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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
2021–2022
(2nd update)

Establishment	Faculty / Institute	Department

Domain	Sector	Speciality
Sciences And Technologies	***Civil Engineering***	***Civil Engineering***

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Educational Committee National Domain

Science and Technology

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From 2021 to 2022

Al-Qaeda	Al-Qaeda/Al-Qaeda	Al-Qaeda

The	Allah	Allah
The whole world	The whole world	The Lord and the Lord

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:

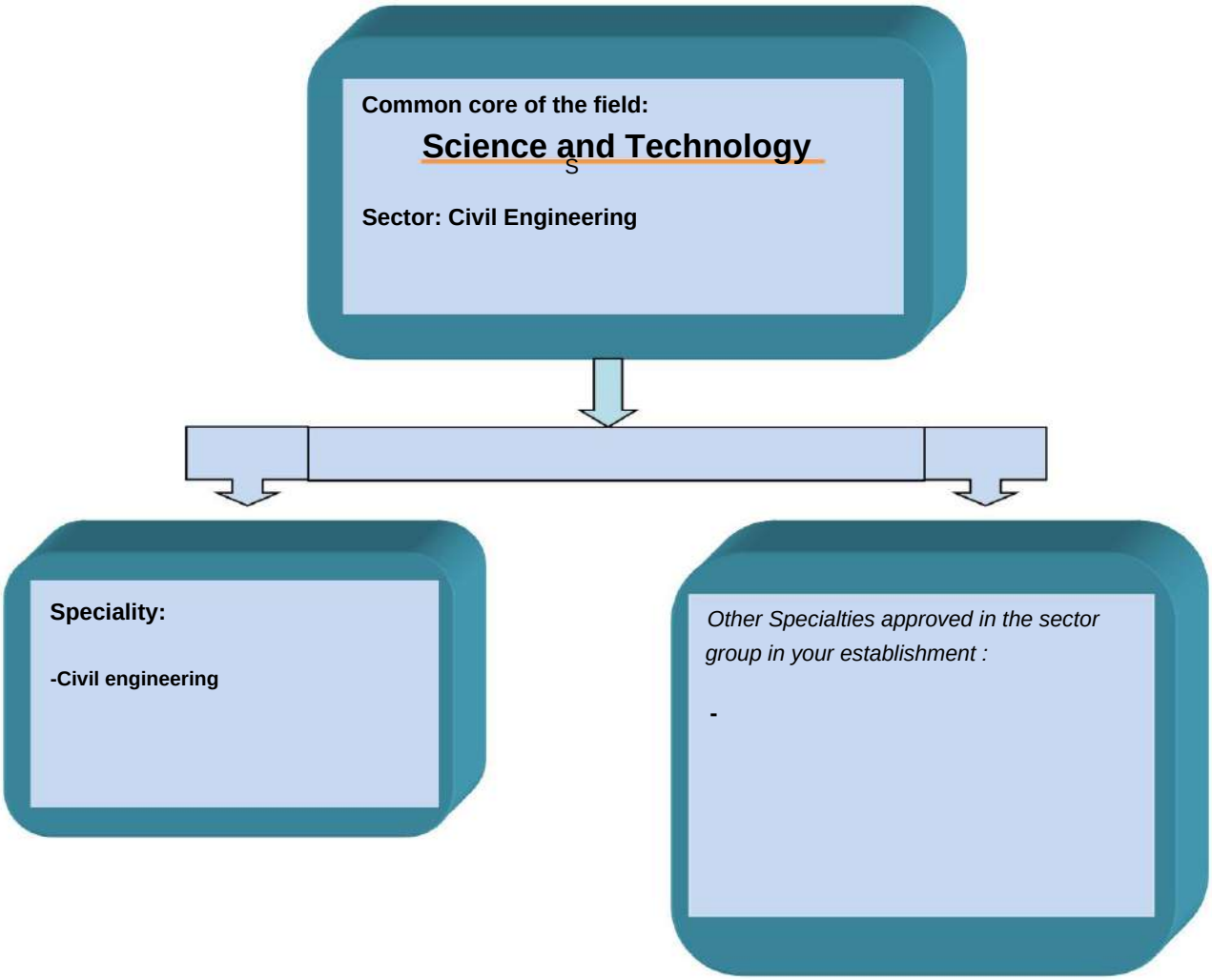
Businesses and other socio-economic partners:

International partners:

3 – Context and objectives of the training

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

Enter in the following diagram the License subject to this framework as well as all approved licenses (functional or not) at the establishment level and belonging to the same Group of sectors.
Indicate with an asterisk any other license that is also supervised by a large proportion of the teachers involved in this license. Indicate frozen licenses with a double asterisk. Also mark with (P) any professional-type license.



B - Training objectives:

The Civil Engineering Bachelor's degree course aims to provide students with a scientific and technological foundation ensuring mastery of academic and practical knowledge in the various fields of construction. In addition to providing professional skills leading to successful integration into supervisory and management roles within construction companies, as well as project monitoring and control, this Bachelor's degree provides students with basic scientific and specific training that provides them with the ability to assimilate knowledge, enabling them to access higher degrees: the Master's degree and the possibility of preparing for a Doctorate in the various specialties of Civil Engineering.

C – Targeted profiles and skills:

This training aims to train managers for the Civil Engineering, Construction and Public Works sector in general, and more specifically, companies, design offices and expert firms.

Furthermore, we are witnessing the emergence of a field, promising in terms of employability and research, which is undergoing rapid technological change: the development of new materials. These require the introduction of new technologies, new production methods, and new commercial techniques, and consequently a boost in the demand for specialized personnel.

D – Regional and national employability potential:

Professional opportunities at the management level are important in all phases of a construction operation:

- The programming of works: public sector (local authorities, construction companies) constructions.
- Calculation of works: Design offices, engineering firms.
- Management and monitoring of works and quality control of works: Construction companies for structural works and secondary works, inspection offices.
- Maintenance and management of assets: Technical management, rehabilitation, arrangements.
- Site monitoring: medium and large-scale construction.

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 Compliance 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 Study and/or End of Cycle dissertations.
- ÿ Number of practical exercises carried out as well as the multiplication of the type of practical exercises per subject (diversity of practical exercises).
- 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 opportunities.
- ÿ Establishment of an association of former graduates of the sector.
- ÿ Creation of small businesses by graduates of the specialty.
- ÿ Employer satisfaction level.

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 various university establishments showed heterogeneity in the implementation of continuous assessment of students. We are therefore led to admit a real deficit in the effective management of this educational activity, which required us to

serious reflection 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:

1.1. 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	Materials to teach	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%
E Transversal Code: UET 1.1 Credits: 2 Coefficients: 2	Ethical and deontological dimension (the foundations)	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
	Foreign language 1 (French or English)	1	1	1h30				10:30 p.m.	2:30 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

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	TD	TP		Hourly Volume 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 technology 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

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume 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	Probability 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	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	TD	TP		Volume Hourly Biannual (15 weeks)	Work Complementary in Consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 2.2.1 Credits: 6 Coefficients: 3	Soil mechanics	4	2	1h30	1h30			45h00	55h00	40%	60%
	Materials of construction	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%
Methodological EU Code: UEM 2.2 Credits: 9 Coefficients: 5	Soil Mechanics Practical Work	2	1			1h30		10:30 p.m.	27:30	100%	
	Construction materials TP	2	1			1h30		10:30 p.m.	27:30	100%	
	Drawing Assisted by Computer	2	1			1h30		10:30 p.m.	27:30	100%	
	Numerical Methods Practical Work	2	1			1h30		10:30 p.m.	27:30	100%	
	TP MDF & RDM	1	1			1 hour		3:00 p.m.	10:00 a.m.	100%	
EU Discovery Code: UED 2.2 Credits: 2 Coefficients: 2	Geology	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
	Topography 1	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 2.2 Credits: 1 Coefficients: 1	Techniques of expression, information and communication	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

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	TD	TP		Hourly Volume Biannual (15 weeks)	Work Complementary in Consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 3.1.1 Credits: 12 Coefficients: 6	Resistance of the Materials 2	4	2	1h30	1h30			45h00	45h00	40%	60%
	Reinforced Concrete 1	4	2	1h30	1h30			45h00	45h00	40%	60%
	Metal Frame	4	2	1h30	1h30			45h00	45h00	40%	60%
Fundamental EU Code: UEF 3.1.2 Credits: 6 Coefficients: 3	Soil Mechanics 2	4	2	1h30	1h30			45h00	45h00	40%	60%
	Construction Materials 2	2	1	1h30				10:30 p.m.	27:30		100%
Methodological EU Code: UEM 3.1 Credits: 9 Coefficients: 5	Topography TP	2	1			1h30		10:30 p.m.	27:30	100%	
	Soil Mechanics 2 Practical Work	2	1			1h30		10:30 p.m.	27:30	100%	
	TP Materials of Construction2	2	1			1h30		10:30 p.m.	27:30	100%	
	Construction drawing	3	2			2h30		37h30	37h30	100%	
EU Discovery Code: UED 3.1 Credits: 2 Coefficients: 2	Topography 2	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
	General hydraulics	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 3.1 Credits: 1 Coefficients: 1	Construction techniques and rules	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Total semester 5		**30**	**17**	**12:00**	**6:00**	**7:00**		**375 hours**	**375 hours**		

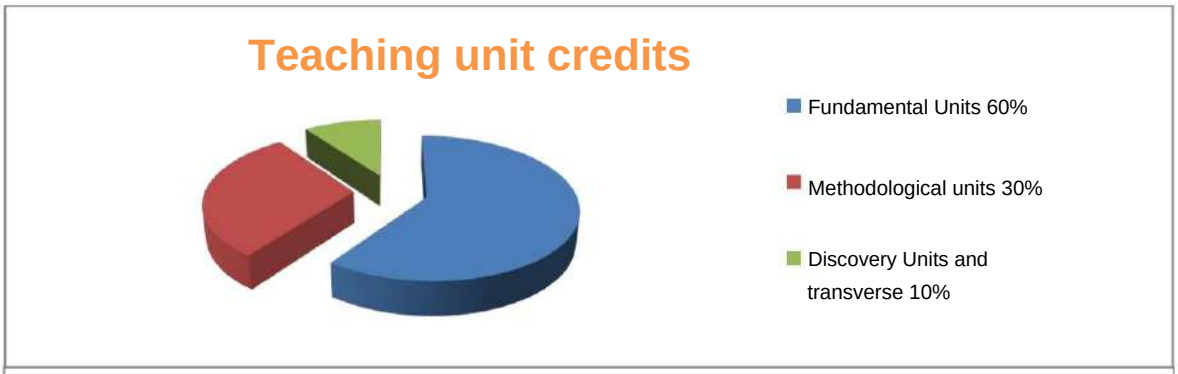
Semester 6

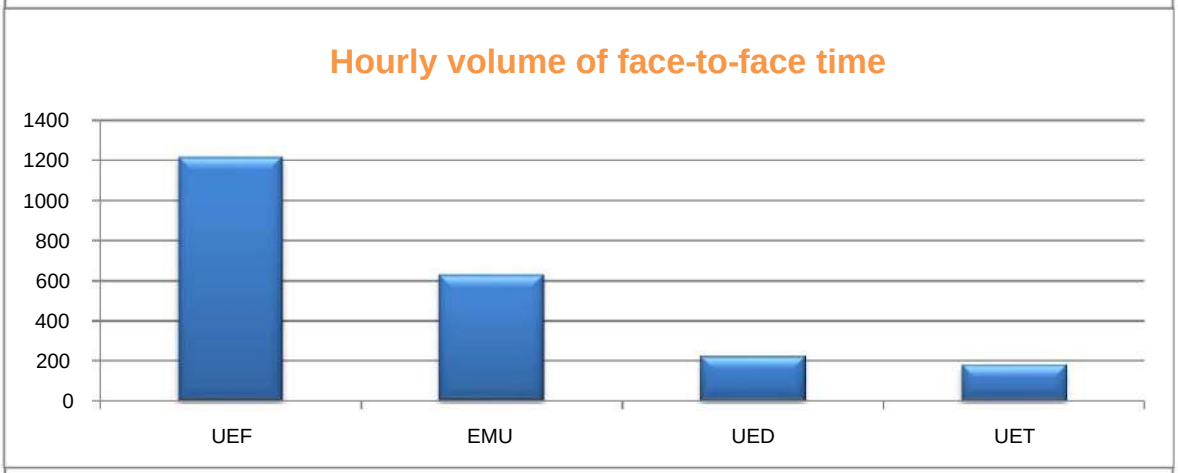
Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	TD	TP		Hourly Volume Biannual (15 weeks)	Work Complementary in Consultation (15 weeks)	Assessment method Control Continuous	Exam
Fundamental EU Code: UEF 3.2.1 Credits: 8 Coefficients: 4	Structural Calculation	4	2	1h30	1h30			45h00	55h00	40%	60%
	Metal Constructions	4	2	1h30	1h30			45h00	55h00	40%	60%
Fundamental EU Code: UEF 3.2.2 Credits: 10 Coefficients: 5	Reinforced Concrete 2	6	3	3h00	1h30			67h30	82h30	40%	60%
	Foundations and works Geotechnics	4	2	1h30	1h30			45h00	55h00	40%	60%
Methodological EU Code: UEM 3.2 Credits: 9 Coefficients: 5	End of Cycle Project	4	2				3:00 a.m.	45h00	55h00	100%	
	Computer-aided calculation	3	2				2h30	37h30	37h30	100%	
	Measurement and Estimation Awards	2	1	1h30				10:30 p.m.	27:30		100%
EU Discovery Code: UED 3.2 Credits: 2 Coefficients: 2	Roads and Miscellaneous Networks	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
	Organization of construction sites	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Transversal EU Code: UET 3.2 Credits: 1 Coefficients: 1	Entrepreneurship and business management	1	1	1h30				10:30 p.m.	2:30 a.m.		100%
Total semester 6		**30**	**17**	**1:30 p.m.**	**6:00 a.m.**	**5:30 a.m.**		**375 hours**	**375 hours**		

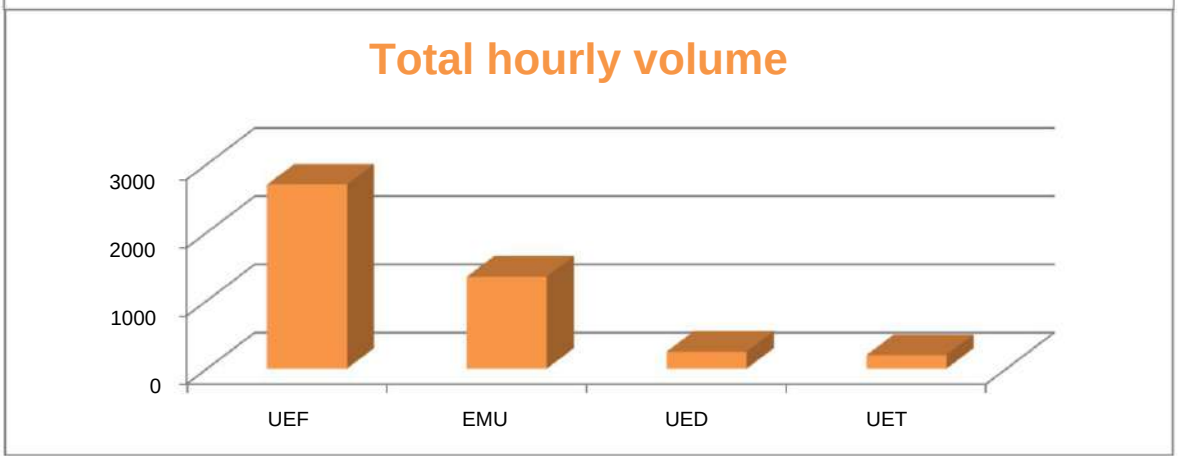
The assessment methods presented in these tables are given for information purposes only; the establishment's training team may suggest other weightings.

Overall training summary:

EU / VH	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 **(1 Week)**
Reasoning. 1-2 Reasoning by Contraposition. 1-3 Reasoning by Absurdity. 1-4 Reasoning by Contraexample. 1-5 Reasoning by Recurrence.

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

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 **(3 Weeks)**
Function. 4-2 Logarithmic Function. 4-3 Exponential Function. 4-4 Hyperbolic Function. 4-5 Trigonometric Function. 4-6 Inverse Function

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

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

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 – 2 e 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 1.1
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 1.1 Subject 1: Physics 1 VHS: 10:30 p.m. (TP: 1:30 p.m.)
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: **(4 weeks)**

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

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 3.1

Subject: Ethical and deontological dimension (the foundations)

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

Credits: 1

Coefficient: 1

Teaching objectives:

The main objective of this course is to facilitate an individual's immersion in student life and their transition into a responsible adult. It helps develop students' awareness of ethical principles. It introduces them to the rules that govern life at university (their rights and obligations towards the university community) and in the world of work, raises awareness of respect for and the valorization of intellectual property, and explains the risks of moral evils such as corruption and how to combat them.

Recommended prior knowledge:

None

Content of the material:

I. Fundamentals – ÿÿÿÿÿÿ ÿÿÿÿÿ) 2 weeks)

Definitions:

1. Moral:
2. Ethics:
3. Ethics “Theory of Duty”:
4. The right:
5. Distinction between the different concepts

A. Distinction between ethics and morality

B. Distinction between ethics and deontology

II. The Reference Materials – 2 weeks)

Philosophical references

The religious reference

The evolution of civilizations

The institutional reference

III. The University Franchise – ÿÿÿÿÿÿÿ ÿÿÿÿÿ) 3 weeks)

The Concept of University Franchises

Regulatory Texts

University franchise fees University campus

stakeholders

IV. University Values – ÿÿÿÿÿÿÿÿ ÿÿÿÿÿ) 2 weeks)

Social Values

Community Values

Professional Values

V. Rights and Duties **(2 weeks)**

Student Rights
Student's duties
Teachers' Rights
Obligations of the professor-researcher
Obligations of administrative and technical staff

VI. University Relations (2 weeks)

Definition of the concept of university relations
Student-teacher relations
Student-student relations
Student-staff relations Student-
member relations

VII. Practices (2 weeks)

Best practices for the teacher
Best practices for the student

Bibliographic references

1. Collection of ethics and professional conduct courses from Algerian universities.
2. BARBERI (J.-F.), 'Morality and corporate law', *Les Petites Affiches,* no. 68, June 7, 1995.
3. J. Russ, *Contemporary Ethical Thought,* Paris, puf, *Que sais-je?,* 1995.
4. LEGAULT, GA, Professionalism and Ethical Deliberation, Quebec, University Press of Quebec, 2003.
5. SIROUX, D., 'Ethics', in M. Canto-Sperber (ed.), Dictionary of Ethics and Moral Philosophy, Paris, Quadrige, 2004.
6. Prairat, E. (2009). Teaching professions in the era of ethics. *Education and Companies, 23.*
7. https://elearning.univ-annaba.dz/pluginfile.php/39773/mod_resource/content/1/Cours%20Ethique%20et%20la%20d%C3%A9ontology.pdf .

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 2: 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 1.2
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. **(3 weeks)**
Work, 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 **(3 weeks)**
2nd law 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 1.2 Subject 1:
Physics 2 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:
Practical Chemistry 2 VHS:

10:30 p.m. (practical work: 1:30 p.m.)
Credits: 2
Coefficient: 1

Teaching objectives

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

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 1: 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) etc.), Rankings

global most sustainable companies (Dow Jones Sustainable Index, Global 100, etc.), Case studies 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. Reactor Cooling System. Conductor and Conductivity. Induction Motors. Electrolysis. Flow and Metering. Liquid Pumps. Petroleum. Road Foundations. Pavements. for Foundations. Suspension Bridges.	Explanation of Cause Result Conditions (if), Conditions (Restrictive) Eventuality Manner When, Once, If, etc. + Past Participle Liquid It is + Adjective + to As It is + Adjective or Verb + that… Similarity, Difference Rigid In Spite of Although, Piles Formation of Adjectives Phrasal 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 2.1.1
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.

1. H. Djelouah; Electromagnetism; Office of University Publications, 2011.

Semester: 3

Teaching unit: UEF 2.1.2 Subject 1: Fluid mechanics VHS: 45h00 (Lecture: 1h30, TD: 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 subject:

Chapter 1: Properties of Fluids **(3 weeks)**

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

Perfect fluid, real fluid, compressible fluid and incompressible fluid.
Density, density, rheology
of a fluid, viscosity of fluids, surface tension of a fluid

Chapter 2: Fluid Statics Definition of **(4 weeks)**

pressure, pressure at a point in a fluid Fundamental law of fluid statics
Level surface Calculation of pressure forces: Flat
plate (horizontal, , Pascal's Theorem
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 **(4 weeks)**

Steady flow Continuity
equation Mass flow and
volume flow Bernoulli's theorem,
cases without work exchange and with work exchange Applications to flow and speed measurements:
Venturi, Diaphragms, Pitot tubes, etc.
Euler's theorem

Chapter 4: Dynamics of real incompressible fluids Flow regimes, **(4 weeks)**

Reynolds experiment Dimensional analysis, Vashy-
Buckingham theorem, Reynolds number 3. Linear pressure losses and singular pressure losses, Moody diagram.

Generalization of Bernoulli's theorem to real fluids

Assessment method:

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

Bibliographic references: 1- R.

Comolet, 'Experimental fluid mechanics', Volumes 1, 2 and 3, Ed. Masson et Cie.
2- R. Ouziaux, 'Applied Fluid Mechanics', Ed. Dunod, 1978 3- BR
Munson, DF Young, TH Okiishi, 'Fundamentals of Fluid Mechanics', Wiley & Sons.
4- RV Gilles, 'Fluid Mechanics and Hydraulics: Courses and Problems', Schaum Series, Mc Graw Hill, 1975.
5- CT Crow, DF Elger, JA Roberson, 6- Engineering fluid mechanics', Wiley & sons
RW Fox, AT Mc Donald, 'Introduction to fluid mechanics', fluid mechanics' 7- VL
Streeter, BE Wylie, 'Fluid mechanics', McGraw Hill 8- FM White,
''Fluid mechanics', McGraw Hill 9- S. Amiroudine,
JL Battaglia, 'Fluid mechanics Courses and exercises corrected', Ed. Dunod.

Semester: 3

Teaching unit: UEF 2.1.2 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

Physics 1 and Mathematics 2

Content of the subject:

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

Chapter 2. Generalities and basic definitions 2.1 **(2 weeks)**

Definition and physical meaning of force

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. Statics. **(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:

1. Elements of Rational Mechanics. S. Targ. Mir Editions Moscow
2. Mechanics for engineers. STATICS. Russell Edition. 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, Publications Office Academics, Tahar HANI 1983, 386p.

Semester: 3

Teaching unit: UEM 2.1 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: Usual Discrete and Continuous Probability Laws Weeks **3**

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 2.1 Subject 2:

Computer science 3 VHS: 22h30

(TP: 1h30)

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

Computer Science 1 and 2

Content of the subject:

TP 1: Presentation of a scientific programming environment	**(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 Repeat 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:

1. start in algorithms with MATLAB and SCILAB / Jean-Pierre Grenier, . - Paris: Ellipses, 2007 . - 160 p.

2. Scilab from theory to practice / Laurent Berger, . - Paris: D. Booker, 2014.

3. Programming and simulation in Scilab / Bégyn Arnaud, Gras Hervé, Grenier Jean-Pierre, - Paris: Ellipses, 2014 . - 160 p.

4. Computer science: programming and scientific computing in Python and Scilab classes scientific preparatory courses 1st and 2nd years / Thierry Audibert, ; Amar Oussalah ; Maurice Nivat, . - Paris: Ellipses, 2010. - 520 p

Semester: 3

Teaching unit: UEM 2.1 Subject 3: Technical drawing

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

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 **(6 Weeks)**

2.1 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, rules of standardized representations (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:

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 AndreRicordeauEditionAndreCasteilla;
5. ÿÿÿÿÿÿ ÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿÿÿ ÿÿÿÿ ÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ
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Semester: 3

Teaching unit: UEM 2.1 Subject 4:
Practical work on Waves and Vibrations

VHS: 3:00 p.m. (practical work: 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 2.1 Subject 1: Basic VHS Technology: 22h30 (Course: 1h30)
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 **(3 Weeks)**

1.1 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 material 2.1 **(4 Weeks)**

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 material removal **(4 Weeks)**

Turning, milling, drilling; adjustment, etc.
Workshop visits and demonstrations.

Chapter 4. Assembly techniques **(4 Weeks)**

Bolting, riveting, welding, etc.

Assessment method:

Final exam: 100%.

Bibliographic references: 1. Manual of

mechanical technology, Guillaume SABATIER, et al Ed. Dunod.
2. MemoTech: materials production and machining BARLIER C. Ed. Casteilla
3. Industrial Sciences MILLET N. ed. Casteilla
4. MemoTech: Industrial Technologies BAUR D. et al 5. , Ed. Casteilla
Dimensional Metrology CHEVALIER A. Ed. Delagrave
6. Drilling, milling JOLYS R and LABELL R. Ed. Delagrave
7. Guide to mechanical manufacturing PADELLA P. Ed. Dunod
8. Technology: first part, Ben Saada S and FELIACHI d. Ed. OPU Algiers
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Semester: 3

Teaching unit: UED 2.1 Subject 2:

Metrology VHS: 22h30

(Course: 1h30)

Credits: 1

Coefficient: 1

Teaching objectives To teach

the student the precision criteria for manufacturing and assembling parts; To 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, laboratory, legal, industrial);

1.2 Metrological vocabulary, definition;
1.3 National and international metrology institutions.

Chapter 2. The International System of Measurement SI (3 Weeks)

2.1 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, reproducibility of a measuring device)
3.2 Classification of measurement errors: (Raw value; Systematic error; Corrected raw value)
3.3 Random errors: (Random errors; parasitic errors; Estimated systematic errors.
3.4 Confidence interval ; Technical uncertainty; Total measurement uncertainty;
3.7 Complete measurement result;
3.8 Identification and interpretation of the specifications of a definition drawing for 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: 1. Manual

of mechanical technology, Guillaume SABATIER, et al Ed. Dunod.
2. Memotech: materials production and machining BARLIER C. Ed. Casteilla
3. Industrial Sciences MILLET N. ed. Casteilla
4. Memotech: Industrial Technologies BAUR D. et al 5. , Ed. Casteilla
Dimensional Metrology CHEVALIER A. Ed. Delagrave
6. Drilling, milling JOLYS R and LABELL R. Ed. Delagrave
7. Guide to mechanical manufacturing PADELLA P. Ed. Dunod
8. Technology: first part, Bensaada S and FELIACHI d. Ed. OPU Algiers
Remove the water from the water. 9.

Semester: 3

Teaching unit: UET 2.1 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, area, volume, power, etc.
Describe scientific experiments.
Characteristics of scientific texts.

NB: The courses are taught largely or entirely in English.

Assessment method:

Final exam: 100%.

Bibliographic references:

Semester: 4

Teaching unit: UEF 2.2.1

Subject 1: Soil mechanics VHS:

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

Credits: 4

Coefficient: 2

Teaching objectives:

The student will be able to characterize the physical parameters of soils, classify them based on laboratory and in-situ identification tests and become familiar with flows in soils.

Recommended prior knowledge:

Fundamental subjects of Semesters 1 and 2

Content of the material:

Chapter 1. Introduction to soil mechanics (2 weeks)

Purpose of soil mechanics (History and scope of application), Definitions of soils, Origin and formation of soils, Structure of soils (Grainy soils and fine soils).

Chapter 2. Identification and classification of soils (4 weeks)

Physical characteristics, Granulometric analysis, Consistency of fine soils (Atterberg limits), Soil classification.

Chapter 3. Soil Compaction (4 weeks)

Compaction theory, Laboratory compaction tests (Normal and modified Proctor tests), Special in-situ compaction materials and processes, Compaction requirements and control.

Chapter 4: Water in the soil Water **(5 weeks)**

flow in soils: velocity, gradient, flow rate, Darcy's law, permeability, Measurement of permeability in the laboratory and in situ, Principle of effective stress, Study of flow networks.

Assessment method:

Continuous Assessment: 40%; Exam: 60%.

Bibliographic references

1. COSTET J. and SANGLERAT G, “Practical course in soil mechanics”, Volume 1, Dunod, 1981.
2. SANGLERAT G., CAMBOU B., OLIVARI G. "Practical Problems of Soil Mechanics, Volume 1, Dunod, 1983.
3. AMAR S. and MAGNAN JP "Soil mechanics tests in the laboratory and in situ," published by LCPC, 1980.
4. SCHLOSSER F. "Elements of soil mechanics, 2nd Ed., Presses de l'ENPC", 1997.

Semester: 4

Teaching unit: UEF 2.2.1
Subject 2: Construction materials

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

Coefficient: 1

Teaching objectives:

The student will be able to characterize the physico-mechanical parameters of construction materials.

Recommended prior knowledge:

All the fundamental subjects of the common core S1 and S2.

Content of the subject:

Chapter 1: General Information (2 weeks)

History of building materials, Classification of building materials, Properties of building materials.

Chapter 2: Aggregates (4 weeks)

Granularity, Classification of aggregates, Characteristics of aggregates, Different types of aggregates.

Chapter 3: Binders (6 weeks)

Classification, Air binders (air lime), Hydraulic binders (Portland cements), Main constituents and additions **Chapter 4: Mortars (3 weeks)**

Composition, The different types of mortars (lime mortar, cement mortar), Main characteristics.

Assessment method:

Exam: 100%.

Bibliographic references:

1. Materials Volume 1, Properties, applications and design: courses and exercises: Bachelor's degree, master's degree, schools of engineers, Dunod Edition, 2013.
2. Concrete admixtures, Afnor, 2012.
3. Aggregates, soils, cements and concretes: characterization of civil engineering materials by laboratory tests: final year STI civil engineering, BTS building, BTS public works, DUT civil engineering, master pro geosciences civil engineering, engineering schools, Casteilla, 2009.
4. The physicochemical properties of construction materials: matter & materials, properties rheological & mechanical, safety & regulation, thermal, hygroscopic, acoustic and optical behavior, Eyrolles, 2012.

Semester: 4

Teaching unit: UEF 2.2.2 Subject 1:

Mathematics 4 VHS: 45h00 (Lecture:

1h30, TD: 1h30)

Credits: 4

Coefficient: 2

Teaching objectives:

This course covers 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: Full Series 3 weeks

Radius of convergence. Domain of convergence. Expansion in power series. Analytic functions. Laurent series and expansion in Laurent series.

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: S4

Teaching unit: UEF 2.2.2 Subject 2:

Digital methods VHS: 45h00 (Lecture:

1h30, TD: 1h30)

Credits: 4

Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

Mathematics 1, Mathematics 2, Computer Science 1 and Computer Science 2

Content of the subject:

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

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

Chapter 2: Polynomial Interpolation General **(2 weeks)**

introduction, Lagrange polynomial, Newton polynomials.

Chapter 3: Function Approximation: (2 weeks)

Approximation method and quadratic mean, Orthogonal or pseudo-Orthogonal systems, Approximation by orthogonal polynomials, Trigonometric approximation.

Chapter 4: Digital Integration **(2 weeks)**

General introduction, Trapezoid method, Simpson's method, Quadrature formulas.

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

General introduction, Euler's method, Improved Euler's method, Runge-Kutta method. **(2 weeks)**

Chapter 6: Direct method of solving systems of linear equations

Introduction and definitions, Gauss method and pivoting, LU factorization method, Choeleski factorization methodMMt , Thomas Algorithm (TDMA) for diagonal sorting systems.

Chapter 7: Approximate method of solving systems of linear equations (2 weeks)

Introduction and definitions, Jacobi method, Gauss-Seidel method, Use of relaxation.

Assessment method:

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

References:

1- C. Brezinski, Introduction to the practice of numerical calculation, Dunod, Paris 1988.

2- G. Allaire and SM Kaber, Numerical Linear Algebra, Ellipses, 2002.

3- G. Allaire and SM Kaber, Introduction to Scilab. Corrected practical exercises in linear algebra, Ellipses, 2002.

4- G. Christol, A. Cot and C.-M. Marle, Differential Calculus, Ellipses, 1996.

5- M. Crouzeix and A.-L. Mignot, Numerical analysis of differential equations, Masson, 1983.

6- S. Delabrière and M. Postel, Approximation methods. Differential equations. Scilab applications, Ellipses, 2004.

7- J.-P. Demailly, Numerical Analysis and Differential Equations. Grenoble University Press, 1996.

8- E. Hairer, SP Norsettet and G. Wanner, Solving Ordinary Differential Equations, Springer, 1993.

9- PG Ciarlet, Introduction to numerical matrix analysis and optimization, Masson, Paris, 1982.

Semester: 4

Teaching unit: UEF 2.2.3
Material: Resistance of materials

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

Coefficient: 2

Teaching objectives:

Learn the basic concepts of the resistance of materials, the goals and assumptions of RDM, the concept of internal forces, geometric characteristics of sections, the law of behavior of materials, the concept of admissible stresses and the dimensioning of parts under simple stresses.

Recommended prior knowledge:

Rational mechanics and function analysis.

Content of the subject:

Chapter 1. Introduction and General Information (2 weeks)

Goals and hypotheses of the resistance of materials, Different types of loading, Connections (supports, embedments, hinges), General principle of equilibrium - Equilibrium equations, Method of sections -
Concept of internal forces: Normal force N, Shear force T, Bending moment M, Definitions, sign conventions and units.

Chapter 2. Geometric characteristics of straight sections (2 weeks)

Center of gravity, Static moments, Moments of inertia of a cross section, Transformation of moments of inertia. Central principal axes, principal moments of inertia.

Chapter 3. Simple traction and simple compression (3 weeks)

Definitions, Normal tensile and compressive forces, Normal stress, Elastic deformation, Hooke's law, Young's modulus, Stress-strain diagram, Resistance condition and concept of admissible stress.

Chapter 4. Simple Flexion (4 weeks)

Definitions and assumptions, Shear forces, Bending moments, Differential relationship between load, shear force and bending moment. Diagram of shear forces and bending moments, Stresses in simple bending, Concept of the neutral axis and dimensioning. Deformation of a beam subjected to simple bending (concept of deflection), Calculation of tangential stress.

Chapter 5. Shearing (2 weeks)

Definitions, Simple shear, Pure shear, Shear stress, Elastic shear deformation, Shear strength condition.

Chapter 6. Torsion (2 weeks)

Definitions, Tangential or sliding stress, Elastic torsional deformation, Condition of resistance to torsion.

Assessment method:

Continuous Assessment: 40%; Exam: 60%.

Bibliographic references:

1. F. Beer, Mechanics for Engineers – Statics, McGraw-Hill, 1981.
2. G. Pissarenko et al., Aide-mémoire of resistance of materials.
3. I. Miroliоubov et al., "Problems of Strength of Materials", Moscow Publishing House.
4. L. Aleinik & J. Durler, "Resistance of materials", Ed. Spes, Dunod.
5. M. Kerguignas & G. Caignaert, "Resistance of materials", Ed. Dunod University.
6. P. Stepine, Resistance of Materials, MIR Editions; Moscow, 1986.
7. S. Timoshenko, Resistance of Materials, Dunod, 1986.
8. William and Nash, Strength of Materials, Lecture and Problem, Schaum Series, 1983.

Semester: 4

Teaching unit: UEM 2.2

Subject 1: Practical work on soil mechanics

VHS: 10:30 p.m. (TP: 1h30)
Credits: 2

Coefficient: 1

Teaching objectives:

The student will be able to characterize the physical parameters of soils, classify them based on in-situ and laboratory identification tests and control their compaction.

Recommended prior knowledge:

Soil mechanics course.

Content of the subject:

- Measurement of weight characteristics (density – water content)
- Measurement of consistency parameters (Atterberg limits)
- Granulometric analysis (by sieving and sedimentometry)
- Measurement of compaction and bearing characteristics (Proctor and CBR tests)
- In-situ density measurement (membrane densitometer test)

Assessment method:

Continuous assessment: 100%.

Bibliographic references: 1. Costet and Sanglerat, “Practical courses in soil mechanics”, Dunod – Paris.
2. Caquot and Kerisel, “Treatise on soil mechanics”, Gauthier, Villars – Paris.

Semester: 4

Teaching unit: UEM 2.2

Subject 2: Practical work on construction materials

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

Credits: 2

Coefficient: 1

Teaching objectives:

The student will be able to characterize the physico-mechanical parameters of construction materials.

Recommended prior knowledge: Construction materials course.

Content of the subject:

TP1: Densities of cement, sand and gravel

TP2: Granulometric analysis of sand and gravel

TP3: Water content and expansion of sand

TP4: Porosity of sand and gravel

TP5: Volumetric coefficient of gravel

TP6: Sand equivalent

TP7: Cement consistency and setting test

Assessment method:

Continuous assessment: 100%.

Semester: 4

Teaching unit: UEM 2.2 Subject 3:

Computer-aided drawing VHS: 10:30 p.m. (practical work: 1.5 hours)

Credits: 2

Coefficient: 1

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

Recommended prior knowledge: Technical Drawing.

Content of the subject:

1. PRESENTATION OF THE CHOSEN SOFTWARE **(4 weeks)**

(SolidWorks, Autocad, Catia, Inventor, etc.)

1.1 Introduction and history of CAD; 1.2 Configuration of the chosen software (interface, shortcut bar, options, etc.); 1.3 Software reference elements (software help, tutorials, etc.); 1.4 Saving files (part file, assembly file, drawing file, saving procedure for handing over to the teacher); 1.5 Communication and interdependence between files.

2. CONCEPT OF SKETCHES **(3 weeks)**

2.1 Sketch tools (point, line segment, arc, circle, ellipse, polygon, etc.); 2.2 Sketch relationships (horizontal, vertical, equal, parallel, hilly, fixed, etc.); 2.3 Sketch dimensioning and geometric constraints.

3. 3D MODELING 3.1 **(3 weeks)**

Concepts of planes (front plane, right plane and top plane); 3.2 Basic functions (extrusion, material removal, revolution): 3.4 Display functions (zoom, multiple views, multiple windows etc.): 3.5 Modification tools (Erase, Offset, Copy, Mirror, Adjust, Extend, Move): 3.6 Creation of a sectional view of the model.

4. LAYOUT OF THE 3D MODEL **(3 weeks)**

4.1 Editing the plan and the title block: 4.2 Choice of views and drawing: 4.3 Dressings and object properties (Hatching, dimensioning, text, tables, etc.)

5. ASSEMBLIES **(2 weeks)**

5.1 Assembly constraints (parallel, coincidence, coaxial, fixed, etc.): 5.2 Production of assembly drawings: 5.3 Assembly drawing and parts list: 1. Exploded view.

Assessment method:

Continuous assessment: 100%.

References:

- Solidworks bible 2013 Matt Lombard, Edition Wiley,
- Technical drawing, Saint-Laurent, GIESECKE, Frederick E. Editions du renouveau pédagogique Inc., 1982.
- Exercises in drawing mechanical parts and assemblies with the software SolidWorks, Jean-Louis Berthéol, François Mendes,
- CAD accessible to all with SolidWorks: from creation to production volume 1 Pascal Rebellious,
- Industrial Designer's Guide, Chevalier A, Hachette Technique Edition,

Semester: S4

Teaching unit: UEM 2.2

Subject 4: Digital Methods VHS Practical Work:

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

Credits: 2

Coefficient: 1

Teaching objectives:

Programming of different numerical methods with a view to their applications in the field of mathematical calculations using a scientific programming language.

Recommended prior knowledge:

Numerical method, Computer Science 2 and Computer Science 3.

Content of the subject:

Chapter 1: Solving Nonlinear Equations (3 weeks)

1. Bisection method. 2. Fixed point method, 3. Newton-Raphson method

Chapter 2: Interpolation and Approximation (3 weeks)

1. Newton interpolation, 2. Chebyshev approximation

Chapter 3: Numerical Integrations 1. **(3 weeks)**

Rectangle Method, 2. Trapezoid Method, 3. Simpson Method **Chapter 4: Differential**

Equations 1. Euler Method, 2. Runge-Kutta **(2 weeks)**

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%.

References :

1. Algorithms and numerical calculation: practical work solved and programming with Scilab and Python software / José Ouin, . - Paris: Ellipses, 2013. - 189 p.

2. Mathematics with Scilab: guide to calculation, programming, graphic representations; conforms to the new MPSI program / Bouchaib Radi, ; Abdelkhalak El Hami . - Paris: Ellipses, 2015. - 180 p.

3. Applied numerical methods: for scientists and engineers / Jean-Philippe Grivet, - Paris: EDP sciences, 2009. - 371 p.

Semester: 4

Teaching unit: UEM 2.2

Subject 5: MDF and RDM practical work

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

Credits: 1

Coefficient: 1

Teaching objectives:

Apply the different concepts studied in the subjects “Fluid mechanics” taught in semester 3 and the subject “Resistance of materials” of the current semester.

Recommended prior knowledge: Part I: Fluid mechanics

Part II: Strength of materials.

Content of the subject:

Part I: Practical work: Fluid mechanics

Practical work No. 1: Measuring the density and volume of liquids **Practical work No. 2:** Measuring the viscosity of liquids **Practical work No. 3:** Measuring the pressure of liquids and calibrating a pressure gauge **Practical work No. 4:** Measuring hydrostatic force and determining the center of pressure **Practical work No. 5:** Measuring the flow rate of liquids

Part II: Practical work: Strength of materials

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%.

Semester: 4

Teaching unit: UED2.2 Subject 1: Geology VHS: 10:30 p.m. (Course: 1.5 hours)
Credits: 1
Coefficient: 1

Teaching objectives: The student will be able to read and interpret a geological map and better understand geotechnical problems. Knowledge of the geophysical methods used.

Recommended prior knowledge:
Fundamental subjects of S1, S2 and S3

Contents of the subject:

Chapter 1: Introduction to Geology 1.1 Definition of Geology 1.2 Paleontology 1.3 Origin of the Earth 1.4 Division of Geology Chapter 2: Minerals and Rocks 2.1 Concept of Mineralogy 2.2 Loose Rocks 2.3 Eruptive Rocks 2.4 Sedimentary Rocks 2.5 Metamorphic Rocks Chapter 3: Action of Different Elements on Rocks 3.1 Action of Air on Rocks 3.2 Action of Water on Rocks 3.3 Action of Glaciers on Rocks (4 weeks)

Chapter 4: Concept of geodynamics 4.1 Internal geodynamics (Earthquakes, volcanoes, etc.) 4.2 External geodynamics (Alteration, Erosion, Falls and Sliding, etc.) (3 weeks)

Chapter 5: Adaptation of geological techniques to the needs of civil engineering (3 weeks)
5.1 Geological mapping 5.2 Use of graphic constructions 5.3 Geological survey of discontinuity surfaces 5.4 Use of stereographic projection

Assessment method:
Exam: 100%.

References:

1. Hydrogeology and concepts of engineering geology, G. BOGOMOLOV 2. Geology: Basics for the engineer, Aurèle Parriaux and Marcel Arnould, 2009 3. Engineering geology: Engineering geology.. Bilingual French/English, Roger Cojean and Martine Audiguier, 2011 4. Hydrogeology, engineering geology, Éditions du BRGM, 1984.

Faucault A. Raoult JF (1995) – Dictionary of Geology, 4th edition. Editions Masson, 325p 5. Pomerol C., Lagabrielle Y., Renard M. (2005) – Elements of Geology, 13th edition. Editions Dunod, 762p

Semester: 4

Teaching unit: UED 2.2

Subject 2: Topography 1

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

Coefficient: 1

Teaching objectives:

The student will be able to know the basics of topography allowing him to carry out and subsequently control the implantation of a construction, leveling, measurement of angles and coordinates, the drawing of topographic plans.

Recommended prior knowledge:

Mathematics; Physics 1; Technical drawing

Content of the subject:

Chapter 1. General (3 weeks)

Topography in the act of building, The different topographic measuring devices, Scales (plans, maps), Errors and mistakes

Chapter 2. Measuring Distances (3 weeks)

Direct distance measurement, Alignment methods and accuracies, Measuring practice, Indirect distance measurements

Chapter 3. Measurement of Angles (3 weeks)

Operating principle of a theodolite, Setting up a theodolite (Adjustment, Reading), Reading horizontal angles, Reading vertical angles.

Chapter 4. Determination of surfaces (3 weeks)

Calculation of the surface area of a polygon, Determination of the surfaces of the contours represented on the plan, Planimeter and surface measurement.

Chapter 5. Direct and Indirect Leveling Direct **(3 weeks)**

Leveling, Indirect Leveling.

Assessment method:

Exam: 100%.

Bibliographic references:

1. Antoine, P., Fabre, D., Modern topography and topography (Volumes 1 and 2) – Serge Milles and Jean Lagofun, 1999.

2. Bouquillard, Topography Course BepTech.geo T1, 2006 3. Dubois

, F. and Dupont, G. (1998) summary of topography, Principles and methods, Editions Eyrolles Paris

4. Herman, T. (1997a) Parameters for the ellipsoid. Edition Hermès, Paris 5.

Herman, T. (1997b) Parameters for the sphere. Edition Dujardin, Toulouse 6.

Meica (1997), Digital levels, MiecaGeosystems, Paris 7. Tchin, M.

(1976) Applied topography, Course at the National School of Arts and Industries of Strasbourg, Topography Specialty.

Semester: 4

Teaching unit: UET2.2

Subject: Expression, information and communication techniques

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

Credits: 1

Coefficient: 1

Teaching objectives:

This course aims to develop the student's skills, both personal and professional, in the field of communication and expression techniques. It also allows the student to learn the techniques, tools, and methods used to facilitate communication.

Recommended prior knowledge:

Languages (Arabic; French; English)

Content of the material:

Chapter 1: Research, analyze and organize information Identify and use **(2 weeks)**
locations, tools and documentary resources, Understand and analyze documents, Create and update documentation.

Chapter 2: Improving the ability to express oneself Take into account the communication situation, Produce a written message, Communicate orally, Produce a visual and audiovisual message, Improve the ability to communicate in a group. **(2 weeks)**

Chapter 3: Developing autonomy, organizational and communication skills within the framework of a project approach
Positioning oneself in a project and **(2 weeks)**
communication approach, Anticipating action, Implementing a project: Presentation of a report on practical work (Homework).

Chapter 4: ICT - Definition and Evolution **(2 weeks)**
Definition, Activities using ICT, Mastery of ICT skills, Evolution of ICT,
Information and Communication Services

Chapter 5: Searching, Using, and Retrieving Information. **(2 weeks)**
Search directories (YAHOO, GOOGLE), Search engines, Query and search language, Retrieving and printing an HTML page, Retrieving an image, Downloading a file or software, Playing an HTML file locally, Playing a multimedia file saved on the Web.

Chapter 6: ICT Rights Computer **(2 weeks)**
Crime, Media Law, Electronic Communications Law, Electronic Commerce Law, Internet Governance, etc.

Chapter 7: Securing Sensitive Information, Protecting Confidential Data and Preventing Nuisances.
(3 weeks)

Backup of important data, "Informatique et Libertés" law, Dangers of the Internet, Computer hacking, Machine protection, Protection against viruses, Protection against
Cyber threats or online threats (Phishing, spam emails, spyware, malware, ransomware,

viruses and trojan horses, man-in-the-middle attacks, etc.), Prevent data loss, Spam, Hoaxes, Cryptology, Electronic signature….

Assessment method:

Final exam: 100%.

Bibliographic references:

(Books and handouts, websites, etc.)

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. 3- Matthieu Dubost, Improving your written and oral expression: all the keys, Edition Ellipses 2014.
4. Allegrezza Serge and Dubrocard Anne (edited by). Internet Econometrics. Palgrave Macmillan Ltd, 2011. ISBN-10: 0230362923; ISBN-13: 9780230362925
5. Anduiza Eva, Jensen J. Michael and Jorba Laja (edited by). Digital Media and Political Engagement Worldwide. Cambridge UniversityPress - MUA, 2012. ISBN-10: 1107668492; ISBN-13: 9781107668492
6. Baron GL, and Bruillard E. Computing and its users in education. Paris, PUF, 1996. ISBN-10: 2130474926; ISBN-13: 978-2130474920
7. Online Chantepie P. and Le Diberder A. Digital revolution and cultural industries. Landmarks. Paris, La Découverte, 2010. ISBN-10: 2707165050; ISBN-13: 978-2707165053
8. Dawn Medlin B. Integrations of Technology Utilization and Social Dynamics in Organizations. Information Science Reference (Isr), 2012. ISBN-10: 1-4666-1948-1; ISBN-13: 978-1-4666-1948-7
9. Devauchelle B. How digital technology transforms places of knowledge. FYP Editions, 2012. ISBN-10: 2916571612; ISBN-13: 978-2916571614
10. GreenfieldDavid. “The Addictive Properties of Internet Usage.” In Internet Addiction, 133?153. John Wiley Inc., 9780470051665. http://dx.doi.org/10.1002/9781118013991.ch8. 2007. ISBN:
11. Kurihara Yutaka and [Al.]. Information technology and economic development. Information Science Reference (Isr), 2007. ISBN 10: 1599045818; ISBN 13: 9781599045818
12. Paquelin D. The appropriation of digital training devices. From prescription to use. Paris, L'Harmattan, 2009. ISBN-10: 2296085563; ISBN-13: 978-2296085565
13. Tansey Stephen D. Business, information technology and society. Routledge Ltd, 2002. ISBN-10: 0415192137; ISBN-13: 978-0415192132

Semester: 5

Teaching unit: UEF 3.1.1 Subject 1:
Resistance of materials 2

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

Coefficient: 2

Teaching objectives:

This subject is a continuation of the Resistance of Materials taught in the fourth semester; we will cover compound stresses, energy methods and hyperstatic systems.

Recommended prior knowledge: RDM 1, materials science, mathematics.

Content of the subject:

Chapter 1: Plane bending of symmetrical beams – reminder (2 weeks) • Reminder bending moment – shear force. • Normal stresses in simple bending • Tangential stresses in simple bending

Chapter 2: Displacement of symmetrical beams in plane bending (2 weeks)

• Displacement of beams of constant section • Initial parameter method • Moment of area methods • Superposition method

Chapter 3: General Theorems of Elastic Systems (Applications) (3 weeks)

• Elastic strain energy in tension • Elastic strain energy in torsion • Elastic strain energy in shear • Elastic strain energy in bending • General expression of elastic strain energy • Castigliano's theorem • Generalized fictitious force method

Chapter 4: Compound stresses • Generalities • Deflected bending (generalities, constraints, deformations) • Compound bending • Bending – torsion **(3 weeks)**

Chapter 5 : **Resolution of Hyperstatic Systems (4 weeks)** • Generalities (bar systems, nodes, joints, frames, gantries etc.) • Initial parameter method • Force effects superposition method

- Method of the 3 moment equations
- Method of forces

Chapter 6: Sizing Examples - Applications **(1 week)**

Assessment method: Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. A. Giet; L. Geminard. *Resistance of materials,* Editions Dunod 1986, Paris.
2. SP Timoshenko. *Strength of Materials,* Dunod Editions; Paris.
3. M. Albiges, ; A Coin . *Resistance of materials,* Editions Eyrolles 1986; Paris.
4. Jean-Claude Doubrère. *Resistance of materials,* Editions Eyrolles 2013
5. YoudeXiong. *Solved exercises on resistance of materials,* Editions Eyrolles, 2014.

Claude Chèze. *Strength of materials - Dimensioning of structures, Simple and compound stresses, buckling, internal energy, hyperstatic systems,* Ellipses, 2012.

Semester: 5

Teaching unit: UEF 3.1.1
Material 2: Reinforced concrete 1

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

Coefficient: 2

Teaching objectives:

Teach the physical and mechanical characteristics of reinforced concrete. Learn the dimensioning of sections subjected to simple stresses (tension, compression and simple bending) according to the BAEL and CBA93 rules.

Recommended prior knowledge:

Strength of materials 1, Construction materials.

Content of the material:

Chapter 1. Formulation and mechanical properties of reinforced concrete **(2 Weeks)**

Definition and general information, Constituents of reinforced concrete, Mechanical properties.

Chapter 2. Regulatory requirements Pivot **(3 Weeks)**

rule, Limit states, Combinations of actions, Non-fragility condition

Chapter 3. Adhesion and Anchoring (3 Weeks)

Adhesion stress, Anchoring of a straight isolated bar, Anchoring by curvature, Overlap

Chapter 4. Simple Compression **(4 Weeks)**

Ultimate strength limit state, serviceability limit state

Chapter 5. Simple tension **(3 Weeks)**

Ultimate limit state of resistance, serviceability limit state

Assessment method:

Continuous Assessment: 40%; Exam: 60%.

Bibliographic references:

1. DTR-BC2-41, “Rules for the design and calculation of reinforced concrete structures”, (CBA 93).
2. Jean-Pierre Mouguin, “Reinforced Concrete Course”, BAEL 91”, BERTI Edition.
3. Jean Perchat and Jean Roux, “Mastery of BAEL 91 and associated DTUs”, EYROLLES.
4. Jean Perchat and Jean Roux, “Practice of BAEL 91 (Course with corrected exercises)”, EYROLLES.
5. Pierre Charon, "Reinforced concrete exercise according to BAEL 83 rules", EYROLLES, 2nd edition.
6. Jean-Marie Paillé, "Calculation of concrete structures Application guide", Eyrolles, 2013.

Semester: 5

Teaching unit: UEF 3.1.1

Material 3: Metal frame

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

Credits: 4

Coefficient: 2

Teaching objectives:

At the end of the teaching of this subject, the knowledge acquired must allow the student to understand the bases of calculation of metallic elements and knowledge of the regulations in force (EC3 and CCM97) and to have general knowledge of the philosophy of dimensioning and the operation of assemblies.

Recommended prior knowledge:

Applied mathematics, rational mechanics, Strength of materials 1.

Content of the subject:

Chapter 1. General information **(1 Week)**

Steel in construction, Steel materials, Mechanical properties of steels.

Chapter 2. Basics and Safety **(3 Weeks)**

Safety concepts, Characteristic values of actions, Technical procedures in CM calculation, Regulations (CCM97 and Eurocode3), Principle of safety verification, Stresses and Combinations of actions (EC3 and CCM97).

Chapter 3. Assemblies (4 Weeks)

General information on connections, Assembly methods (Rivets, bolts, welding), Technological aspects and Operating principle

Chapter 4. Calculation of parts subjected to simple tension **(3 Weeks)**

Use of tensioned parts, Behavior of tensioned parts, Calculation of the net section area, Verification of tensioned parts at ULS, Taking into account the effects of assembly eccentricities in the calculation of tensioned parts.

Chapter 5. Calculation of bent parts **(4 Weeks)**

Use of bent parts, Elastic calculation of resistance to bending moments, Introduction to plastic calculation of sections, Resistance to shear force, Verification of bent parts at ULS (bending moments, shear forces, combined forces), Verification of bent parts at SLS (Calculation of deflections).

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. J. MOREL, “Calculation of Metallic Structures according to EUROCODE 3”.
2. "Design rules for steel structures CCM97", CGS edition, Algiers 1999 3. "Eurocode 3 version", 2008
4. J. BROZZETTI, MA HIRT, R. BEZ, "Metal Construction, Digital Examples adapted to Eurocodes", Presses Polytechniques et Universitaires Romandes.
5. SP TIMOSHENKO, "Theory of Elastic Stability", DUNOD.

Semester: 5

Teaching unit: UEF 3.1.2

Subject 1: Soil mechanics 2

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

Credits: 4

Coefficient: 2

Teaching objectives:

The objective of this course is to enable the student to complete the knowledge acquired in the subject of soil mechanics1 in S4. The student will receive instruction on the calculation of stresses in soils and the calculation of settlements and consolidation of soils. He will also receive knowledge on the behavior of soils under shear as well as on soil investigation methods.

Recommended prior knowledge: Soil mechanics

1, Strength of materials 1.

Content of the material:

Chapter 1. Stresses and strains (3 Weeks)

Introduction to the mechanics of continuous media, Principal stresses, Distribution of stresses as a function of the orientation of the facets around a point, Mohr circle, Concept of effective stress (Terzaghi principle), Geostatic stresses in a soil.

Chapter 2. Soil Compaction and Consolidation (5 Weeks)

Determination of stresses due to overload, Boussinesq theory (point and distributed load), Amplitude of settlements: Instantaneous settlement, primary settlement and secondary settlement, Compressibility of soils: Characteristics of the compressibility curve, Determination of the compressibility curve from laboratory tests, Terzaghi's one-dimensional consolidation theory.

Chapter 3. Shear strength of soils (4 Weeks)

Notions on soil plasticity, Intrinsic curve, Laboratory shear tests: Casagrande box test and triaxial test (Determination of the cohesion and internal friction angle of a soil), Drained and undrained behavior: distinction between coarse-grained soils and fine-grained soils.

Chapter 4. Soil reconnaissance and exploration (3 weeks)

Importance of a reconnaissance campaign in a civil engineering project, General organization chart of a geotechnical study, Geophysical reconnaissance; Geotechnical reconnaissance., Sampling tools and techniques.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. COSTET J. ET SANGLERAT G, "Practical course in soil mechanics", Dunod, 1981.
MAGNAN JP, 3. FILLIAT “Soil mechanics tests in the laboratory and in situ”, Aide-mémoire, 1980, 2. AMAR S.,
G, “The practice of soils and foundations”, Editions du Moniteur. 1981
4. SCHLOSSER F, “Elements of soil mechanics, Presses of the National School of Bridges and Roads”, 1988.
5. J. COLLAS and M. HAVARD, "Geotechnical Guide: Glossary and Essays", Editions Eyrolles, 1983.

Semester: 5

Teaching unit: UEF 3.1.2
Subject 2: Construction Materials 2

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

Coefficient: 1

Teaching objectives:

The objective is to allow the student to continue with the material taught in S4, in particular on the components of concrete and their behavior in the fresh state (workability) and in the hardened state (mechanical resistance), without forgetting to describe the different types of existing concrete based on current normative texts. Also, the student will know the processes of development of the different materials, from the raw material to the finished product.

Recommended prior knowledge:

During S4, the student will have acquired preliminary and basic knowledge on the physical and mechanical characteristics of binders and aggregates. The student will be able to differentiate between types of mortars.

Content of the material:

Chapter 1. Concretes (7 Weeks)

Definition and classification, Physical and/or mechanical characteristics, Additions, Admixtures, Concrete formulation, Tests on fresh concrete, Tests on hardened concrete, Notions on new concretes and their applications.

Chapter 2. Ceramic Products (4 Weeks)

General information, Classification of ceramic products, Raw materials, Manufacture of ceramic products (Bricks, tiles, Wall and floor tiles, Sanitary ceramics, etc.).

Chapter 3. Ferrous and non-ferrous metals (2 Weeks)

General information, Properties of metals (Physical, chemical and mechanical), Classification of steels according to composition, Protection of ferrous metals against corrosion.

Chapter 4. Glass (2 Weeks)

Production, Manufacturing process, Properties and uses.

Assessment method:

Review: 100%.

Bibliographic references:

1. Materials Volume 1, "Properties, applications and design: courses and exercises: Bachelor's degree, master's degree, schools of engineers", Edition, Dunod, 2013.
2. “Concrete admixtures”, Afnor, 2012.
3. "Aggregates, soils, cements and concretes: characterization of civil engineering materials through laboratory tests: Engineering schools", Castilla, 2009.
4. G. Dreux, "The New Concrete Guide". Editions Eyrolles.
5. “Current cements and concretes”, CIIC, Paris, 1987.

Semester: 5

Teaching unit: UEM 3.1 Subject 1:

Topography practical work VHS:

22h30 (practical work: 1h30)

Credits: 2

Coefficient: 1

Teaching objectives:

The topics covered in the practical work will allow the student to put into practice the theoretical knowledge acquired during the Topography 1 and 2 courses. The student will therefore have the opportunity to carry out all the measurements, calculations and reports known in the subject of topography.

Recommended prior knowledge:

Knowledge acquired in the subjects Topography 1 and 2.

Content of the material:

TP.1: Measurement of angles and distances

Angles: horizontal and vertical; Distances: Direct method, Indirect method.

TP.2: Polygonation

Location reconnaissance, Choice of stations, Location sketches, Measurements (Angles and distances), Calculations and reporting **TP.3:**

Tacheometry

Establishment of the field sketch, Survey of details by radiation, Calculations and reporting

TP.4: Survey by abscissa and ordinate and quasi-ordinate Choice of lines of operation, Measurements, Calculations and transfer

TP.5: Measurements by lateral obliques

Establishment of the field sketch, Survey of details by radiation, Calculations and transfer

TP.6: Implementation

Alignment layout: Preliminary calculations (Office), Site layout, Site layout of a bend, Preliminary calculations (Office), Site layout, Site layout of a building.

Assessment method:

Continuous assessment: 100%.

Bibliographic references: 1. L.

Lapointe, G. Meyer, "Topography applied to public works, building and urban surveys", Eyrolles, Paris, 1986.

2. R. D'Hollander, "General Topography, volumes 1 and 2", Eyrolles, Paris, 1970.
3. M. Brabant, “Mastering topography”, Eyrolles, Paris, 2003.

Semester: 5

Teaching unit: UEM 3.1

Subject 2: Practical work Soil mechanics 2

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

Credits: 2

Coefficient: 1

Teaching objectives:

The student will have the opportunity to carry out practical laboratory tests which are related to the knowledge acquired in the MDS2 course.

Recommended prior knowledge: MDS1 and MDS2.

Content of the material:

TP N.1: Soil permeability Constant and variable head permeameters.

TP N.2: Compressibility test using an oedometer

TP N.3: Direct shear test with the large Cas box

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

1. J. Collas and M. Havard, "Geotechnical Guide: Glossary and Essays", Editions Eyrolles, 1983.

Semester: 5

Teaching unit: UEM 3.1 Subject 3:
Construction materials 2 practical work

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

Coefficient: 1

Teaching objectives:

The main objective of these practical exercises is to develop in the student an interest in knowing certain specific properties of materials while respecting the standards in force and, above all, to become familiar with a key material in the field of civil engineering: concrete. To put the student directly in contact with laboratory techniques.

Once the student has acquired basic knowledge in terms of practical work on materials, it becomes necessary to deepen their knowledge through more specific tests on concrete.

Recommended prior knowledge:

Construction materials, TP Construction materials, Strength of materials1.

Content of the subject:

TP. 1: Determination of the fineness modulus and the fines content of the sand.

TP. 2: Use of the Dreux-Gorisse method for determining the composition of concrete.

TP.3: preparation and testing of mortars.

TP.4: Abrams cone workability test.

TP.5: Crushing test on concrete.

TP.6 : Non-destructive testing.

Assessment method:

Continuous assessment: 100%.

Bibliographic references

1. G. Dreux,
The new guide to concrete, Editions Eyrolles.
2. F. Gorisse, Testing and control of concrete, Editions Eyrolles.

Semester: 5

Teaching unit: UEM 3.1
Subject 4: Building Drawing

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

Coefficient 2

Teaching objectives:

The student must be able to:
- Optimize your technological “culture” (understanding and communication of information through graphic mode),
- Know the current vocabulary and graphic representation conventions,
- Take into account the design/execution link (feasibility).

Recommended prior knowledge:

Technical Drawing

Content of the material:

Chapter 1. Principles of Technical Drawings **(3 Weeks)**

Technical drawing conventions (Lines, Hatching, Writing, Formats, Title block), Presentation of objects (Scales, Orthogonal projections, Sections, Cuts, Dimensions, Perspectives).

Chapter 2. Building drawings **(4 Weeks)**

Terminology and consistency of architectural drawings, Usual scales, Naming of facades, Plans, Identification of premises, Sections, Execution drawings of metal and reinforced concrete frames, Plan representation of floors and identification of their elements, Dimensioning of the building, Schematic and symbolic representation of doors, windows and conduits in walls, Various symbols, Layout and distribution of figures.

Chapter 3. Specific rules and conventions for presenting drawings (5 Weeks)

Site development and soil survey (Conventional land representation, Lithological legend of foundation soils, Geological section, Survey of reconnaissance drilling), Masonry (Principle of representation of the different categories of masonry), Reinforced concrete and prestressed concrete (formwork and reinforcement plans), Metal framework (Overall drawings, Assemblies)

Chapter 4. Drawing of sanitation works Sanitation **(3 Weeks)**

works (Network plans, general rules for presenting networks).

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

1. G. Kienert and J. Pelletier, "Technical drawing of public works and buildings". Eyrolles.
2. Jean Pierre Gousset, "Building drawing techniques - Technical drawing and plan reading Principles and exercises", Editions Eyrolles, 2012.

Semester: 5

Teaching unit: UED 3.1

Subject 1: Topography 2

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

Credits: 1

Coefficient: 1

Teaching objectives At the end of this course, the student must be able to carry out and control the installation of a structure or parts of a structure on the ground.

Recommended prior knowledge

Knowledge acquired in the subject Topography 1 in semester 4

Content of the material:

Chapter 1. Polygonation (3 Weeks)

The different types of polygonal path, Attached polygonal, Polygonal calculations, Report

Chapter 2. Tacheometry (4 Weeks)

Definitions, Use of the tacheometric method, Preparation of the work: Its purpose, Basic document; Reconnaissance of the places: Canvas, Field sketch; Field work: Composition of a brigade, Measurements on the ground; Office work: Calculations, Report

Chapter 3. Survey by abscissa and ordinate and quasi-ordinate (2 Weeks)

Definitions, Survey method, Calculations.

Chapter 4. Lateral Oblique Lift (2 Weeks)

Definitions, Survey Method, Calculations.

Chapter 5. Implementation (4 Weeks)

Definitions, Implementation of straight alignments, Implementation of curves (Circular connections), Implementation of buildings.

Assessment method:

Review: 100%.

Bibliographic references:

1. A.G. Heerbrugg, "Topography and navigation, laica – wild GPS system", gosystms 1992
2. L. Lapointe, G. Meyer "Topography applied to public works, building and urban surveys", Eyrolles, Paris, 1986.
3. R. D'hollander, "General Topography, Volumes 1 and 2", Eyrolles, Paris, 1970.
4. M. Brabant, "Mastering topography", Eyrolles, Paris, 2003.
5. S. Milles, J. Lagofun, "Modern Topography and Topometry", Eyrolles, Paris, 1999.

Semester: 5

Teaching unit: UED 3.1

Subject 2: General hydraulics

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

Credits: 1

Coefficient: 1

Teaching objectives

Teach the fundamentals of hydraulics, fundamental flow equations, pressure loss assessment and introduction to network calculations.

Recommended prior knowledge:

Fluid mechanics

Content of the material:

Chapter 1. Hydrostatics - **(2 weeks)**

Physical characteristics and properties of liquids
- Concept of pressure
- Fundamental equation of hydrostatics -
Pressure at a point on a wall
- Pressure forces on the walls

Chapter 2. Fundamental Equations of Hydrodynamics **(2 weeks)**
- Streamlines, stream tube.
- Continuity equation
- BERNOULLI's theorem
- VENTURI phenomenon
- PITOT tube

Chapter 3. Dynamics of Real Liquids - **(3 weeks)**

Flow of Liquids
- Pressure losses
- Generalized Bernoulli's theorem
- Energy diagram

Chapter 4. Flow regimes in pipes, hydraulic resistances (3 weeks)
- Laminar regime – turbulent regime
- Reynolds number
- Calculation of pressure losses using the MANNING equation

Chapter 5. Flow through orifices - Flow **(2 weeks)**

through the Orifice - Flow
under constant head
- Flow under variable load

Chapter VI: Free surface flow and spillways **(3 weeks)**
- Classification of flows
- Geometric characteristics of flows
- Flow through the spillways

Assessment method:

Review: 100%.

Bibliographic references

1. "Fluid Mechanics and Hydraulics (Lectures and Problems)" Schaum series.
2. Armando Lencastre, "General Hydraulics", Edition: Eyrolles.
3. Michel Carlier, "General and Applied Hydraulics", Edition: Eyrolles.

Semester: 5

Teaching unit: UET 3.1

Subject: Construction techniques and rules

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

Credits: 1

Coefficient: 1

Teaching objectives:

This subject is composed of two parts. The first part aims to introduce students to the technical and technological aspects of the construction operation. The second part introduces students to the basic concepts of the various regulations applied in the design of civil and industrial constructions with an application of the rules for justifying reinforced concrete structures according to the RPA.

Recommended prior knowledge:

Subjects taught in semester 4.

Content of the material:

Chapter 1. Project development techniques. (1 Week)

Process of carrying out a construction project, design and preparatory arrangements for the execution of the works, choice of site and installation of structures, geotechnical investigations.

Chapter 2. Site preparation techniques Preparation (3 Weeks)

of works and techniques for organizing building sites, staking out and demarcating the site, earthworks and backfilling, techniques for removing earth, digging wells, ramming, reclaiming topsoil, trenches and shielding, sloping **(2 weeks)**

Chapter 3. Techniques for the construction of reinforced concrete structures

Techniques for the construction of shallow and deep foundations. Formwork and reinforcement techniques for building structures.

Chapter 4. Metal and mixed works (2 weeks)

Welding and bolting, Assemblies of metal structures in buildings and industrial halls.

Chapter 5. Introduction to the different regulations (2 Weeks)

Generalities and Need for Regulation, Introduction to the different construction standards, BAEL standards and Eurocodes.

Chapter 6. RPA 99 earthquake rules version 2003 (1 Week)

(General rules for designing seismic zones, criteria for classifying structures).

Chapter 7. Justification of Reinforced Concrete Structures (2 Weeks)

(Combinations of actions, Justification with regard to resistance, overall balance, and stability of foundations, Definition and justification of joints).

Chapter 8. Specification of structural elements (2 Weeks)

Specifications for the main elements (columns, beams, floors, slabs, walls and walls).
Specifications for secondary elements, Specifications for materials.

Assessment method:

Review: 100%.

Bibliographic references:

1. J. MATHIVAT and C. BOITEAU, “General construction processes Volume 1: Formwork and concreting”, ENPC, Eyrolles.
2. J. MATHIVAT and FENOUX, "General construction procedures Volume 2: Foundations and civil engineering structures", ENPC, Eyrolles.
3. J. MATHIVAT and JF BOUGARD, "General construction procedures Volume 3: Underground works", ENPC, Eyrolles.
4. Algerian earthquake rules RPA 99 version 2003. DTR –BC-2.48.

Semester: 6

Teaching unit: UEF 3.2.1
Subject 1: Calculation of structures

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

Coefficient: 2

Teaching objectives:

This course should allow students to deepen their knowledge of the strength of materials and to acquire methods for solving hyperstatic two-dimensional systems and structures.

Recommended prior knowledge:

Strength of materials 1, Strength of materials 2.

Content of the subject:

Chapter 1. Isostatic Truss Systems (4 Weeks)

General information; Calculation of forces in bars; Analytical method; Node method; Section method.

Chapter 2. Isostatic frames (2 Weeks)

General information; Calculation of internal forces, plotting of diagrams (N, T, M)

Chapter 3 Lines of Influence (3 Weeks)

Definition and Principle of the line of influence, Principle of the moving load. Isostatic systems: Effect of a concentrated load, Effect of a uniform load, Line of influence of reactions, Line of influence of a shear force, Line of influence of a bending moment.

Chapter 4. Hyperstatic Systems (6 Weeks)

Generalities, Degree of hyperstaticity, Method of forces, Application to hyperstatic frames.

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references:

1. F. Beer, Mechanics for Engineers – Statics, McGraw-Hill, 1981.
2. G. Pissarenko et al., Aide-mémoire of resistance of materials.
3. I. Miroliubov et al., "Problems of Strength of Materials", Moscow Publishing House.
4. L. Aleinik & J. Durler, "Resistance of materials", Ed. Spes, Dunod.
5. M. Kerguignas & G. Caignaert, "Resistance of materials", Ed. Dunod University.
6. P. Stepine, Resistance of Materials, MIR Editions; Moscow, 1986.
7. S. Timoshenko, Resistance of Materials, Dunod, 1986.
8. William and Nash, Strength of Materials, Lecture and Problem, Schaum Series, 1983.
9. R. Soltani, Influence lines of isostatic beams and arches, OPU, 2003.

Semester: 6

Teaching unit: UEF 3.2.1

Subject 2: Metal constructions

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

Credits: 4

Coefficient: 2

Teaching objectives:

At the end of the teaching of this subject, the knowledge acquired in metal framework (semester 5) should allow the student to complete his general knowledge on the phenomena of elastic instabilities of thin profiles: theoretical and regulatory aspects.

Recommended prior knowledge:

To follow this course, it is necessary to have followed the lessons of the CM1 subject of S5 and to have notions on the theory of elastic stability.

Content of the material:

Chapter 1. Elastic instability phenomena (2 Weeks)

Presentation of instability; different types of instability; regulations.

Chapter 2. Calculation of parts subjected to simple compression (5 Weeks)

Use of compressed parts, buckling theory, buckling length, concepts of slenderness and imperfection, verification of compressed parts at ULS.

Chapter 3. Calculation of parts subjected to compound buckling (6 Weeks)

Theoretical and regulatory aspects of compound buckling (EC3 and CCM97).

Chapter 4. Discharge of metal parts (2 Weeks)

Presentation of the tilting phenomenon, Torsional moment of inertia of open profiles, Reminders on torsion with warping (non-uniform torsion).

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic References:

1. Handout prepared by the teacher.
2. J. MOREL, “Calculation of Metallic Structures according to EUROCODE 3”.
3. P. BOURRIER; J. BROZZETTI, "Metallic and Mixed Steel – Concrete Construction – Volumes 1 and 2", EYROLLES.
4. MA HIRT; R. BEZ, "Metal Construction – Volumes 10 and 11" - Polytechnic and University Presses Romands.
5. “Design rules for steel structures”, CCM97 CGS edition, Algiers, 1999.
6. “Practical calculation of metallic structures”, Office of University Publications, Algiers.
7. J. BROZZETTI; MA HIRT; R. BEZ, "Metal Construction "Digital Examples adapted to Eurocodes", Presses Polytechniques et Universitaires Romandes.
8. SP TIMOSHENKO, "Theory of Elastic Stability", DUNOD.

Semester: 6

Teaching unit: UEF 3.2.2

Material 1: Reinforced concrete 2

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

Credits: 6

Coefficient: 3

Teaching objectives:

Teach the dimensioning of common sections (rectangular and T-shaped) under the action of simple and compound stresses with consideration of the action of shear force and torsion.

Recommended prior knowledge:

Strength of materials, Construction materials, Reinforced concrete 1.

Content of the material:

Chapter 1. Calculation of reinforced concrete sections subjected to simple bending (3 Weeks)

Rectangular section and T-section Ultimate resistance limit state + serviceability limit state

Chapter 2. Shear Force (3 Weeks)

Calculation of transverse reinforcements, Checks in areas of application of concentrated forces, Checks of punching resistance, Checks in areas of junction with the web of beams.

Chapter 3. Calculation of BA sections subjected to composite bending (7 Weeks)

Calculation of sections at limit states / rectangular sections and T-sections, Buckling of compressed columns.

Chapter 4. Twisting (2 Weeks)

General overview of the torsion phenomenon and justification of concrete and reinforcement (hollow and solid sections).

Assessment method:

Continuous Assessment: 40%; Exam: 60%.

Bibliographic references:

1. DT RB.C.2-41, “Rules for the design and calculation of reinforced concrete structures”.
2. Jean-Pierre Mouguin, “BAEL 91 Reinforced Concrete Course”, BERTI Edition.
3. Jean Perchat and Jean Roux, “Mastery of BAEL 91 and associated DTUs”, EYROLLES.
4. Jean Perchat and Jean Roux, "Practice of BAEL 91 (Course with corrected exercises)", EYROLLES 5.
Pierre Charon, "Reinforced concrete exercise according to BAEL 83 rules", EYROLLES 2nd edition.

Semester: 6

Teaching unit: UEF 3.2.2

Subject 2: Foundations and geotechnical structures

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

Credits: 4

Coefficient: 2

Teaching objectives:

In this subject, the student will have the opportunity to acquire knowledge about foundations and geotechnical structures. He will be able to calculate and verify the stability of certain structures, such as: retaining structures, foundations and slopes.

Recommended prior knowledge:

Knowledge acquired in the subjects MDS1, MDS2, RDM1, RDM2, BA1.

Content of the material:

Chapter 1. Limiting Equilibrium States (3 Weeks)

Rankine lower and upper limit equilibria (Earth thrust and abutment coefficients), Boussinesq equilibrium (general case), Prandtl equilibrium (Thrust due to overloads).
Determination of failure planes using Mohr's circle in cases of thrust and abutment.

Chapter 2. Retaining structures (4 Weeks)

Definition and classification of retaining structures; Earth actions: thrusts and stops; Stability of retaining walls.

Chapter 3. Shallow Foundations (4 Weeks)

Definition and classification of foundations; Theory and calculation of the bearing capacity of shallow foundations.

Chapter 4. Slope Stability (4 Weeks)

Introduction and general concepts on slope stability calculation methods (concepts of safety coefficient).

Assessment method:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references

1. . J. Costet; G. Sanglerat, "Practical Course in Soil Mechanics", Volume 2, Dunod, 1981.
2. G. Sanglerat; B. Cambou, G. Olivari, "Practical Problems of Soil Mechanics, Volume 2, Dunod, 1983.
3. G. Phillipponat, B. Hubert "Foundations and earthworks", Edition Eyrolles, 1997
4. F. Schlosser, "Element of Soil Mechanics", 2nd Ed., Presses des Ponts, 1997
5. F. Schlosser, "Exercises in Soil Mechanics", 2nd Ed., Presses des Ponts, 1989
7. Schlosser F., 1988, "Elements of soil mechanics", Presses of the National School of Bridges and Roads.

Semester: 6

Teaching unit: UEM 3.2

Subject 1: End of Cycle Project

VHS: 45h00 (TP: 3h00)

Credits: 4

Coefficient: 2

Teaching objectives:

They contribute to the assimilation of the knowledge provided by the program. They are more particularly devoted to the practical application of concepts. They tend to encourage the intellectual openness of students. They develop in a privileged way the sense of initiative and autonomy in the pursuit of work, while leaving certain points very open: The project can be individual or collective,

Recommended prior knowledge:

RDM, BA, MDS, MDC, Building Design, CAD, Foundation and geotechnical works

Content of the material:

- Presentation and description of the project
- Presentation of the different stages of calculating a project
- Calculation assumptions
- Materials used
- Standards and regulations used
- Choice of carrier system
- Pre-dimensioning of structural elements and load assessment
- Calculation of floor reinforcement (hollow body floors, slabs)
- Calculation of secondary elements (a balcony, acroterion)
- Calculation and reinforcement of stairs
- Calculation and reinforcement of a gantry
- Foundation system.
- Production of plans (formwork plan, reinforcement plan, etc.) for the calculated elements.
- Conclusions and perspectives

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

1. A. GUERRIN 2. , RC LAUVAUR, "Treatise on Reinforced Concrete Volume 1-3-4-11", Dunod Edition.

Jean-Pierre Mouguin, “Reinforced concrete course BAEL 91”, BERTI Edition.

3. Jean Perchat and Jean Roux, “Mastery of BAEL 91 and associated DTUs”, EYROLLES.

4. Jean Perchat and Jean Roux, “Practice of BAEL 91 (Course with corrected exercises)”, EYROLLES.

Semester: 6

Teaching unit: UEM 3.2

Subject 2: Computer-aided calculation

VHS: 37h30 (TP: 2h30)

Credits: 3

Coefficient: 2

Teaching objectives:

Familiarize students with civil engineering calculation software. Students must be familiar with the essential features of calculation software, based on an existing project, and must be able to master the software interface and correctly enter data and retrieve results.

Recommended prior knowledge:

Computer Science 1 and 2 and Computer Science 3

Content of the material:

Chapter 1. Basic Concept of Calculation Software (3 Weeks)

Mode of operation and calculation methods used, closed software, open software, advantages and limitations of software.

Chapter 2. Getting started with available software. (6 Weeks)

Presentation of the interface, the working environment, the data, the options, the results (numerical and graphical), interpretation.

Chapter 3. Study and monitoring of a real project: (6 Weeks)

Preferably end-of-cycle project

Assessment method:

Continuous assessment: 100%.

Bibliographic references:

1. Host Software User Manual.

Semester: 6

Teaching unit: UEM 3.2

Subject 3: Measurement and price estimation

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

Credits: 2

Coefficient: 1

Teaching objectives:

The objective of this teaching unit is to provide the student with knowledge of the basic tools for establishing a preliminary estimate and a quote as well as knowledge of the different measurement procedures.

Prerequisites:

This teaching unit requires essential prerequisites such as Construction Drawing and CAD.

Content of the material:

Chapter 1. General Notions (1 Week)

Definition and purpose of the quantity survey and preliminary quantity survey, the role of the quantity surveyor in construction, necessity and degree of precision of the evaluation of works, the quantity survey and preliminary quantity survey documents.

Chapter 2. The acts of the quantity survey and the preliminary quantity survey (2 Weeks)

Summary estimates, quotes, attachments, work status, statements and reports.

Chapter 3. Method of measurement and preliminary measurement of works (2 Weeks)

Drafting and presentation form of the preliminary measurement, order of the preliminary measurement; Reminders of common formulas: measurement of areas and volumes (planes, polyhedra, etc.), measurement of classic volumes – three-level method, Simpson and Poncelet formula.

Chapter 4. Application of preliminary measurements of earthworks and excavations (2 Weeks)

Preliminary measurements of excavations for foundations, calculation of earthwork quantities

Chapter 5. Pre-measurement in masonry (2 Weeks)

Rubble masonry, brick masonry or agglomerates.

Chapter 6. Pre-measurement of reinforced concrete (3 Weeks)

Concrete, formwork, reinforcement.

Chapter 7. Price Study (3 Weeks)

Definition and purpose, price sub-detailing, calculation methods, diagram and presentation of price sub-detailing.

Assessment method:

Review: 100%.

Bibliographic references:

1. Michel Manteau, "Building Measurements", 7th Edition, Eyrolles, 1990.
2. Jena-Pierre Gousset, Jean-Claude Capdebielle, René Pralat, "The Measurement, CAD-CAM with Autocad - Price Study", Editions Eyrolles, 2011.

Semester: 6

Teaching unit: UED 3.2
Subject 1: Roads and various networks

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

Coefficient: 1

Teaching objectives:

In this subject, the student will learn about all the infrastructure works and structures relating to the construction and development of access and traffic routes around buildings: roads, sidewalks, cycle paths, green spaces, public lighting, street furniture, etc.

Recommended prior knowledge:

Prior knowledge of construction materials, soil mechanics, technical drawing and plan reading

Content of the material:

Chapter 1. Road works (3 weeks)

The definition, classification, characteristics of the road network; The layout of the roads, the composition of the roadways (the different layers of the roadway); Parking areas (sidewalks, pedestrian paths, curbs, Integration of disabled people; Lanes reserved for emergency vehicles, Vehicle lanes, Ladder lanes

Chapter 2. Sanitation (5 Weeks)

Sanitation networks: definition, principles and provisions, water to be evacuated, quantity and quality, rainwater, runoff water, domestic wastewater, industrial discharges.

Sizing of pipes, composition of sanitation networks (collectors and pipes, manholes, inspection chimneys, connections), rainwater and runoff water collection structures, ancillary structures.

Chapter 3. Various networks (5 Weeks)

The AEP networks (water requirements, the distribution network (types and materials), connections, fire service and reserves, the electrical distribution network; the fuel gas distribution network; the telecommunications network.

Chapter 4. Green spaces (2 Weeks)

The design of green spaces, the components of green spaces, the management of green spaces.

Assessment method:

Review: 100%.

Bibliographic references:

1. R. Bayon, “Roads and various networks”, Eyrolles.
2. The practice of VRD. The instructor.

Semester: 6

Teaching unit: UED 3.2

Subject 2: Organization of construction sites

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

Credits: 1

Coefficient: 1

Teaching objectives:

Acquire the theoretical and practical knowledge necessary to master the problems of organization and planning of work in construction.

Prerequisites:

Knowledge acquired in the subject General construction processes.

Content of the material:

Chapter 1. Site installation Site installation and preparation, Particularities of construction sites. **(1 Week)**

Chapter 2. Construction equipment (1 week)

Equipment and its use, Choice of equipment to use, Calculation of equipment performance, Equipment maintenance.

Chapter 3. Work Planning (3 Weeks)

Definition of unit labor time, Material yield, Relationship between labor unit time and material yield, Determination of unit labor times and yields, Calculation of total projected labor and material time.

Chapter 4. Planning and Scheduling **(3 Weeks)**

General information on schedules, Common objective of schedules, Different categories of schedules, Methods of presenting schedules.

Chapter 5. PERT Language (3 Weeks)

Definition and graphical representation of the PERT network, Combination of PERT network tasks, Conversion of the PERT network into BAR (GANTT) planning.

Chapter 6. Construction site management Key installations, Determination of the detailed and simplified execution program, Determination of the simplified execution program, Monitoring of construction sites and work controls. **(4 Weeks)**

Assessment method:

Review: 100%.

Bibliographic references:

1. “Organization and management of works: Part 1: Construction machinery and equipment”, IUT of Saint Nazaire, Department of Civil Engineering.
2. Olivier EMILE, “Practical organization of construction sites, Volume 1. “Construction Technicians” Collection.
3. MEAT, "Study and preparation of the opening of a construction site", INPE, -Rouiba, 1994
4. The PERT method, Federal Electric Corporation. Construction Technicians Collection.

Semester: 6

Teaching unit: UET 3.2

Subject: Entrepreneurship and business management

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

Credits: 1

Coefficient: 1

Teaching objectives:

- ÿ Prepare for professional integration at the end of studies;
- ÿ Develop entrepreneurial skills among students;
- ÿ Raise awareness and familiarize students with the opportunities, challenges, procedures, characteristics, attitudes and skills required by entrepreneurship;
- ÿ Prepare students so that they can, one day or another, create their own business or, at least, better understand their work in an SME.

Recommended prior knowledge:

No specific knowledge, except mastery of the language of instruction.

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. Be aware of entrepreneurship by presenting an overview of management knowledge useful for business creation.

Content of the material:

Chapter 1 – Operational preparation for employment: Writing a **(2 Weeks)**

cover letter and developing a CV, Job interview, etc., Documentary research on careers in the sector, Conducting interviews with professionals in the field and Simulating job interviews.

Chapter 2 - Entrepreneurship and Entrepreneurial Spirit: **(2 Weeks)**

Entrepreneurship, Companies around you, Entrepreneurial motivation, Knowing how to set goals, Knowing how to take risks

Chapter 3 - The profile of an entrepreneur and the profession of Entrepreneur: **(3 Weeks)**

The qualities of an entrepreneur, Knowing how to negotiate, Knowing how to listen, The place of SMEs and VSEs in Algeria, The main factors for success when creating a VSE/SME

Chapter 4 - Finding a Good Business Idea: **(2 Weeks)**

Creativity and innovation, Recognizing and evaluating business opportunities

Chapter 5–Starting and Running a Business : **(3 Weeks)**

Choosing a suitable market, Choosing a location for your business, Legal forms of business, Finding help and funding to start a business, Recruiting staff,
Choosing your suppliers

Chapter 6 - Development of the business project: **(3 Weeks)**

The Business Model and the Business Plan, Carry out your business project with the Business Model Canvas

Assessment method: Exam: 100%

References:

- FayolleAlain, 2017. Entrepreneurship theories and practices, applications for learning to undertake. Dunod, 3rd ed.

- LégerJarniou, Catherine, 2013, The Entrepreneur's Big Book. Dunod, 2013.

- PlaneJean-Michel, 2016, Management of organizations: theories, concepts, performances. Dunod, 4th ed.

- LégerJarniou, Catherine, 2017, Building Your Business Plan. The Entrepreneur's Big Book. Dunod,.

- Sion Michel, 2016, Succeeding in your business Methods, tools and tips plan.Dunod, 4th ed.

- Patrick Koenblit, Carole Nicolas, Hélène Lehongre, Building your professional project, ESF, Publisher 2011.

- Lucie Beauchesne, Anne Riberolles, Building your professional project, L'Etudiant 2002.

- ALBAGLI Claude and HENAULT Georges (1996), Business creation in Africa, ed EDICEF/AUPELF, 208 p.

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

Degree title: Civil Engineering

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