UED 8.0

Subject 1: Basic VHS Technology:

10:30 p.m. (Course: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives

This course will enable students to acquire knowledge about the processes for obtaining and manufacturing parts and the techniques for assembling them.

Recommended prior knowledge

Content of the material

Chapter 1: Materials 1.1 **3 Weeks**

Metals and alloys and their designations

1.2 Plastics (polymers)

1.3 Composite materials 1.4
Other materials

Chapter 2: Processes for obtaining parts without removing material4 Weeks

2.1 Casting, Forging, Stamping, Rolling, Wire Drawing, Extrusion…. Etc.

2.2 Cutting, bending and stamping, etc.

2.3 Sintering and powder metallurgy

2.4 Profiles and Pipes (steel, aluminum);
- Workshop visits.

Chapter 3: Processes for obtaining parts by removing material Turning, milling, **4 Weeks**
drilling; adjustment, etc.
- Workshop visits and demonstrations.

Chapter 4: Assembly Techniques - Bolting, **4 Weeks**
Riveting, Welding, etc.

Assessment method: Final exam: 100%.

Bibliographic references:
(Depending on the availability of documentation at the establishment level, websites, etc.)

0- Manual of mechanical technology, Guillaume SABATIER, et al Ed. Dunod.
1- Memotech: materials production and machining BARLIER C. Ed. Casteilla
2- Industrial Sciences MILLET N. ed. Casteilla 3- Memotech:
Industrial Technologies BAUR D. et al 4- Dimensional Metrology , Ed. Casteilla
CHEVALIER A. Ed. Delagrave
5- Drilling, milling JOLYS R and LABELL R. Ed. Delagrave
6- Guide to mechanical manufacturing PADELLA P. Ed. Dunod
7- Technology: first part, Bensaada S and FELIACHI d. Ed. OPU Algiers
Remove the water from the water. 8-

Semester: 3

Teaching Unit: UED 8.0

Subject 2: Metrology

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives

Teach the student the precision criteria for manufacturing and assembling parts; Know and be able to choose, in different cases, the methods and means of controlling and measuring the dimensions and manufacturing defects of mechanical parts.

Recommended prior knowledge: Trigonometry, optics and others.

Content of the material

Chapter 1: General information on metrology 2 Weeks

1.1 Definition of the different types of metrology (Scientific, so-called laboratory, legal, industrial);
1.2 Metrological vocabulary, definition;
1.3 National and international metrology institutions.

Chapter 2: The International System of Measurement SI 2.1 **3 Weeks**
Basic quantities and their units of measurement;
2.2 Supplementary quantities; 2.3 Derived quantities.

Chapter 3: Metrological characteristics of measuring devices 6 Weeks

3.1 Error and uncertainty (Accuracy, precision, fidelity, repeatability, reproducibility of a measuring device)
3.2 Classification of measurement errors
3.2.1 Gross value;
3.2.2 Systematic error;
3.2.3 Corrected gross value.
3.3 Random errors
3.3.1 Random errors;
3.3.2 parasitic errors;
3.3.3 Estimated systematic errors.
3.4 Confidence interval;
3.5 Technical uncertainty;
3.6 Total measurement uncertainty;
3.7 Complete measurement result;
3.8 Identification and interpretation of the specifications of a definition drawing for the control;
3.9 Basics of calibers, gauges and simple measuring instruments.

Chapter 4: Measurement and Control 4 Weeks

4.1 Direct measurement of lengths and angles (use of ruler, caliper, micrometer and protractor);

4.2 Indirect measurement (use of comparator, standard gauges);
4.3 Dimension control (use of buffers, jaws, etc.);
4.4 Measuring and control machines used in mechanical workshops (use of pneumatic comparator, profile projector and roughness meter.

Assessment method: Final exam: 100%.

Bibliographic references:
(Depending on the availability of documentation at the establishment level, websites, etc.)

9- Manual of mechanical technology, Guillaume SABATIER, et al Ed. Dunod.
10- Memotech: materials production and machining BARLIER C. Ed. Casteilla
11- Industrial Sciences MILLET N. ed. Casteilla **12-** Memotech: Industrial Technologies BAUR D. et al **13-** Dimensional Metrology , Ed. Casteilla CHEVALIER A. Ed. Delagrave
14- Drilling, milling JOLYS R and LABELL R. Ed. Delagrave
15- Guide to mechanical manufacturing PADELLA P. Ed. Dunod
16- Technology: first part, Bensaada S and FELIACHI d. Ed. OPU Algiers
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Semester: 3

Teaching unit: UET 8.0

Subject 1: Technical English

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives

This course should enable the student to have a language level where he will be able to use a scientific document and speak about his specialty and field in English at least with ease and clarity.

Recommended prior knowledge

English 1 and English 2

Content of the material

- Oral comprehension and expression, vocabulary acquisition, grammar, etc.
- nouns and adjectives, comparatives, following and giving instructions, identifying things.
- Use of numbers, symbols, equations.
- Measurements: Length, surface, volume, power, etc.
- Describe scientific experiments.
- Characteristics of scientific texts.

Assessment method: Final exam: 100%.

Bibliographic references:

(Depending on the availability of documentation at the establishment level, websites, etc.)

Semester: 4

Teaching unit: UEF 2.2.1 Subject:
Electronics and Avionics
VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives

Acquire basic notions of electronics (diode circuits, transistors, op-amps).
Introduce the student to avionics systems. This unit must be followed by other subjects.
Digital electronics, instrumentation, telecommunications, automation before tackling the aircraft's electronic instruments (avionics systems).

Recommended prior knowledge

Notions of fundamental physics and electricity.

Content of the material

Chapter 1 – Continuous Regime and Fundamental Theorems: (2 weeks)

Definitions (dipole, branch, node, mesh), voltage and current generators (ideal, real), voltage-current relationships (R, L, C), voltage divider, current divider.
Thévenin's theorem, Norton's theorem, Equivalence between Thévenin and Norton.

Chapter 2 - Passive Quadrupoles: (2 weeks)

Representation of a passive network by a quadrupole. Matrices of a quadrupole, associations of quadrupoles. Quantities characterizing the behavior of a quadrupole in an assembly (input and output impedance, voltage and current gain). Passive filters (low-pass, high-pass, etc.).

Chapter 3 - Diodes: (2 weeks)

Basic reminders on semiconductor physics: Definition and structure
atomic mass of a semiconductor. If crystalline, Concept of doping, N and P semiconductors,

PN junction.
Diode theory: Construction and operation of a diode, forward and reverse polarizations
inverse, current-voltage characteristic, static and variable regime. Equivalent diagram.
Diode applications: Single and double half-wave rectification. Stabilization of the

voltage by the Zener diode. Clipping.
Other types of diodes: Varicap, LED, Photodiode.

Chapter 4 - Bipolar Transistors: Bipolar **(3 weeks)**

Transistors: Transistor effect, operating modes (blocking, saturation, etc.), static characteristics network, polarizations, charge line, rest point.
Study of the three fundamental assemblies: EC, BC, CC, equivalent diagram, voltage gain, decibel gain, bandwidth, current gain, input and output impedances.
Study of multi-stage BF amplifiers in static and dynamic regimes,
coupling capacitors, decoupling capacitors.
Other uses of the transistor: Darlington circuit, switching transistor/

Chapter 5 - Operational Amplifiers: (2 weeks)

Principle, Equivalent diagram, Ideal op-amp, feedback, characteristics of the op-amp, Basic assemblies of the operational amplifier: inverting, non-inverting, summing, subtracting, comparator, etc.

Chapter 6 – Introduction to Avionics: (4 weeks)

-Avionics: Definition, The ATA 100 system
-Avionics elements: Automatic piloting (ATA 22), communication (ATA 23), Navigation (ATA 34), Electrical Generation (ATA 24), Equipment and Fittings (ATA25), Fire Protection (ATA 26), Flight Controls (ATA 27), Fuel Systems (ATA28), Hydraulic Generation (ATA 29), Ice and Rain Protection (ATA 30), Indication Systems (ATA 31), Landing Gear (ATA 32), Lighting (ATA 33), Oxygen (ATA 35), Pneumatics/Vacuum (ATA 36), Water/Waste (ATA 38), On-Board Maintenance Systems (ATA 45).

Assessment method:

Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1. *T. Floyd, Electronic Components and Application Systems, 5th Edition, Dunod, 2000.*
2. *Malvino, Principle of Electronics, 6th Edition Dunod, 2002.*
3. *F. Milsant, Electronics Course (and Problems), Volumes 1 to 5, Eyrolles.*
4. *M. Kaufman, Electronics: Components, Volume 1, McGraw-Hill, 1982.*
5. *P. Horowitz, Treatise on Analog and Digital Electronics, Volumes 1 and 2, Publitronic-Elektor, 1996.*
6. *Neffati, General Electricity, Dunod, 2004*
7. *Y. Hamada, Electronic Circuits, OPU, 1993.*
8. *R. Collinson, Introduction to Avionics Systems, 3rd Ed, Springer, 2011.*
9. *FAA, Advanced Avionics Handbook, 2009*
10. *Moir, Aircraft Systems: Mechanical, Electrical, and Avionics Subsystems integration, 3rd ed, Wiley, 2008.*

Semester: 4

Teaching unit: UEF 2.2.1 Subject:
Aeronautical construction
VHS: 10:30 p.m. (Class: 1.5 hours)
Credits: 2
Coefficient: 1

Teaching objectives

At the end of this course, the student will have a set of theoretical knowledge giving him a better understanding of mechanical construction in general and the specificities of construction in the field of aeronautics.

Recommended prior knowledge

Basic Technology Concepts.

Content of the material

Chapter 1: Introduction to Aircraft Construction **(1 week)**

History, interest in aeronautical construction, the largest manufacturers.

Chapter 2: Definition of aircraft components **(3 weeks)**

The engine, the wings, the fuselage, the electrical and electronic equipment, the interior fittings...

Chapter 3: Materials used in aircraft construction Different materials **(3 weeks)**

(maraging steels, stainless steels, refractory steels, aluminum, composite materials), new materials in aircraft construction, characteristics of materials used in aeronautics.

Chapter 4: Manufacturing Technology and Systems (3 weeks)

Metal-metal bonding, Sandwich constructions, Metal honeycomb, Foam expansive, Plastic materials (Laminate - Plexiglas - Makrolon)...
Non-removable systems (Welding, Riveting, Gluing), Dismountable systems (Bolting, Keying, Grooving).

Chapter 5: Aircraft assembly and installation processes **(4 weeks)**

Interpretation of aircraft subassembly drawings and documents, Subdivision into subassemblies of the final assembly, analysis of interfaces between subassemblies, Safety procedures to be implemented, Components required to complete the assembly, Establishment of the logical procedure for assembly and installation of components for each subassembly. Establishment of the logical sequence of

Manufacturing.

Chapter 6: Conducting an inspection or test. **(1 week)**

Assessment method:

Final exam: 100%.

Bibliographic references:

1. *Darrol Stinton, The design of the airplane, Blackwell Science, 1983*
2. *EF Bruhn, Analysis and design of flight vehicle structures, Ed. Tri State Offset Company, Cincinnati, Ohio, USA, 1965*
3. *P. de Guillenchmidt, Elements of calculation of aeronautical construction, Edition: Etienne CHIRON, 1949*

Semester: 4

Teaching unit: UEF 2.2.2

Subject: Mathematics 4 VHS:

10:30 p.m. (Lecture: 1:30 p.m., Tutorial: 1:30 p.m.)

Credits: 4

Coefficient: 2

Teaching objectives:

This course focuses on the differential and integral calculus of complex functions of a complex variable. The student must master the different techniques for solving functions and integrals with complex and special variables.

Recommended prior knowledge: Mathematics

1, Mathematics 2 and Mathematics 3.

Content of the subject:

Complex Variable Functions and Special Functions

Chapter 1: Holomorphic Functions. Cauchy-Riemann Conditions **3 weeks**

Chapter 2: Power Series **3 weeks**

Radius of convergence. Domain of convergence. Power series expansion. Analytic functions. Laurent series and Laurent series expansion

Chapter 3: Cauchy Theory **3 weeks**

Cauchy Theorem; Cauchy Formulas. Singular Point of Functions, General Method for Calculating Complex Integrals

Chapter 4: Applications **4 weeks**

Equivalence between holomorphy and Analyticity. Maximum Theorem. Liouville's Theorem. Rouché's Theorem. Residue Theorem. Calculation of integrals by the Residue Method.

Chapter 5: Special Functions **2 weeks**

Special Euler functions: Gamma, Beta functions, applications to integral calculations

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1- Henri Catan, Elementary theory of analytic functions of one or more complex variables. Publisher Hermann, Paris 1985.

2- Jean Kuntzmann, Complex Variable. Hermann, Paris, 1967. Undergraduate textbook.

3- Herbert Robbins Richard Courant. What is Mathematics?, Oxford University Press, Toronto, 1978. Classic popular science work.

4- Walter Rudin, Real and Complex Analysis. Masson, Paris, 1975. Second cycle textbook.

Semester: 4
Teaching unit: UEF 2.2.2
Subject: Digital methods VHS:
45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives: Familiarization with numerical methods and their applications in the field of mathematical calculations.

Recommended prior knowledge: Math1, Math2, Computer Science1 and Computer Science 2

Content of the subject:

Chapter 1: Solving nonlinear equations f(x)=0 **(3 weeks)**

1. Introduction to calculation errors and approximations,
2. Introduction to methods for solving nonlinear equations,
3. Bisection method,
4. Method of successive approximations (fixed point),
5. Newton-Raphson method.

Chapter 2: Polynomial Interpolation 1. **(2 weeks)**

General introduction,
2. Lagrange polynomial,
3. Newton polynomials.

Chapter 3 Function Approximation: **(2 weeks)**

1. Approximation method and quadratic mean.
2. Orthogonal or pseudo-orthogonal systems. Approximation by polynomials orthogonal 3.

Trigonometric approximation

Chapter 4: Numerical Integration 1. **(2 weeks)**

General introduction,
2. Trapeze method,
3. Simpson's method,
4. Quadrature formulas.

Chapter 5: Solving ordinary differential equations (initial condition or Cauchy problem). **(2 weeks)**

1. General introduction,
2. Euler's method,
3. Improved Euler method,
4. Runge-Kutta method.

Chapter 6: Direct method of solving systems of linear equations **(2 weeks)**

1. Introduction and definitions,
2. Gaussian method and pivoting,
3. LU factorization method,
4. ChoeleskiMMt factorization method ,

5. Thomas algorithm (TDMA) for diagonal sorting systems.

Chapter 7: Method for Approximate Resolution of Systems of Linear Equations **(2 weeks)**

1. Introduction and definitions,
2. Jacobi method,
3. Gauss-Seidel method,
4. Use of relaxation.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

References:

1. BREZINSKI (C.), Introduction to the practice of numerical calculation. Dunod, Paris (1988).
2. G. Allaire and SM Kaber, 2002. Numerical linear algebra. Ellipses.
3. G. Allaire and SM Kaber, 2002. Introduction to Scilab. Corrected practical exercises linear algebra. Ellipses.
4. G. Christol, A. Cot and C.-M. Marle, 1996. Differential calculus. Ellipses.
5. M. Crouzeix and A.-L. Mignot, 1983. Numerical analysis of differential equations. Mason.
6. S. Delabrière and M. Postel, 2004. Approximation methods. Differential equations. Scilab applications. Ellipses.
7. J.-P. Demailly, 1996. Numerical Analysis and Differential Equations. Grenoble University Press, 1996.
8. E. Hairer, SP Norsett and G. Wanner, 1993. Solving Ordinary Differential Equations, Springer.
9. CIARLET (PG). Introduction to numerical matrix analysis and optimization. Masson, Paris (1982).

Semester: 4

Teaching unit: UEF 2.2.3
Subject: Resistance of materials VHS: 45h00

(Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives

Know the methods of calculating the resistance of construction elements and determine variations in the shape and dimensions (deformations) of the elements under the action of charges.

Recommended prior knowledge

Analysis of functions; rational mechanics.

Content of the material

Chapter 1: Introductions and Generalities **(2 weeks)**

Goals and hypotheses of the resistance of materials, Classification of solids (beam, plate, shell), Different types of loads, Connections (supports, embedments, hinges), General principle of equilibrium – Equilibrium equations, Principles of cutting –
Reduction elements, Definitions and sign conventions of: Normal force N, Shear force T, Bending moment M

Chapter 2: Traction and Compression **(3 weeks)**

Definitions, Normal tensile and compression stress, Elastic deformation in tensile/compression, Tensile/compressive strength condition.

Chapter 3: Shear **(2 weeks)**

Definitions, Simple shear – pure shear, Shear stress, Deformation elastic in shear, Shear strength condition.

Chapter 4: Geometric characteristics of cross sections Static moments of a cross **(3 weeks)**

section, Moments of inertia of a cross section, Formulas for transforming moments of inertia.

Chapter 5: Twisting **(2 weeks)**

Definitions, Tangential or sliding stress, Elastic torsional deformation, Torsion resistance condition.

Chapter 6: Simple Plane Bending **(3 weeks)**

Definitions and assumptions, Shear forces, bending moments, Diagram of shear forces and bending moments, Relationship between bending moment and shear force, Deformation of a beam subjected to simple bending (arrow), Calculation of stresses and dimensioning.

Assessment method:

Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1- *F. Beer, Mechanics for Engineers – Statics, McGraw-Hill, 1981.*
2- *P. Stepine, Resistance of materials, Editions MIR; Moscow, 1986.*
3- *W. Nash, Strength of Materials 1, McGraw-Hill, 1974.*
4- *S. Timoshenko, Resistance of materials, Dunod, 1986.*

Semester: 4
Teaching unit: UEM 2.2.3
Subject: Computer-aided drawing VHS:
10:30 p.m. (TP: 1:30 p.m.)
Credits: 2
Coefficient: 1

Teaching objectives

This teaching will allow students to acquire the principles of representation of parts in industrial design. Moreover, this subject will allow the student to represent and read the plans.

Recommended prior knowledge

Technical Drawing.

Content of the material

Chapter 1: Presentation of the chosen software **(4 weeks)**

(SolidWorks, Autocad, Catia, Inventor, etc.)
Introduction and history of DAO, Configuration of the chosen software (interface, toolbar) shortcuts, options, etc.), Software reference elements (software help, tutorials, etc.), File backup (part file, assembly file, drawing file, backup procedure for delivery to the teacher), Communication and
interdependence between files.

Chapter 8: Concept of sketches **(3 weeks)**

Sketch tools (point, line segment, arc, circle, ellipse, polygon, etc.), Sketch relationships (horizontal, vertical, equal, parallel, hilly, fixed, etc.), Sketch dimensioning and geometric constraints.

Chapter 3: 3D Modeling (3 weeks)

Concepts of planes (front plane, right plane and top plane), Basic functions (extrusion, material removal, revolution), Display functions (zoom, multiple views, multiple windows etc.), Modification tools (Erase, Offset, Copy, Mirror, Adjust, Extend, Move), Creation of a sectional view of the model.

Chapter 4: 3D Model Layout **(3 weeks)**

Editing the plan and the title block, Choice of views and drawing, Dressings and object properties (Hatching, dimensioning, text, tables, etc.

Chapter 5: Assemblies Assembly **(2 weeks)**

constraints (parallel, coincidence, coaxial, fixed, etc.), Production of assembly drawings, Assembly drawing and parts list, Exploded view.

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

1- *M. Lombard Solidworks bible, Edition Wiley, 2013*
2- *Saint-Laurent Giesecke, Technical Drawing, Éditions du renouveau pédagogique Inc., 1982.*
3- *JL Berthéol, Exercises in drawing mechanical parts and assemblies with the software SolidWorks.*
4- *Rétif, CAD accessible to all with SolidWorks: from creation to production volume 1*
5- *Chevalier, Industrial Designer's Guide, Hachette Technique Edition.*

6-

Semester: 4

Teaching unit: UEM 2.2 Subject:
Practical work Fluid mechanics VHS:
22h30 (Practical work: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives

The student puts into practice the knowledge in the subject of fluid mechanics taught in S3.

Recommended prior knowledge Knowledge of Physics, Mathematics, Fluid Mechanics.

Contents of the subject TP

No. 1. Viscometer **TP No.**

2. Determination of linear and singular pressure losses **TP No. 3.** Flow measurement **TP No. 4.** Water hammer and mass

oscillations **TP No. 5.** Verification of Bernoulli's theorem **TP No. 6.** Impact of the jet **TP No. 7.** Flow through an orifice **TP**

No. 8. Visualization of flows around an obstacle **TP No. 9.** Determination of the

Reynolds number: Laminar and turbulent flow

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

Semester: 4
Teaching unit: UEM 2.2
Subject: Digital Methods Practical Work
VHS: 10:30 p.m. (TP: 1:30 p.m.)
Credits: 2
Coefficient: 1

Teaching objectives

Programming of different digital methods with a view to their applications in the field of mathematical calculations using a scientific programming language (matlab, scilab…).

Recommended prior knowledge

Numerical method, Computer Science 2 and Computer Science 3.

Content of the material

Chapter 0: Solving nonlinear equations 1. Bisection method. **(3 weeks)**
2. Fixed point method, 3.
Newton-Raphson method

Chapter 2: Interpolation and Approximation 1. **(3 weeks)**
Newton's Interpolation, 2.
Chebyshev's Approximation

Chapter 3: Numerical Integrations 1. **(3 weeks)**
Rectangle Method, 2.
Trapezoid Method, 3.
Simpson Method

Chapter 4: Differential Equations 1. **(2 weeks)**
Euler's Method,
2. Runge-Kutta methods

Chapter 5: Systems of linear equations **(4 weeks)**
1.Gauss-Jordon method,
2. Crout decomposition and LU factorization, 3.
Jacobi method, 4. Gauss-Seidel method

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

Semester: 4

Teaching unit: UEM 2.2 Subject:
Practical work Resistance of materials VHS:

15h00 (Practical work: 1h00)
Credits: 1
Coefficient: 1

Teaching objectives

Apply the various concepts studied in the materials strength module. Determine the characteristics of materials using simple mechanical tests.

Recommended prior knowledge: Strength of materials, Materials science.

Content of the material

TP No. 1. Simple tensile – compression tests **TP No. 2.** Torsion test **TP No. 3.** Simple bending

test **TP No. 4.** Impact test **TP No. 5.**
Hardness test

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

Semester: 4

Teaching unit: UEM 2.2 Subject:

Electronics VHS practical work:

22h30 (practical work: 1h30)

Credits: 2

Coefficient: 1

Teaching objectives

The aim of the practical work is to give students the opportunity to create electronic assemblies on a test board and then validate their operation using measuring devices.

Recommended prior knowledge

Electronics and Avionics

Content of the material

Practical work No. 1: Fundamental theorems

Practical work No. 2: Diode/rectification characteristics **Practical work No. 3:** Stabilized power supply with Zener diode **Practical work No. 4:** Characteristics of a transistor and operating point **Practical work No. 5:** Operational amplifiers.

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

1- *AP Malvino; Principle of electronics; Ediscience.*
2- *J. Millman; Microelectronics; Ediscience.*
3- *M. Dubois; Basic electronic components; Laval University, 2006.*
4- *M. Girard; Discrete active components. Volume 2: Field effect transistors; Ediscience.*
5- *Ch. Gentili; Microwave amplifiers and oscillators; Masson.*
6- *F. Milsant; Electronics problems; Chihab-Eyrolles; 1994*

Semester: 4

Teaching unit: UED 2.2

Subject: Air navigation

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives

The student must understand that the navigator will have to know the land on which he will have to locate and move, and must have a set of information on modes, rules and navigation instruments.

Recommended prior knowledge

Content of the material

Chapter 1: The Earth **(1 week)**

Size and shape of the Earth, Movement of the Earth, Geographic coordinates (Longitude, Latitude)

Chapter 2: Evaluation of terrestrial distances **(2 weeks)**

Orthodromy and loxodrome, The measurement of distances

Chapter 3: Maps **(2 weeks)**

Map scale, Visual approach and landing charts, Time measurement (Night aeronautics)

Chapter 4: Route and Distance Calculation **(2 weeks)**

Choosing the best route, calculating the distance

Chapter 5: Orientation on Earth **(1 week)**

Earth's magnetism, magnetic north (Nm), true north (Nv), declination (Dm)

Chapter 6: Navigation Modes (3 weeks)

The route, The estimate (North compass (Nc), the deviation (d), The heading, the route, Wind effect (Calculation of the proper speed (Vp), Drift (X), The speed triangle, Calculation of no-wind time (TSV)), Radio navigation

Chapter 7: Navigation Instruments **(3 weeks)**

– The radio compass (Using the ADF)

–The VOR (, Advantages and disadvantages, The receiver, Interpretation of the VOR, Navigation on the axis (Without wind, With wind))

– The RMI, The DME, The FMS, The HSI, The ILS (The radio beacons, ILS categories), The GPS, The Transponder, EFIS (EFIS, PFD, ND, ECAM)

Chapter 8: Navigation Rules (1 week)

The quality of the preparation, Taking into account the meteorology, The documentation aeronautics, the choice of travel parameters...

Assessment method:

Final exam: 100%.

Bibliographic references:

1- *JM LESCURE, Air Navigation, Volume 1, Publisher: ENAC - Service, Edition, 2004.*
2- *Mermoz - 060 - General Navigation ATPL, Denis CHAMBELIN, Jean Mermoz Aeronautical Institute, 2002.*
3- *Denis CHAMBELIN , Mermoz - 060 - General Navigation, Collection of QCM volumes 1, 2 and 3 Jean Mermoz Aeronautical Institute, 2002.*
4- *Alari, Radioelectric aids to air navigation: general information on long-distance aids Goniometry Book 1980.*
5- *Combes, Michel, Avionics of air navigation, Book 1993.*
6- *Boukhalfa, Mohamed, Design and control of a three-degree-of-freedom gyroscope for air navigation, Thesis 1996.*
7- *Air navigation T1, JM Lescure, National School of Civil Aviation – 1995.*
8- *Air navigation T2, JM Lescure, National School of Civil Aviation – 1995.*
9- *Navigation of the airline pilot, Jean Luis Sicre., Cépaduès-Éd.1998.*

Semester: 4

Teaching unit: UED 8.8 Subject:
Aeronautical regulations

VHS: 10:30 p.m. (lesson: 1 hour 30 minutes)
Credits:
Coefficient:

Teaching objectives

At the end of this course the student must have in mind all of the elements taught and must Understand the regulatory context relating to air traffic at the national and international.

Recommended prior knowledge

Content of the material

Chapter 1: Laws establishing the general rules relating to civil aviation in Algeria **(5 weeks)**

Definitions section - General principles - Aircraft: (Registration, nationality and ownership of aircraft), (Seizure, mortgage, etc.) - Construction, technical inspection and maintenance - Airports, aerodromes. Aeronautical easements, rules for the protection of airport property - Air traffic and meteorology - Accidents and assistance - Fees - Operation - Light aviation - Insurance - liability of the personal carrier of aeronautics - Penal provisions.

Chapter 2: International Regulation **(8 weeks)**

Market Access Rules (Route Rights, Operating Rights, Traffic Rights, Impact of the "Sixth Freedom" on Market Access), Air Carrier Capacity (Regulation of Capacity by Governments, Capacity from the Air Carriers' Perspective), Air Carrier Tariffs (Regulation of Tariffs by States, Definition of Tariff, Types of Tariffs and Their Characteristics, Methods of Tariff Regulation), Air Carrier Ownership (Discretionary Criteria, Use of Criteria, Foreign Investment in Air Carriers), Air Cargo (Distinct Characteristics of Air Cargo, Regulation of Air Cargo), Non-Scheduled Air Services (Non-Scheduled Air Services, Types of International Non-Scheduled Air Services, Regulation of Non-Scheduled Air Services), Airline Business Activities (Currency Conversion and Remittance of Revenues, Employment of Foreign Personnel, Sale and Marketing of International Air Transport, Distribution of Airline Products and E-Commerce, Aircraft Leasing), Cooperative Activities among Airlines (Company alliances

Airlines, Code Sharing Between Airlines, Franchise), Passengers (Passenger Rights, Conditions of Contract/Airline Conditions of Carriage, Disruptive Passengers, Passengers Without Required Documents), Airports (Slot Allocation, Ground Handling Services, Airport Privatization)

Chapter 3: General Terminology Introduction **(2 weeks)**
to general terminology, Air carriers, Airports, Aircraft, Air services.

Assessment method:

Review: 100%.

Bibliographic references:

1- The official texts which govern the field of aeronautics, at the national and international.

Semester: 4

Teaching unit: UET 2.2

Subject: Expression and Communication Techniques

VHS: 10:30 p.m. (lesson: 1 hour 30 minutes)

Credits:

Coefficient:

Teaching objectives

This teaching aims to develop the student's skills, on a personal or Professional in the field of communication and expression techniques.

Recommended prior knowledge

Languages (Arabic; French; English)

Content of the material

Chapter 0: Research, analyze and organize information Identify and use locations, tools and documentary resources, Understand and analyze Documents, Create and update documentation. **(3 weeks)**

Chapter 8: Improving the ability to express oneself Take into account the communication situation, Produce a written message, Communicate orally, produce a visual and audiovisual message. **(3 weeks)**

Chapter 3: Improving communication skills in interaction situations Analyze the process of interpersonal communication, Improve the ability to Face-to-face communication, Improve group communication skills. **(3 weeks)**

Chapter 4: Developing autonomy, organizational and communication skills as part of a project approach (6 weeks)

Position yourself in a project and communication approach, Anticipate action, Implement work on a project: Presentation of a report of a practical work (Homework).

Assessment method:

Final exam: 100%.

Bibliographic references:

1 *Jean-Denis Commeignes 12 methods of written and oral communication – 4th edition, Michelle Fayet and Dunod 2013.*

2 *Denis Baril; Sirey, Techniques of written and oral expression; 2008.*

3 *Matthieu Dubost Improving your written and oral expression: all the keys Ellipses Edition 2014.*

Semester: 5
Teaching unit: UEF 3.0.0 Subject: Aerodynamics
VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

This course contributes to the acquisition of essential knowledge for aeronautical undergraduate students. Students will acquire the fundamentals for understanding and analyzing MDF applied to aerodynamic profiles.

Recommended prior knowledge:

Elementary Fluid Mechanics, basic mathematical concepts.

Content of the subject:

Chapter 1: Fundamentals of Aerodynamics **(3 weeks)**
- Aerodynamic forces and moments
- Center of thrust
- Similarity of flows
- Types of flows
- Basic notions of boundary layers
- Aerodynamic coefficients and magnitudes

Chapter 2: Conservation Equations **(4 weeks)**
- Control volume and fluid element
- Continuity equation
- Momentum equation
- Energy equation (Optional)

Chapter 3: Incompressible Flow over Aerodynamic Profiles **(4 weeks)**
- Reminder of the hypotheses
- Euler and Bernoulli equations
- Coefficient of friction
- Nomenclature and characteristics of aerodynamic profiles
- Flows on aerodynamic profiles

Chapter 4: Compressible Flow on Aerodynamic Profiles **(4 weeks)**
- Introduction
- thermodynamics in brief
- definition of compressibility
- general equations of incompressible flows
- some aspects of supersonic flows

Assessment method:

- Continuous Assessment: *40%,* Exam: *60%.*

Bibliographic references:

1. *Anderson JD-Fundamentals of Aerodynamics-McGraw-Hill (2010),*
2. *Anderson JD-Solutions manual toFundamentals of aerodynamics*
3. *Munson, BR, Young, DF & Okiishi, TH 2006 Fundamentals of Fluid Mechanics. J.Wiley & Sons, 5th ed.*
4. *Çengel, YA &Cimbala, JM 2006 Fluid Mechanics: Fundamentals and Applications. McGrawHill.*
5. *John J. Bertin, Russell M. Cummings-Aerodynamics for Engineers (5th Edition)-Pearson Education, Inc. (2009)*

Semester: 5

Teaching unit: UEF 3.0.0 Subject:
Digital electronics
VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Mastery of the essential concepts of the digital part of aeronautical control electronics

Recommended

prior knowledge:

Mathematical concepts concerning algebraic functions (mathematics 1) as well as the basics of electricity (physics 2) and electronics (UEF 2.2.1).

CONTENT OF THE MATERIAL

Chapter 1: Representation of numbers 1-1- **(02 weeks)**

Decimal, binary, octal, hexadecimal representation…

1-2- Transition from one base to another, (decimal-binary and vice versa …..)

Chapter 2: Logical Functions **(04 weeks)**

2-1- Basic logic functions

2-2- Derived logical functions

2-3- Symbolic representation

2-4- Flowcharts

2-5- Boolean Algebra

2-5-1- Properties of logical functions

2-5-2- Minterms and maxterms

2-5-3- Application to the simplification of logical functions

2-5-4 Karnaugh Table

Chapter 3: Logic Integrated Circuits **(03 weeks)**

3-1- Bipolar families RTL, DTL, TTL, ECL (history…)

3-2- MOS families (PMOS, NMOS, CMOS, etc.)

Chapter 4: Combinational Circuits **(03 weeks)**

4-1 Synthesis of a combinational circuit

4-1-1 7-segment display

4-1-2 BCD-7 segment decoder

4-1-3 Multiplexer

4-2- Arithmetic circuits

4-2-1- 1-bit comparator

4-2-2- 1-bit adder

Chapter 5: Sequential Circuits **(03 weeks)**

5-1 Asynchronous and synchronous sequential circuits, advantages of synchronous…

5-2 Flip-flops and latches, (FlipFlop and Latch) RS, RSH, D, JK, T ….

5-3 Counters, registers, memories, etc.

5-4- Introduction to the synthesis of a sequential machine…

Other possibilities if time permits, introduction to GALs (16V8) and to VHDL

Assessment method:

Continuous assessment: *40% ;* Exam: *60%.*

Bibliographic references:

6. EM HARKAT; Combinatorial logic systems, course, Batna 2 University
7. EM HARKAT; Combinatorial logic systems, exercises and problems with solutions
8. EM HARKAT; Sequential logic systems, course
9. EM HARKAT; Sequential logic systems, exercises and problems with solutions
10. A large amount of courses and books (.pdf) on the internet*
11. Letocha; Introduction to Logic Circuits; Mc-Graw Hill Edition.
12. JC Lafont; Course and problems in digital electronics, 124 exercises with solutions; Edition Ellipses.
13. R. Delsol; Digital Electronics, Volumes 1 and 2; Berti Edition 14. P. Cabanis; Digital Electronics; Dunod Edition.
15. M. Gindre; Combinatorial logic; Ediscience Edition.
16. H. Curry, Combinatory Logic II. North Holland, 1972
17. JP. Ginisti, Combinatorial Logic, Paris, PUF (coll. "What do I know?" n°3205), 1997.
18. JL. Krivine, Lambda-calculus, types and models, Masson, 1990, chap. Combinatorial logic, 19. R. Katz Contemporary Logic Design, 2nd ed. Prentice Hall, 2005.
20. M. Gindre, Digital electronics: combinational logic and technology: courses and exercises, Mc Graw Hill, 1987
21. C. Brie, Combinatorial and Sequential Logic, Ellipses, 2002.

Semester: 5
Teaching unit: UEF 3.0.0 Subject:
Flight mechanics VHS:
22h30 (Course: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

This course contributes to the acquisition of essential knowledge for aeronautical undergraduate students. Students will acquire the fundamentals for understanding and analyzing the forces acting on an aircraft in flight, and for studying flight characteristics.

Recommended prior knowledge:

The Mechanics of the Point, Elementary MDF

Content of the subject:

Chapter 1: Aerodynamic Forces (3 weeks)

- The actions of air in flow
- Study of lift and influencing parameters (the effects of wing shape, speed, and angle of incidence)
- Study of Drag and influencing parameters (the effects of wing shape, speed, angle the incidence, and the elongation))

Chapter 2: Using Aerodynamic Forces for Trajectory Control (3 weeks)

- Pitch control
- Roll control
- Yaw control

Chapter 3: Study of polars (3 weeks)

- General information on polars
- Study of the EIFFEL type polar
- Study of the polar speeds

Chapter 4: The main phases of flight (4 weeks)

- The axes and angles of flight mechanics
- Uniform straight and level flight
- The uniform straight rise
- The uniform straight descent
- The symmetrical turn in level at constant speed
- Gliding
- Takeoff
- The landing

Chapter 5: Static stability of an aircraft (2 weeks)

- Longitudinal static stability
- Transverse static stability

Assessment method:

- Exam: *100%.*

Bibliographic references:

1 *Anderson JD-Fundamentals of Aerodynamics-McGraw-Hill (2010),*

2 *Anderson JD-Solutions manual toFundamentals of aerodynamics*

3 *Munson, BR, Young, DF & Okiishi, TH 2006 Fundamentals of Fluid Mechanics. J.Wiley & Sons, 5th ed.*

4 *Çengel, YA &Cimbala, JM 2006 Fluid Mechanics: Fundamentals and Applications. McGrawHill.*

5 *John J. Bertin, Russell M. Cummings-Aerodynamics for Engineers (5th Edition)-Pearson Education, Inc. (2009)*

Semester: 5

Teaching unit: UEF 3.0.8 Subject:
Aeronautical structure VHS:
45h00 (Lecture: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

This UE is more concerned with the design and architecture of the aircraft. It allows know the vocabulary specific to the aircraft which will allow you to locate this or that element mechanics on the device, the loads applied to it and the appropriate shapes adapted.
It also affects the calculation and sizing side of the

Recommended prior knowledge:

Analytical mechanics, RDM

Content of the subject:

CHAPTER 1: Aircraft Structures and Materials **(2 weeks)**

CHAPTER 2: Introduction to Aeronautical Technology **(3 weeks)**

- History -

Description and characteristics of aircraft: propeller planes, helicopter planes, propeller planes, propulsion planes and other types (missiles and space planes).

- 3D landmark of the aircraft

CHAPTER 3: General Concepts of Aircraft Loads **(3 weeks)**

- Source charge
- Load case types
- Flight charges
- Stable horizontal flight (maneuvering load cases, gust cases, cabin pressure cases)
- Ground loads (ramp condition, taxi condition, braking condition, landing condition)
- Internal load induced by the torque
- Internal load induced by vertical shear & bending moment
- Application of a constraint

CHAPTER 4: Wing Design **(3 weeks)**

- Forces and moment on the wing
- Structures of the box cells composing the structural wings
- wing box
- idealization of wing structures

CHAPTER 5: Theory of Engineering Beams **(3 weeks)**

- Buckling
- Lattice

Assessment method:

Continuous assessment: *40% ;* Exam: *60%.*

Bibliographic reference

1. *DUBOST Benoît, Aluminum alloys for lightening structures in aeronautics and car bodywork,]*
2. *Composites: materials of the future - Part 10: composites in aeronautics, http:// www.pluscomposites.eu/ sites/ default/ files/ chroniques-techniques-chapitre10-FR.pdf [PDF]*
3. *National Aeronautics and Space Administration-Composites, http:// www.aeronautics.nasa.gov/ pdf/ composites_k-12.pdf [PDF]*
4. *TSE William, Electrical characterization of composite materials for fuselages, https:// publications.polymtl.ca/ 493/1/2010_WilliamTse.pdf [PDF]*
5. *CY NIU Michael, Air frame stress analysis and sizing, Conmilit Press Ltd., Hong Kong, 1997, 2nd editions, 795 pages.*
6. *VALLAT Paul, Resistance of materials applied to aviation, Librairie polytechnique CH. Béranger, Paris, 1950, 734 pages.*
7. *Aleinik L. and Durler J. Resistance of materials basic course, Edition Bibliotheque de the engineer 1973.*
8. *Anissimov A., Djillali-Berkane Z. And Strakhov V., buckling of isostatic systems of bars, opu 04-1987.*
9. *Brown EH, structural analysis Volume 1, Edition Longmans 1967.*
10. *Coates RC, Coutie MG and Kong FK, structural analysis, 2nd edition 1980, VNR Ltd.*
11. *Decelle AF, and Legendre D., mechanics applied to civil engineering, Editions Eyrolles 1983.*
12. *Doberscu CA, some chapters on resistance of materials, volume 1, OPU 04-91*
13. *Nouredine Bourahla.Resistance of basic materials.Publisher Gecotec.*
14. *Timoshenko S. Strength of Materials – Volume 1: Elementary Theory and Problems. 3rd Ed. Dunod, Paris, 1968, 420p*
15. *Chalines charles. Wing sizing. Aeronautical project 2006. Study of a Bombardier Challenger Cl604*
16. *http:// lewebpedagogique.com/ sergebarranxbia/ 2008/10/24/ cours-n°6-efforts-contraintes-et-materiaux-utilises-types-de-fuselage/, page consulted on March 19, 2016.*
17. *Wood in aeronautical construction, http:// www.aero-constructeurs-amateurs-atlantique.fr/ joomla/ technique-generale/ 111-tech-bois/ 288-les-bois-en-construction-aeronautique, page consulted on March 19, 2016.*

Semester: 5

Teaching unit: UEF 3.1.2 Subject:

Mechanics of Continuous Media VHS: 45h30 (Lecture: 1h30, TD: 1h30)

Credits: 4

Coefficients: 2

Teaching objectives: -To provide the basic concepts of continuous media mechanics.
- Understand its application in the case of infinitesimal elasticity.
- Solving simple analytical problems.

Recommended prior knowledge: - Vector analysis - RDM - Differential and integral calculus

Content of the subject:

Chapter 1: Tensor Calculus Element **(4 weeks)**

- Index notation, The Kronecker delta and the permutation symbol
- Symmetric and antisymmetric systems
- Application: to determinants, to vector algebra, to the transformation laws of Cartesian tensors

Chapter 2: Constraint Analysis **(4 weeks)**

- Concept of continuous media
- Volume forces and surface forces
- Cauchy's constraint principle (Constraint vector)
- State of stress at a point (The stress tensor)
- Relationship between stress vector and stress tensor
- Balance of forces and moments (symmetry of the stress tensor)
- Constraint transformation laws
- The values and principal directions of the constraints
- Representation of constraints by Mohr's tricircle

Chapter 3: Analysis of deformations (4 weeks)

- Configuration of a continuous medium, concepts of deformation and flow
- Position vector, Displacement vector
- Descriptions of Lagrange and Euler
- Strain gradient and displacement gradient and Strain tensors
- Small deformation theory, linearized deformation tensors
- Relative displacements, linearized rotation tensor and rotation vector
- Interpretation of linearized strain tensors
- Elongation ratio, principal strains, strain invariants, cubic expansion
- Compatibility equation for linear deformations

Chapter 4: Laws of Behavior **(3 weeks)**

- Generalized Hooke's Law
- Anisotropy, elastic symmetry, isotropy
- Isotropic medium, elastic constants

Assessment method:

Continuous assessment: *40% ;* Exam: *60%.*

Bibliographic references:

22. *Harry Lass，Vector and Tensor Analysis, McGraw-Hill, 1950*
23. *LE Malvern - Introduction the Mechanics of Continuous Medium, Prentice Hall,* 1969
24. *P.Germain - Mechanics of continuous media, Paris, Masson, 1983*
25. *S.Timoshenko, J.M.Goodier, Theory of elasticity, Beranger, 1961*
Carole Nadot-Martin and Jean Coirier , Mechanics of continuous media. 4th edition: 26. Course and corrected exercises. 2013
27. John Botsis Michel Deville. Continuum Mechanics: An Introduction. 2006

Semester: 5
Teaching unit: UEM 3.1
Subject: Aerodynamics TP
VHS: 10:30 p.m. (TP: 1:30 p.m.)
Credits: 2
Coefficients: 1

Teaching objectives:

The student should be able to:
- to process and study flows around aerodynamic profiles,
- to produce convincing experimental results curves,
- to interpret measurements and observations.

Recommended prior knowledge:

It is recommended to master the aerodynamics course, the basic notions of

fluid mechanics.

Content of the subject:

Plan some experiments related to aerodynamics according to the means available: **1.** Presentation of the theoretical elements necessary for understanding the manipulations
(Bernoulli's theorem in the case of ideal gases, the basic principles governing the lift and drag of aerodynamic bodies, Boundary layer, Similarity...)

2. Presentation of the installations and measuring instruments.

3. Measurement of gas flow rates in different sections of a Venturi tube.

4. Experimentation of compressible flows on a smooth, rough flat plate (boundary layers).

5. Determination of aerodynamic coefficients of bodies with different profiles.

6. Experimentation of flows in an aerodynamic vein, measurement, analysis of results and determination of drag and lift on an aircraft wing profile.

Assessment method:

Continuous assessment: 100%

Bibliographic references : *(catalogues of typical laboratory equipment)*

educational)

1. *http://www.tecquipment.com/#*

2. *http://www.deltalab-smt.com/teaching-mechanical-engineering/fluid-mechanics-aerodynamics/aerodynamics/subsonic-suction-wind-tunnel-ea600*

Semester: 5

Teaching unit: UEM 3.0 Subject:
Digital electronics VHS practical work:
22h30 (practical work: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives

The objective of the practical work is to understand and learn how to practically use logic integrated circuits in order to carry out various combinational or sequential functions.

RECOMMENDED PREVIOUS KNOWLEDGE

The digital electronics course.

CONTENT OF THE MATERIAL

TP1: Logic circuits with diodes and transistors

Inverting transistor

AND , OR with diodes and resistors

LEDs will be used to facilitate understanding of high and low states and negative/positive logic.

TP2: Logic integrated circuits

Based on bipolar circuitsTTL (74xx) or CMOS (4xxx)

AND OR NOT NAND NOR XOR gates …depending on availability

Understanding Power Connection

LED diodes (with resistors) will be used to facilitate the understanding of high and low states and negative/positive logic and to make truth tables for the different logic functions.

TP 3: Combinational circuits

7-segment display
BCD-7 decoder (7447 or 4543 for example)
Understanding Common Anode/Common Cathode and the Use of Other Inputs

TP 4: Combinational circuits

Study/analysis/design/test of a combinational circuit
Example: Multiplexer, arithmetic circuits, comparator, adder

TP 5: Sequential circuits

Flip-flops and latches, (FlipFlop and Latch) RS, RSH, D, JK or T depending on means and time

TP 6: Sequential circuits

Counters (if possible with 7-segment display and timer for the clock),

Or registers, or memory, depending on availability and time….etc…..

Other possibilities if time permits: simulation of more complex circuits

Programming GALs (16V8) or introduction to VHDL

Assessment method:

Continuous assessment: *100%*

Semester: 5

Teaching unit: UEM 3.0

Subject: Aeronautical equipment and circuits

VHS: 10:30 p.m. (TP: 1:30 p.m.)

Credits: 2

Coefficient: 1

Targeted skills:

Recommended prior knowledge:

- Digital Electronics Course

Content of the material:

Chapter 1. RADIO ELECTRICITY • **(3 weeks)**

Wave propagation
- AM, FM modulations
- Fourier Transform - Spectrum of a signal
- Types of transmitters
- Types of receptors
- Frequency bands in aeronautics

Chapter 2. Telecommunications in Aeronautics • Signal Processing and Navigation • Electromagnetism, Antennas • Data Communication Networks **(3 weeks)**

Chapter 3. CIRCULAR BEACON **(1 week)**

- General information
- Principles
- Types
- Uses

Chapter 4. VISUAL OMNI RANGE (VOR) • General **(2 weeks)**

- Operating principles
- VOR en route and approach
- Transmitter operation
- General characteristics

Chapter 5. INSTRUMENTS LANDING SYSTEM (ILS) • General information and constitution **(4 weeks)**

- Operation
- LOCALIZER (Principle and use)
- GLIDE (Principle and use)
- MARKERS (Principle and use)
- Security measures
- Controls
- Functional disorders
- Classification into accuracy categories

Chapter 6. FLIGHT INSTRUMENTS • **(2 weeks)**

anemometric instruments
- Gyroscopic instruments
- MEMS instrument

Assessment method:

Continuous assessment: 100%

Bibliographic references:

1. *Pierre Olivier NTONGMO The role of emergency telecommunications in the aeronautical field, Presentation.*
2. *Noël Cresp, iArchitecture and governance of communication services, Emmanuel Bertin, Publisher(s): Hermès - Lavoisier 2013*
3. *Yves Rengade, Joël Molac Private Pilot's English Manual, Volume 1, Radio Communications, Weather Information - 8 audio CDs, Publisher(s): Cépaduès 2010*
4. *Yves Rengade AIRCOM English course in radio communications for airline pilots - Access to ICAO levels 4 and 5 - MP3, edition Cépaduès 2013*
5. *Philippe Louvel, Pierre Ezerzere, Philippe JourdesOn-board electronic systems and transport Publisher(s): Dunod 2015*
6. *International Standards and Recommended Practices and Procedures for Air Navigation Services Sixth Edition October 2001 Volume II (Annex 10 to the Convention on International Civil Aviation)*

Semester: 5

Teaching unit: UEM 3.0
Subject: Aircraft CAD

VHS: 37h30 (Course 1h30, Practical work: 1h00)
Credits: 3

Coefficient: 2

Teaching objectives:

Understand the theoretical principles of geometric modeling, reverse engineering, and rapid prototyping, including an overview of point cloud geometric modeling. For the practical part, understand the different phases of basic 3D body design.

Recommended prior knowledge:

Technical and industrial drawing and CAD/CAM courses.

Content of the material:

Course part

Chapter 1: Introduction to CAD (03 weeks)

- The digital model
- Computer-aided design (CAD)
- Complex shape design process
- Shape reproduction tool

Chapter 2: Geometric Modeling Categories (03 weeks)

- Geometric modeling
- The different categories of geometric models
    - o Parametric models
    - o Polyhedral models
    - o Implicit models

Chapter 2: Types of Geometric Modeling (9 weeks)

- o WIREFRAME modeling
- o Modeling by curves and surfaces
- o volume modeling
- o Reverse engineering & rapid prototyping o CAD exchange formats (STL, IGES, OBJ, STEP, etc.)

Practical work section *(the practical work section is included in the course section)*

- **TP 01** Sketching and sketch entities
- **TP 02** Basic modeling of parts
- **TP 03** Symmetry, draft and copy/paste of functions
- **TP 04** Functions Repetitions

- **TP 05** Bottom-up modeling of an assembly, Use of part configurations in assemblies, Sub-assemblies, Smart constraints, Insertion of sub-assemblies, Take-out composition.

Assessment method:

Continuous assessment: *40% ;* Exam: *60%.*

Bibliographic references:

1. *Christophe Tournier, Contribution to the design of complex shapes: the machining surface in 5-axis isocrete milling, Doctoral Thesis, LURPA, 2001.*
2. *LA Piegl and W. Tiller, The NURBS book, Springer-Verlag, 1997.*
3. *N. Aifaoui, CAD/ Calculation Integration, an approach through calculation features, Doctoral Thesis, University of Valenciennes, July 2003.*
4. *ENGINEERING TECHNIQUES: "Computer-aided design"; 1990J-C. LEON, Modeling and construction of surfaces for CAD/ CAM, Hermès, Paris, 1999*
5. *H.Ameddah, CAD Modeling and Machining Strategies for the Production of Surfaces with Geometry complicated (Free Surfaces), Doctoral thesis in science, Batna University, 2013*
6. *Ibrahim Zeid, CAD/ CAM Theory and Practice, McGraw-Hill, 1991 – 1052 pages*
7. *Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, edition4, Pearson Education, 2015, 816 pages*
8. *Kunwoo Lee, Principles of CAD/ CAM/ CAE systems, Addison-Wesley, 1999, 582 pages*
9. *Matt Lombard, Solidworks 2013 Bible, John Wiley & Sons, 2013, 1296 pages*
10. *Y. Gardan, Mathematics and CAD: Volume 1: Numerical Methods for CAD, Springer US, 2012, 166 pages*
11. *Douglas F. Horne, Aircraft Production Technology, August 1986, 221 pages*
12. *John P. Fielding, Introduction to Aircraft Design (Cambridge Aerospace Series) Paperback – Oct 14, 1999, Cambridge University Press, 278 pages*

Semester: 5

Teaching unit: UED 3.1

Material: Light Aviation

VHS: 10:30 p.m. (lesson: 1.5 hours)
Credits: 1

Coefficients: 1

Teaching objectives:

Know the theoretical principles of light aviation, aeromodeling as well as flying club associations.

Recommended prior knowledge:

Basics of Aeronautics

Content of the subject:

Chapter 1: General introduction - General information on light aviation - Use of light aviation (Civil, military, etc.) **(04 weeks)**
- Construction of light aircraft
- Construction of light helicopters

Chapter 2: Different Types of Aircraft **(03 weeks)**
- Helicopter, drones
- Glider, ULM
- Parachuting and free flight

Chapter 3: Aeromodeling **(02 weeks)**
- Model airplanes
- Model helicopters

Chapter 4: Activity within associations **(04 weeks)**
- Aeroclubs for airplanes
- Aeromodeling flying clubs

Chapter 5: The socio-economic impact of light aviation (2 weeks)
- Influence of light aviation on economic and social development

Assessment method:

- Exam: *100%.*

Bibliographic references:

1. *Books and handouts, websites, etc.*
2. *Cell and ATPL-CPL systems volumes 1 & 2 - Claude Lalaque (Mermoz Institute)*
3. *ICAO Annex 2: Rules of the Air*
4. *Aeroclub Activities Manual*

Semester: 5

Teaching unit: UED 3.1

Subject: Air transport

VHS: 10:30 p.m. (lesson: 1.5 hours)

Credits: 1

Coefficients: 1

Teaching objectives:

Understand the theoretical principles of air transport, the different types of airlines, airline management and regulations relating to air transport.

Recommended prior knowledge:

Aviation regulations

Content of the subject:

Chapter 1: General introduction - General information on air transport - History of air transport and its development. **(04 weeks)**
- The mobility of people and goods.

Chapter 2: Different Types of Airlines - Types of Air Carriers **(04 weeks)**

- Regular commercial transport (Companies)
- Regular *low-cost* companies ...)
- Transport by charter

Chapter 3: Organization and operation **(04 weeks)**
- The devices
- The crew
- Flight schedules
- Flight progress
- Airports

Chapter 4: The socio-economic impact of air transport - Mobility of people and goods. **(03 weeks)**
- Economic and social development
- Development of landlocked areas

Assessment method:

- Exam: *100%.*

Bibliographic references:

1. *ICAO Doc & annexes*
2. *WARNER Carl, WOOLFORD Stephen, The History of Aviation, Éditions Gründ, Paris, 2009,*

3. Jacques Villiers and Paul Funel, French Air Transport, National Geographic Institute, 1982, 326 p.
4. Pascal Cambournac, Dictionary of Air Transport, Presses of the Institute of Air Transport, Paris, 1993
5. Robert Espérou, History of French Air Transport, Pascal Galodé, 2008
6. Knut Hagrup, The Battle of Air Transport, published by Plon, 1975
7. Gas emissions linked to air traffic in France in 2012" [archive], Ministry of Ecology, Sustainable Development and Energy, Air Transport Directorate - Sub-Directorate of Studies, Statistics and Forecasting, December 2014 8. http://www.logistiqueconseil.org/ Articles/ Transport-aerien/ Reglementation-transport-aerial.htm

Semester: 5

Teaching unit: UET 3.0

Subject: Environment and sustainable development

VHS: 10:30 p.m. (Course: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives:

Raise awareness of the relationship between energy, the environment and sustainable development and control sources of pollution; reduce them in order to ensure sustainable development.

Recommended prior knowledge:

Fluid mechanics, fundamental thermodynamics, heat transfer, and characteristics of the environment.

Content of the material:

Chapter I: Introduction to the concept of environment (2 weeks)

Definition of the environment, General definition, Legal definition, Brief history, Man and the environment, How man has modified his environment, Demography scapegoat.

Chapter II: The concept of sustainable development (2 weeks)

Definition, Brief history, The fundamental principles of sustainable development, The ethical principle, The precautionary principle, The prevention principle, The objectives of sustainable development, the environmental challenges of sustainable development.

Chapter III: Environment and natural resources (4 weeks)

Introduction, Resources, Water, Air, Fossil fuels (oil, natural gas, coal, etc.), Other energies (solar, wind, hydraulic, geothermal, biomass, etc.), Mineral elements, Biodiversity, Soils, Food resources.

Chapter IV: Substances (4 weeks)

The different types of pollutants, Regulated pollutants, Organic compounds, Heavy metals, Particles, Chlorofluorocarbons, The effects of different substances on the environment, Greenhouse effect and climate change, Destruction of the ozone layer, Acidification, eutrophication and photochemistry, Acid rain. Ozone peaks; Effects on materials; Effects on ecosystems: forests, freshwater reserves, Effects on health. The different types of emitters, Corinair nomenclature.

Chapter V: Environmental Preservation (3 weeks)

Introduction of new materials, Reserving oil for noble uses, Improving energy efficiency, Recycling, Economic, legal and regulatory mechanisms for environmental preservation, The role of public authorities in resolving environmental problems, The possible option of private solutions, Current environmental policies, The polluter-pays principle, Ecological taxation: ecotaxes, The market for tradable emission permits.

Assessment method:

Exam: 100%.

Bibliographic references:

1- *De Jouvenel, B., 1970, "The theme of the environment, Analysis and forecasting", 10, pp. 517533.*

2- *Faucheux S., Noël JF, "Economics of natural resources and the environment", Armand Collin, Paris.*

3- *Reed D. (Ed.), 1999, "Structural adjustment, environment and sustainable development", L'Harmattan, Paris, 1995.*

4- *Vivien F-.D, "History of a word, history of an idea: sustainable development put to the test of time", Ed. scientific and medical Elsevier ASA, pp. 19-60, 2001.*

5- *Boutaud, Aurélien. Gondran, Natasha, "The Ecological Footprint", Paris: La Découverte, 2009. - 128 p.*

6- *Lazzeri, Yvette (Dir.); preface by Gérard Guillaumin, "Sustainable development, businesses and territories: towards a renewal of practices and tools", Paris: L'Harmattan, 2008. – 284.*

Semester: 6

Teaching unit: UEF 3.8.0 Subject:

Propulsion

VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)

Credits: 4

Coefficient: 2

Teaching objectives:

The objective of the course is to provide the elements necessary for understanding propulsion in aeronautics.

Recommended prior knowledge:

Course in fluid mechanics, thermodynamics.

Content of the material:

Chapter I: Different propulsion systems. **(2 weeks)**

I1. Piston engine

I2. Propulsive turboshaft engine

I3. Turbojet

I4. Double-flow turbojet

I5. Double-flow turbojet with afterburner

I6. Double-spool turbojet.

I7. Rocket engines, ramjets, pulsejets

Chapter II: Global thermodynamic study of a turbojet **(3 weeks)**

II.1- Thrust of a turbojet

II.2- Thermal efficiency

Propulsive efficiency

Thermopropulsive Efficiency II.3 -

Thermodynamic cycle of a turbojet in flight

Theoretical thermodynamic cycle of a turbojet in flight

Study of the real thermodynamic cycle of a turbojet in flight

Chapter III: Energy study of the entry and exit passages **(4 weeks)**

III.1 Air inlet (Diffuser)

-External flow configuration

-Internal flow configuration

-Performance of a diffuser

*Adiabatic efficiency

*Total pressure ratio.

III.2 Air outlet ducts (Nozzle)

- Flow study

- Performance of a nozzle.

-

Chapter IV: Energy study of the Compressor-Turbine couple **(4 weeks)**

IV-1 Compressor study

-Air flow in a compressor

* Air flow in fixed channels

* Air flow in moving channels

-Speed triangle for one stage

-Thermodynamic study of a stage

IV2-Study of the turbine

-Description

-Kinematic study of the fluid through a stage

-Thermodynamic study of the fluid through a stage

-Dynamic study of the floor

IV 3- Coupling of the turbine with the compressor.

Chapter V: Energy study of the combustion chamber (2 weeks)

V 1-Design and description of the room

-Injection system

-Ignition system

-Flame attachment device

-Cooling systems

V2-Energy behavior of the combustion chamber

Personal work:

Students will be required to complete a course project on:

-the turboprop

- the propeller

Assessment method:

Continuous Assessment 40% Exam: 60%.

Bibliographic references:

1. Pascal Bauer. Aeronautical and space propulsion: Thermodynamics of inert and reactive gases; Anaerobic and aerobic propulsion systems. Edition Ellipses.2009.
2. *G P. SUTTON, OSCAR BIBLARZ, Rocket Propulsion Elements: an introduction to the engineering of rockets / by George P. Sutton, Oscar Biblarz.--7th ed. A Wiley-Interscience publication.*
3. *H. Cohen, GFC Rogers, and HIH Saravanamuttoo, Gas Turbine Theory, 3rd ed., Longman Scientific and Technical, New York, 1987.*
4. *Renaud Gciquel, energy systems Volume 2 , Press of the Paris School of Mines.* ***ISBN:*** *2-911762-32-0, 2001*
5. *NA Cumpsty, Cambridge Engine Technology Series: 2, JET PROPULSION, University of Cambridge; Cambridge University Press; ISBN 0 521 59674 2 paperback. 2002.*

Semester: 6

Teaching unit: UEF 3.8.0 Subject: Aircraft engines

VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)

Credits: 4

Coefficient: 2

Teaching objectives:

To provide an analytical description of the operation of internal combustion engines as well as the principles of calculating their performance and basic sizing.
To enable an understanding of the concept of aeronautical propulsion and the different types of propulsion used today.

Recommended prior knowledge:

First and second principle thermodynamics course

Content of the material:

Chapter 1: Introduction to engines used in aeronautics (6 weeks)

- Introduction to engines used in aeronautics
- Piston engines: Definition and operating principle and role of the engine
- Four-stroke engine: Operating cycle and main engine components
- Study of the Otto or Beau De Rochas cycles, the Diesel cycle, the mixed cycle - Expressions of efficiency, work, average indicated pressure and power.
- Examples of applications.
- Actual cycles, timing advance and delay adjustments.
- Overfeeding

Chapter 2: Kinematics of the crank-rod system (4 weeks)

- Kinematics of the connecting rod–crank system: Calculation of spaces, speeds and accelerations
- Dynamics of the connecting rod crank system: Static and dynamic balancing Calculation of the piston, connecting rod and crankshaft.
- Dynamics of the distribution system: Calculation of contact forces

Chapter 3: Combustion (5 weeks)

- Combustion: Combustion reaction - Equilibrium
- Fuels and their properties: MCI fuels, aircraft fuels and Rocket fuel
- Pollution control.
- Piston engine technology: Tuning, electronic injection, Common rail system; Ignition and firing order, variable valve timing, variable compression ratio.

- Engine cooling systems: Air and liquid cooling, Lubrication.

Assessment method:

Continuous Assessment: 40% Exam: *60%.*

Bibliographic references:

1. *JB Heywood, "Internal Combustion Fundamentals", McGraw Hill Higher Education, 1989.*
2. *P. Arquès, "Design and construction of alternative engines", Ellipse, 2000.*
3. *JC. Guibet, "Fuels and engines", T 1 and T2 1997.*
4. *P. Arquès, "Reciprocating internal combustion engines (Technology)", Masson edition, 1987.*
5. *UY FaminGorban, AI, Dobrovolsky VV, Lukin AI et al., "Marine Combustion Engines internal", Leningrad:Sudostrojenij, 1989, 344p.*
6. *W. Diamant, "Internal combustion engines", ECAM, 1984.*
7. *M. Desbois, R. Armao, "The diesel engine, Edition Foucher", Paris, 1974.*
8. *M. Menardon, D. Jolivet, "The Engines, Edition Chotard", Paris, 1986.*
9. *M. Desbois, "The automobile: T1: 4-stroke and two-stroke engines. T2: The components of transmission and use", Edition Chotard, 1989.*
10. *P. Arques, "Combustion", Ellipses, Paris, 1987.*
11. *H. Memetau, "Functional techniques of the automobile: The engine and its auxiliaries", Dunod, Paris, 2002.*
12. *Charles Fayette Taylor* The Internal-Combustion Engine in Theory and Practice *Second Edition, Revised. Massachusetts Cambridge, MIT PRESS.*

Semester: 6

Teaching unit: UEM 3.2.1
Subject: Aeronautical maintenance
VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficients: 1

Teaching objectives:

Allows you to acquire the skills necessary to participate in maintenance training courses aircraft manufacturers

Recommended prior knowledge:

Physics, mechanics and electronics

Subject content: Module: Fault diagnosis and aeronautical maintenance

Chapter 1: Reminder on electrical components: Conductors, Circuit breakers, Connectors, Fuses, Switching Components - Electronic Components: Semis - conductors, junction devices, transistors, special components **(2 weeks)**

Chapter 2: Maintenance and Safety of Various Aircraft Electrical Systems and Detection of breakdowns **(3 weeks)**

Chapter 3: Maintenance of automatic systems: Automation functions, Elements constituents of automatic control automatons **(4 weeks)**

Chapter 4: Maintenance of hydraulic and pneumatic circuits: verification & detection leaks **(4 weeks)**

Chapter 5: Protection systems and their different types (applications) **(2 weeks)**

Assessment method:

Continuous Assessment: 40% Exam: *60%.*

Bibliographic references:

1- *Industrial process control architectures Engineering technique AG3510*
2- *Automation and industrial processes in the food industry Engineering technique F1290*
3- *Industrial programmable controllers S8015 engineering technique*
4- *Industrial local networks - Concepts, typology, characteristics Engineering technique S7574*
5- *Jacques LESENNE, Francis NOTELET and Guy SEGUIER: Introduction to advanced electrical engineering. Technique and Documentation, 1981.*
6- *Pierre MAYÈ: Industrial electric motors. Dunod, 2005.*
7- *R. Annequin and J. Boutigny. Course in physical sciences, electricity 3. Paris, Vuibert.*
8- *M. Kuznetsov. Foundations of electrical engineering.*
9- *H. Lumbroso. Problems solved on electrical circuits. Dunod.*

Semester: 6

Teaching unit: UEF 3.2.2

Subject: Air Operations

VHS: 45h00 (lesson: 1h30, TD: 1h30)

Credits: 4

Coefficients: 2

Teaching objectives:

The objective of this course is to teach the terminologies and fundamental bases of weight and balance calculations, hold loading limitations as well as the performance of airplanes and helicopters.

Recommended prior knowledge:

Air navigation and flight mechanics

Content of the subject:

Chapter 1: Introduction to the concepts of mass and centering **(03 weeks)**

- Center of gravity
- Mass and centering limits
- Centering calculation
- Fixing loads

Chapter 2: Loading - Terminology. **(04 weeks)**

- Aircraft weight checks
- Analysis of the tetrahedron element (three-dimensional)
- Procedures for determining the aircraft weight and balance estimate

Chapter 3: Aircraft Performance **(04 weeks)**

- Definitions of speeds and terms used
- Takeoff and landing performance
- Climb and cruise performance

Chapter 4: Performance of aircraft certified under JAR/FAR 25 conditions - performance class A (4 weeks)

- Takeoff.
- Acceleration-stop distance
- Initial climb - Cruise.
- Descent and landing.

Assessment method:

Continuous assessment: *40% ;* Exam: *60%.*

Bibliographic references:

1. *ATPL weights and centering - Alain N'Guyen (Mermoz Institute);*
2. *Performance class (A) ATPL- Alain N'Guyen (Institut Mermoz)*

3.

Semester: 6

Teaching unit: UEF 3.2.2
Subject: Air traffic and control

VHS: 10:30 p.m. (lesson: 1.5 hours)
Credits: 2

Coefficients: 1

Teaching objectives:

This course covers the basic concepts of air traffic control, the different classes of airspace as well as the essential regulatory points relating to air traffic.

Recommended prior knowledge:

Aviation regulations

Content of the subject:

Chapter 1: Types of air traffic - Existence of 2 flight categories. **(04 weeks)**
- Air traffic services and organizations. - airspace division.

Chapter 2: Altimetry and Altimeter Setting Procedures - Altitude and Height. **(04 weeks)**

- Standard shimming.
- QNH, QFE, QNE.

Chapter 3: Rules of the Air (General, Visual Flight, Instrument Flight)

(04 weeks)

- Correspondences between air rules.
- Services provided and responsible air traffic bodies

Chapter 4: Aerodromes (general) - uncontrolled aerodromes - runway office and aeronautical information office - alert phases **(03 weeks)**

Assessment method:

- Exam: 100%.

Bibliographic references:

1. *Annex 2 relating to ICAO*
2. *Algerian AIP*
3. *Air traffic ATPL-CPL-IR - Jean-Pierre Desbenoit (Mermoz Institute).*
4. *Air Law ATPL-CPL-IR - Rosine de Barbeyrac (Mermoz Institute)*
5. *AIR TRAFFIC MANAGEMENT.* (Doc 4444)

Semester: 6

Teaching unit: UEM 3.8 Subject:
End of cycle project
VHS: 45h (TP: 3h00)
Credits: 4
Coefficient: 2

Teaching objectives:

Assimilate knowledge from different subjects in a comprehensive and complementary manner. Put into practice the concepts taught during training. Encourage students' sense of autonomy and initiative. Teach them to work in a collaborative environment by stimulating their intellectual curiosity.

Recommended prior knowledge: The entire Bachelor's program.

Content of the material:

The theme of the End of Cycle Project must come from a joint choice between the tutor and a student (or a group of students: pairs or even trios). The substance of the subject must necessarily fit with the objectives of the training and the real skills of the student (Bachelor's level). It is also preferable that this theme takes into account the social and economic environment of the establishment. When the nature of the project requires it, it can be subdivided into several parts.

Noticed :

During the weeks when students are familiarizing themselves with the purpose of their project and its feasibility (bibliographic research, search for software or hardware necessary to carry out the project, revision and consolidation of teaching directly related to the subject, etc.), the subject manager must use this face-to-face time to remind students of the essential content of the two subjects "Writing Methodology" and "Presentation Methodology" covered during the first two semesters of the common core.

At the end of this study, the student must submit a written report in which he must state as explicitly as possible:

- The detailed presentation of the study theme, emphasizing its interest in its socio-economic environment.
- The means implemented: methodological tools, bibliographic references, contacts with professionals, etc.
- Analysis of the results obtained and their comparison with the initial objectives.
- Criticism of the observed deviations and possible presentation of other details additional.

- Identification of the difficulties encountered by highlighting the limits of the work carried out and the follow-up to be given to the work carried out.

The student or group of students finally presents their work (in the form of a brief oral presentation or on a poster) in front of their tutor and an examiner who can ask questions and thus assess the work accomplished in terms of technique and presentation.

Assessment method:

Continuous assessment: 100%.

Semester: 6

Teaching unit: UEM 3.8 Subject:
Practical work on aircraft propulsion and engines

VHS: 10:30 p.m. (TP: 1:30 p.m.)
Credits: 2
Coefficient: 1

Teaching objectives:

This course contributes to the acquisition of essential knowledge for aeronautical undergraduate students. Particular attention will be paid to the differences between gasoline and diesel. It provides an opportunity to learn about the operation of internal combustion engines and the role of their various components.

The lessons cover knowledge of the following different points:

- Acquire the basic concepts enabling you to understand how the 4-stroke internal combustion engines.
- Understand the differences between a petrol and diesel engine
- Carry out the timing of the distribution
- Know all the different circuits: lubrication, cooling, ignition, etc.

Recommended prior knowledge:

Aircraft engine yard.

Content of the subject:

Part I: Light aviation engine practical work **(8 weeks)**

1. Analysis of the general operation of a 4-stroke engine (gasoline and diesel)
2. Careful disassembly of the various mechanical elements of an engine, for this it is essential to list:
   - the constituent elements of each part (screws, number of parts, etc.)
   - the assembly order (plan or diagram, chronology, etc.)
3. Analysis of the components of an engine (essential parts, lubrication, waterproofing. . .)
4. Analysis and testing of all elements of the circuit: cooling, fuel , lubrication and firing order.
5. Reassembly of a revised engine.

Part II: Practical work on **(7 weeks)**

propulsion: 1. Practical work to be planned as part of a visit to the Air Algérie, Aéreport and/or other workshops. military aviation organizations.

Assessment method:

- Continuous Assessment: *100%*

Bibliographic references:

1. http:// www.tecquipment.com/ #

2. *http:// www.deltalab-smt.com/ teaching-mechanical-engineering/ fluid-mechanics-aerodynamics/ aerodynamics/ subsonic-suction-wind-tunnel-ea600*

Semester: 6

Teaching unit: UEM 3.2
Subject: On-site visit

VHS: 37h30 (TP: 2h30)
Credits: 3
Coefficients: 2

Teaching objectives:

The lessons are given *in situ* (aerial report), they focus on knowledge of following different points: The structure of the plane, The different elements which constitute the aircraft, and the electrical, electronic and mechanical systems in a plane.

Recommended prior knowledge:

Basic knowledge prerequisite for S4 and S5 of the Aeronautics license training.

Content of the subject:

During the on-site visit, the student is put in direct contact with several institutions and services, which may contain for example:

- A service of the national air navigation establishment ENNA.
- Services of civil aviation companies (Air Algérie etc.).
- A control tower.
- A weather station.
- An aircraft fuel supply station: NAFTAL.
- An aviation school attached to the district airport.
- Additional services: civil protection, maintenance workshop, etc.

During this visit, the student is expected to learn about all the elements necessary for the aeronautical study of an aircraft in its entirety, which includes, among other things, the structure, the engine and the different systems of an aircraft that can equip it for air navigation.

This training is then based on practical teaching in a real environment, which will be followed by the writing of a summary report that the student must present after completing this visit.

Assessment method:

Continuous assessment: *100%*

Bibliographic references :

Semester: 6

Teaching unit: UED 3.8

Subject: Airport infrastructure

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives:

This course aims to teach the characteristics of airport infrastructure and provide an overview of the construction of runways, taxiways, aircraft parking areas and the different constructions within airports as well as the different classifications of such infrastructure.

Recommended prior knowledge:

Aviation regulations

Content of the material:

Chapter 1: General Information **(2 weeks)**

- Definitions.
- Application.
- Declared distances
- Information on airfields.

Chapter 2: Physical Characteristics **(3 weeks)**

- Runways – Runway shoulders – Runway strips.
- Traffic lanes – Traffic lane shoulders – Traffic lane strip.

Chapter 3: Limitation and Removal of Obstacles **(2 weeks)**

- Obstacle limitation surfaces.
- Specifications for obstacle limitation.

Chapter 4: Visual Aids to Navigation **(3 weeks)**

- Indicators and signaling devices.
- Brands.
- Lights.
- Precision approach lighting devices.
- PAPI and APAPI.
- Traffic signs.
- Tags.

Chapter 5: Visual Aids to Signal Obstacles **(2 weeks)**

- Objects to be marked.
- Marking objects.
- Light marking of objects.

Chapter 6: Visual aids to signal limit employment areas **(2 weeks)**

- Runway and taxiways closed in whole or in part
- Low resistance surface
- Pre-threshold area
- Unusable areas.

Assessment method:

Review: 100%.

Bibliographic reference

1. *Horonjeff Robert & McKelvey Francis X., Planning and design of airports, 1994*
2. *Douglas Deborah Gwen, The invention of airports: A political, economic and technological history of airports in the United States 1919-1939, 1996*
3. *Edwards Brian, The Modern Terminal, London, E & FN Spon, 1998*
4. *Conway Erik M., America's Airports: Airfield Development 1918-1947 (review), 2002*
5. *Yoder EJ & Witczak MW, Principles of Pavement Design 2nd Edition, 1975*
6. *Patterson James W., "Impact of New Large Aircraft on Airport Design", US Department of Transportation, 1998*
7. *Steiner JE, Aircraft Evolution and Airline Growth, 1967, pp.85-92*
8. *Annual Passengers Traffic Data 2010, at http:// www.aci.aero/ , (Airports Council International), April 15, 2010.*
9. *Annex 14 ICAO Aerodromes*
10. *Doc 9137 Airport Services Manual*

Semester: 6

Teaching unit: UED 3.2

Subject: Human factors in aeronautics

VHS: 10:30 p.m. (lesson: 1.5 hours)

Credits: 1

Coefficients: 1

Teaching objectives:

The concept of Human Factors is of importance in the field of aeronautics and more particularly in the analysis of air accidents where the main cause of occurrence is human error. This course mainly deals with:

- the medical component (physiology)
- the behavioral component (psychology)

Recommended prior knowledge:

Basics of Human Physiology

Content of the subject:

Chapter 1: Human Factors: Basic Concepts. (04 weeks)

- Human Factors Model in Aeronautics (Application to the profession of application controller for improving human performance etc.)
- Accident statistics.
- Ergonomics (Ergonomics of human-machine systems, Cognitive ergonomics and interface, Ergonomics and workload, Reliability of complex systems
- Flight safety concept.

Chapter 2: Basic Aeronautical Physiology and Health Maintenance (04 weeks)

- Basics of flight physiology
- Man and his environment: the sensory system.
- Health and hygiene

Chapter 3: Notions of aeronautical psychology. (04 weeks)

- Processing of information by humans.
- Human error and reliability.
- Decision making
- Error management and avoidance: cockpit management
- Personality.
- Overwork, overload and underload (of work).
- Advanced cockpit automation

Chapter 4: Stress and Fatigue (03 weeks)

- Stress management
- Human fatigue

Assessment method:

- Exam: *100%*

Bibliographic references:

1. *Human Factor ATPL-CPL-IR - Jean-Pierre Desbenoit (Mermoz Institute).*

Semester: 6

Teaching unit: UET 3.8 Subject 1: Professional project and business management

VHS: 10:30 p.m. (Class: 1.5 hours)

Credits: 1

Coefficient: 1

Teaching objectives:

Prepare for professional integration at the end of studies through a maturation process that is both individual and collective. Implement a post-degree project (continuing studies or job search). Master the methodological tools necessary for defining a post-degree project. Prepare for the job search. Become aware of entrepreneurship by presenting an overview of management knowledge useful for business creation.

Recommended prior knowledge: Basic knowledge + Languages.

Targeted skills:

Ability to analyze, synthesize, work in a team, communicate well orally and in writing, be autonomous, plan and meet deadlines, be responsive and proactive.

Content of the material:

Sequence 1. Plenary session

Presentation of the module's objectives, Inventory of available sources of information on professions and studies, Submission of an individual sheet to be completed on the sector and the chosen profession.

Sequence 2. Preparation of group work

Creation of working groups (4 students/group), Provision of instructions for documentary research, Establishment of an action plan for carrying out interviews with professionals, Presentation of a standard questionnaire.

Sequence 3. Documentary research and field interviews

Free schedule. Each student will be required to provide a certificate signed by a professional, which will be included in their final report.

Sequence 4. Group sharing

Individual presentation and exchange of results in groups, Preparation of a group summary which will be attached to each student's final report.

Sequence 5. Preparation for job search

Writing a CV and cover letters, Examples of recruitment tests (interviews, tests).

Sequence 6. Focus on creating activities

Presentation of management elements related to entrepreneurship.

Alternative - plan two sessions on the subject:

Creating your business: from design to implementation (Content: the profession of entrepreneur, project definition, market and competition analysis, tools

to develop a business plan project, administrative procedures for setting up, an overview of the main management principles, etc.).

Sequence 7. Development of the individual post-license project

Presentation of the outline of the individual final report, Preparation supervised by supervisors.

Assessment method:

Review: 100%.

Bibliographic references:

1- *Patrick Koenblit, Carole Nicolas, Hélène Lehongre, "Building your professional project", ESF Publisher, 2011.*

2- *Lucie Beauchesne, Anne Riberolles, "Building your professional project", L'Etudiant, 2002.*

IV- Agreements / Conventions

STANDARD LETTER OF INTENT

(In case of a license co-sponsored by another university establishment)

(Official paper on the letterhead of the university establishment concerned)

Subject: Approval of co-sponsorship of the license entitled:

The above-mentioned university (or university center) declares co-sponsorship of the hereby grants the license for the entire period of authorization of the license.

To this end, the university (or university center) will assist this project by:

- Giving his point of view in the development and updating of teaching programs,

- Participant in seminars organized for this purpose,
- By participating in the defense juries,
- By working to pool human and material resources.

SIGNATURE of the legally authorized person:

FUNCTION :

Date :

STANDARD LETTER OF INTENT

(In case of license in collaboration with a company in the user sector)

(Official company letterhead)

SUBJECT: Approval of the project to launch a Bachelor's degree course entitled:

Provided to:

The company hereby provides declares his will to demonstrate his support for this training as a potential user of the product.

To this end, we confirm our support for this project and our role will consist of:

- Give our point of view in the development and updating of programs teaching,
- Participate in seminars organized for this purpose,
- Participate in defense juries,
- Facilitate as much as possible the reception of interns either within the framework of theses or end of studies, or within the framework of supervised projects.

The means necessary to carry out the tasks incumbent upon us to achieve these objectives will be implemented on a material and human level.

Mr (or Mrs)*…….is designated as external coordinator of this project.

SIGNATURE of the legally authorized person:

FUNCTION :

Date :

OFFICIAL STAMP or COMPANY SEAL

V - Opinions and Visas of the Administrative and Consultative Bodies

License Title: Aeronautics

Department Head + Domain Team Leader	
Date and visa:	Date and visa:
Dean of the Faculty (or Director of the Institute)	
Date and visa:	
Head of university establishment	
Date and visa:	

VI – Notice and Visa of the Regional Conference

VII – Opinion and Visa of the National Educational Committee of the Domain