الجمهورية الجزائرية الديمقراطية الشعبية
People's Democratic Republic of Algeria
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research

University

LOGO

TRAINING OFFER
LMD

ACADEMIC LICENSE

NATIONAL PROGRAM
2018–2019

Establishment	Faculty / Institute	Department

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

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اللجنة البيداغوجية الوطنية
لميدان العلوم و التكنولوجيا
National Educational Committee for the Field of Science and Technology

عرض تكوين
ل. م. د
ليسانس أكاديمية

برنامج وطني
2019- 2018

المؤسسة	الكلية/ المعهد	القسم

الميدان	الفرع	التخصص
علوم وتكنولوجيا	هندسة مدنية	هندسة مدنية

Summary

I–License identity sheet

1 - Location of the training:

Faculty (or Institute):

Department :

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

2-External partners:

Other partner establishments:

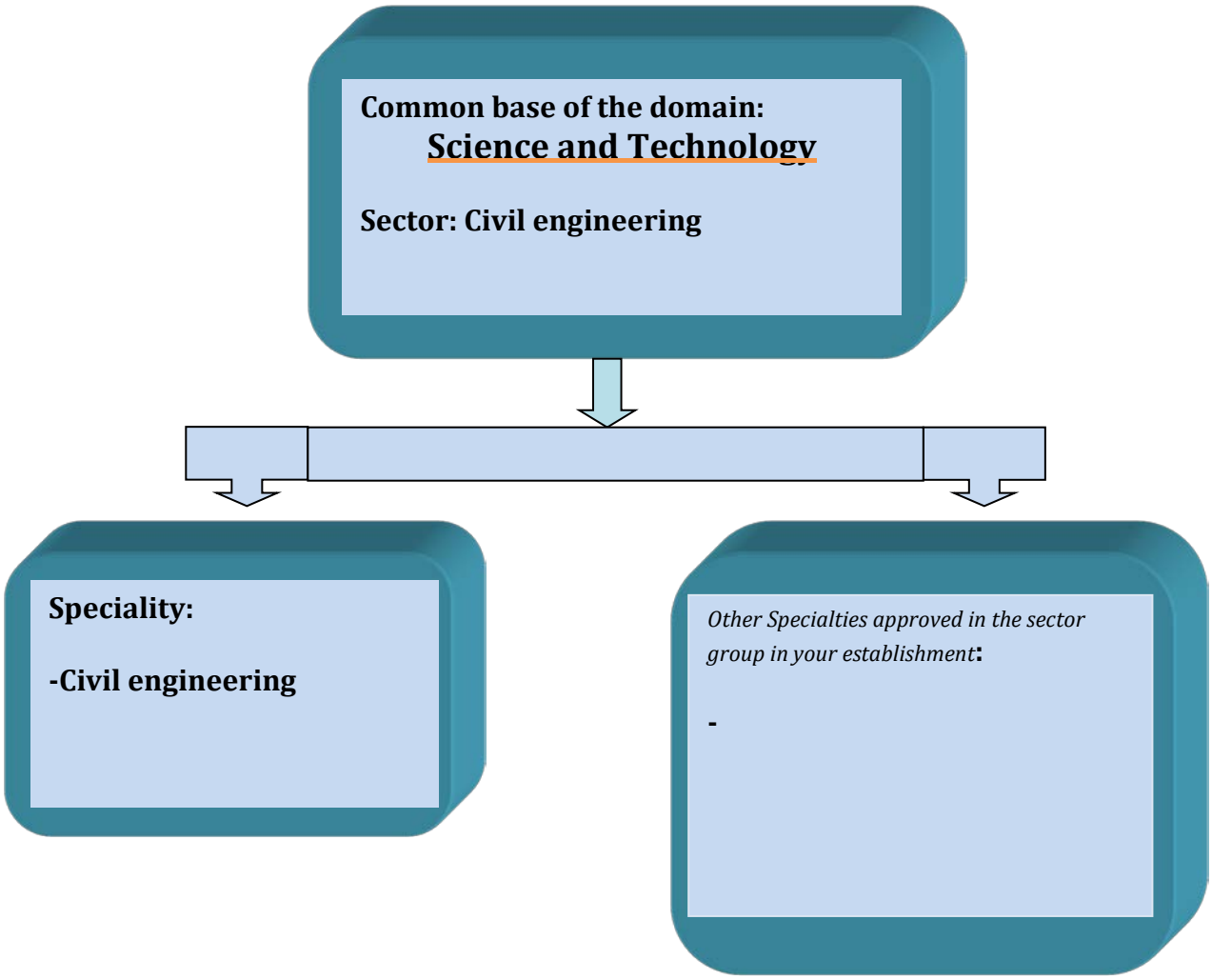
Businesses and other socio-economic partners:

International partners:

3–Context and objectives of the training

A – General organization of training: project position

Enter in the following diagram the License subject to this outline as well as all approved licenses (functional or not) at the establishment level and belonging to the same Sector Group. Specify with an asterisk any other license whose supervision is also ensured by a large part of the teachers involved in this present license. Indicate frozen licenses with a double asterisk. Also mark with (P) any professional type license.



B - Training objectives:

The Civil Engineering Degree course aims to give the student a scientific and technological foundation ensuring mastery of academic and practical knowledge in the different construction fields. In addition to a professional aptitude leading to good integration into supervisory and management functions within construction companies, monitoring and control of projects, this License provides the student with basic scientific and specific training which allows them to provides a capacity for assimilation allowing access to higher diplomas: the Master's degree and the possibility of preparing a Doctorate in the different specialties of Civil Engineering.

C – Targeted profiles and skills:

This training aims to train executives for the civil engineering, building and public works sector in general, and more particularly, companies, design offices, and expertise firms.

Furthermore, we are witnessing the emergence of a promising field in terms of employability and research, which is in full technological evolution, namely the development of new materials. The latter call for the introduction of new technologies, new execution methods, and new commercial techniques and consequently a revival in the demand for specialized personnel.

D – Regional and national employability potential:

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

- Work schedule: public sector (local authorities, construction companies.
- Calculation of works: Design offices, engineering firms.
- Conducting and monitoring work and quality control of works: Structural and secondary works building companies, control offices.
- Maintenance and management of assets: Technical management, rehabilitation, developments.
- Site monitoring: medium and large-scale construction.

E – Gateways to other specialties:

Common semesters 1 and 2	
Sector	**Specialties**
Aeronautics	Aeronautics
Civil engineering	Civil engineering
Climate engineering	Climate engineering
Maritime genius	Naval Propulsion and Hydrodynamics
	Naval construction and architecture
Mechanical Engineering	Energy
	Mechanical construction
	Materials Engineering
Hydraulic	Hydraulic
Transportation Engineering	Transportation Engineering
Metallurgy	Metallurgy
Precision optics and mechanics	Optics and photonics
	Precision engineering
Public works	Public works
Automatic	Automatic
Electromechanics	Electromechanics
	Industrial maintenance
Electronic	Electronic
Electrical engineering	Electrical engineering
Biomedical genius	Biomedical genius
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

Group of sectors A Common semester 3	
Sector	**Specialties**
Automatic	Automatic
Electromechanics	Electromechanics
	Industrial maintenance
Electronic	Electronic
Electrical engineering	Electrical engineering
Biomedical genius	Biomedical genius
Industrial Engineering	Industrial Engineering
Telecommunication	Telecommunication

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

Group of sectors C Semester 3 common	
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 sectors which present basic lessons common to each other (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 transversal teaching programs:

Multidisciplinary, in the sense that the lessons 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 lessons of semester 3 for all the specialties of the same group of sectors are also 100% identical.

Semester	Sector group	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 way, this License offers the student the choice of joining, if they express the desire and depending on the educational places available:

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

- All specialties from the same group of sectors tothe end of semester 3.

- All specialties from another group of sectors tothe end of semester 3
(Subject to equivalence and advice from the training team).

- All specialties from the same group of sectors tothe end of semester 4
(Subject to equivalence and advice from the training team).

F – Performance indicators expected from the training:

All training must meet the quality requirements of today and tomorrow. As such,pto better appreciate theexpected training performanceproposedon the one hand anden exploiting the flexibility and flexibility of the LMD system on the other hand,it is proposed, for information only, for this license a certain number of mechanisms to evaluate and monitor the progress of teaching, training programs, student/teacher and student/administration relationships, the future of graduates of this license 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 as well as their employers. For this, a report must be established,archiveand widely distributed.

1. Evaluation of the course of the training:

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

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

Before the training:

- ✓ Evolution of the rate of students having chosen this License (Rsupply/demand contribution).
- ✓ Rateand quality of studentswho choose this license.

During training:

- ✓ Regularity of meetings of educational committees.
- ✓ Compliance of the themes of the End of Cycle Projects with the nature of the training.
- ✓ Quality of the relationship between students and the administration.
- ✓ Support provided to students in difficulty.
- ✓ Student satisfaction rate with lessons and teaching methods.

After the training:

- ✓ Student success rate per semester in this Degree.
- ✓ Ratewastage (failure and abandonment) of students.
- ✓ Identification of the causes of student failure.
- ✓ Reorientation alternatives are offered to students in a situation of failure.
- ✓ Ratestudents who graduate on time.
- ✓ Ratestudentswho continue their studies after the license.

2. Evaluation of the course of lessons:

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

As a result, a system for evaluating programs and teaching methods can be put in place based on the following indicators:

- ✓ Equipping teaching rooms and laboratories with materials and supports necessary for educational improvement (projection systems (data shows), wifi connection, etc.).
- ✓ Existence of a communication and teaching platform in which courses, tutorials and practical work are accessible to students and their questions resolved.
- ✓ Equipping educational laboratories with materials and equipment in line with the teaching content.
- ✓ Number of effective teaching weeks provided during a semester.
- ✓ Completion rate of teaching programs.

- ✓ Digitization and conservation of end of studies and/or end of cycle dissertations.
- ✓ Number of TPs carried out as well as the multiplication of the type of TPs per subject (diversity of TPs).
- ✓ Quality of the establishment's documentary collection in relation to the specialty and its accessibility.
- ✓ Support from the socio-economic sector for training (company visit, company internship, seminar courses provided by professionals, etc.).

3. Integration of graduates:

A coordination committee is created, made up of those responsible for training and members of the Administration, which is mainly responsible for monitoring the integration of graduates from the sector into professional life, and for establishing a graduate monitoring file. of the sector, to identify and/or update the existing economic and industrial potential at the regional and national level, to anticipate and encourage new professions in relation to the sector in association with the chamber of commerce, the various support agencies employment, public and private operators, etc., to participate in any action concerning the professional integration of graduates (organization of events with socio-economic operators).
To carry out these missions, this committee has complete freedom to carry out or commission any study or survey on the employment and post-employment of graduates. Below is a list ofindicators and modalities that could be considered to evaluate and monitor this operation:

- ✓ Recruitment rate of graduates in the socio-economic sector in a position directly related to training.
- ✓ Nature of jobs held by graduates.
- ✓ Diversity of outlets.
- ✓ Establishment of an association of former graduates of the sector.
- ✓ Creation of small businesses by graduates of the specialty.
- ✓ Level of employer satisfaction.

G- Evaluation of the student through continuous assessment and personal work:

G1- Evaluation by continuous monitoring:

The importance of continuous assessment methods on the training of students in terms of educational achievements no longer needs to be demonstrated. In this regard,Articles 20, 21 and 22 of Order 712 of November 3, 2011, define and specify the terms and organization of the continuous evaluation of students according to the training course. The calculation of the averages for continuous assessment (tutorials and practical work) is made from a weighting of all the elements which constitute this evaluation. These articles specify that this weighting is left to the discretion of the teaching team.

A survey carried out by the CPND-ST among all teachers in the different university establishments showed heterogeneity in the implementation of continuous assessment of students. Also, we are led toadmit a real deficit in the effective management of this educational activity which required serious reflection on this subject on our part which, combined with the proposals coming from several establishments, resulted in the recommendations below.

The analysis of the different proposals coming from these establishments showed that, indeed, articles 21 and 22 of decree 712 of November 3, 2011 are not explicit enough and

deserve more clarification. These articles could be enriched by taking into account the following points which represent a synthesis of the proposals collected.

1. Proposals relating to subjects with guided work:

1.1. Preparing the series of exercises:

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 in a tutorial session.
These exercises must be prepared by the student before coming to tutorial. This preparation can be evaluated. The evaluation method is left to the discretion of the teacher responsible for the tutorial.
The exercises not solved in tutorial can be the subject of personal work to be carried out by groups of 3 to 4 students and to be submitted for evaluation (deadline: 1 week).

1.2. Written questions:

Each end of a series of exercises (ie each end of a chapter) will be followed by a short written quiz. This questioning must be organized in collaboration with the subject manager in order to ensure a fair evaluation for all students (essentially when several teachers are involved in the tutorials).

1.3. Student participation in tutorials:

This participation must be evaluated. The evaluation method is left to the discretion of the teacher responsible for the tutorial.

1.4. Student Attendance:

Student attendance is mandatory in TD and TP. In class, it is difficult to control it for undergraduate students where the numbers are very large (lectures in an amphitheater). For masters where numbers are small, attendance must be compulsory in classes and tutorials.

2. Case of methodological units (Practical work):

In the same way as the tutorials, the practical work must be prepared by the student. A control test of this preparation must be organized by the teacher before each manipulation (in the form of short comprehension questions, multiple choice questions, manipulation diagram, etc.). A report (per working group) must be given at the end of the practical work session. As such, the teacher must prepare a standard report (outline) to facilitate the students' work so that they can actually submit it at the end of the practical session.
At the end of the semester, the teacher organizes a practical test which summarizes all the manipulations carried out by the student.

3. About cross-curricular subjects and discoveries that do not have a TD or TP:

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

However, the teacher in charge of this subject can, if he wishes, let the students know that he can possibly evaluate them (ongoing) by offering to prepare presentations, make reports, look for additional information. of the course, use free software, ask 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 indicated to them the internet link to this film) and ask them to then submit a written report or make an oral presentation of the summary of this film, etc. The improvement of these activities is left to the discretion of the teacher and the training team whoare the only ones capable of defining the best way to take this personal work into account inthe overall score of the final exam.

In the same vein, 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 person responsible for the subject may consider continuous evaluations of the student like 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 Teaching Council.

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

4. Harmonization of continuous monitoring:

The use of a common grid for evaluation would promote the harmonization of these practices from one teacher to another, from one department to another and from one establishment to another. It would also constitute a structuring and reassuring benchmark for students. To do this, we propose below an evaluation grid for information purposes which presents the various continuous controls making it possible to evaluate the degree of acquisition of students' skills, whether in terms of knowledge or analytical skills. and synthesis skills.
Please note that these assessments are not intended to “trap” students by imposing very difficult continuous assessments on them. On the contrary, it is a question of 'honestly' evaluating the degree of assimilation of the different skills and knowledge taught to the student in complete objectivity. In the same spirit, we would benefit from promoting the contractualization of learning evaluation by specifying, for example, the success criteria and good practices which would result in correct and precise answers to the questions. Thus, the evaluation would mainly focus on the acquired knowledge which was the subject of training by giving exercises linked to what was prepared in tutorial without forgetting, however, to evaluate the students' ability to mobilize their skills in more complex situations.

4-1 Directed work:

Preparation of series of exercises and personal work (homework, presentations, etc.)	30%	06 points
Written questions (minimum 02 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	20%	04 points
Report (must be returned at the end of the practical 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 spirit of the LMD. A very substantial amount of weekly time has been reserved for him: approximately 50% of the total hourly volume of the training (see the table ''Overall training summary'' present in this training offer).
A survey carried out by the CPND-ST among training teams across all university establishments indicated that the time relating to the student's personal work could be judiciously exploited, under good supervision of the teacher, in a manner rational and in different forms. The tasks that would then be accomplished by the 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 free will 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 work at home 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, resolve a difficult exercise, go over the proof of a theorem in detail, search for the complement of a course, use free software or a CAD-CAD tool to make applications and simulations linked to the course, etc. These activities can be evaluated, noted and registered as a bonus for the students who carry them out.

2. Mini course project:

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

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 for 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 monitoring score.

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 likely to enable them to better understand the reality of the world of work and subsequently help them achieve better professional integration.
Administrative managers as well as 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. We can offer students templates to help them present their internship report properly.

4. Participation in scientific events:

In order to imbue students with a scientific spirit (mainly for higher level students), they must be guided and encouraged to participate in round tables, laboratory seminars and conferences organized within their faculty and/or establishment. It is even advisable to encourage these students to attend conferences, related to their specialty, outside their university during exhibitions, fairs and others. This activity can be evaluated, graded and recorded as a bonus for the student who completes it.

5. Use of New Information and Communication Technologies:

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

Conclusion :

Student autonomy, considered as a lever for success, relies largely on the personal work that he is required to do, by appropriating the resources and tools made available to him. All this must, of course, be supervised and formalized within the framework of educational monitoring and support which must be provided jointly by the university teacher and the administrative manager throughout the training course.
This autonomy will allow them to build their professional identity according to their aspirations, their abilities and their acquired knowledge or to build their academic career in the pursuit of higher studies.

4 - Human resources available:

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

Number of students:

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

First and last name	Graduation diploma	Specialty diploma (Magister, doctorate)	Grade	Subjects to teach	Registration

Department 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	Home establishment	Graduation diploma	Specialty diploma (Magister, doctorate)	Grade	Subjects to teach	Registration

Department visa

Faculty or institute visa

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

Grade	Internal Workforce	External Workforce	Total
Teachers			
Lecturers (A)			
Lecturers (B)			
Assistant Master (A)			
Assistant Master (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)**

Titledfrom the laboratory:

Student capacity:

No.	Equipment designation	Number	Comments

B- Internship sites and in-company training:(see agreements/conventions section)

Training place	Number of students	Training period

C- Documentation available at the establishment level specific to the proposed training (mandatory field):

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

II – Half-yearly teaching organization sheets of the specialty

Semester 1

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 1.1 Credits: 18 Coefficients: 9	Mathematics 1	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Physics 1	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Structure of matter	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
Methodological EU Code: UEM 1.1 Credits: 9 Coefficients: 5	TP Physics 1	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Chemistry 1	2	1			1h30	10:30 p.m.	27:30	100%	
	Computer science 1	4	2	1h30		1h30	45:00	55:00	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.	02:30		100%
Transversal EU Code: UET 1.1 Credits: 2 Coefficients: 2	Foreign language 1 (French and/or English)	2	2	3:00 a.m.			45:00	05:00		100%
Total semester 1		**30**	**17**	**4:00 p.m.**	**4:30 a.m.**	**4:30 a.m.**	**375h00**	**375h00**		

Semester 2

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 1.2 Credits: 18 Coefficients: 9	Mathematics 2	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Physics 2	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Thermodynamics	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
Methodological EU Code: UEM 1.2 Credits: 9 Coefficients: 5	TP Physics 2	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Chemistry 2	2	1			1h30	10:30 p.m.	27:30	100%	
	Computer science 2	4	2	1h30		1h30	45:00	55:00	40%	60%
	Presentation methodology	1	1	1h00			3:00 p.m.	10:00 a.m.		100%
EU Discovery Code: UED 1.2 Credits: 1 Coefficients: 1	Careers in science and technologies 2	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 1.2 Credits: 2 Coefficients: 2	Foreign language 2 (French and/or English)	2	2	3:00 a.m.			45:00	05:00		100%
Total semester 2		**30**	**17**	**4:00 p.m.**	**4:30 a.m.**	**4:30 a.m.**	**375h00**	**375h00**		

Semester 3

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 2.1.1 Credits: 10 Coefficients: 5	Mathematics 3	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Waves and vibrations	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF 2.1.2 Credits: 8 Coefficients: 4	Fluid mechanics	4	2	1h30	1h30		45:00	55:00	40%	60%
	Rational mechanics	4	2	1h30	1h30		45:00	55:00	40%	60%
Methodological EU Code: UEM 2.1 Credits: 9 Coefficients: 5	Probability and statistics	4	2	1h30	1h30		45:00	55:00	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			1h00	3:00 p.m.	10:00 a.m.	100%	
EU Discovery Code: UED 2.1 Credits: 2 Coefficients: 2	Core Technology	1	1	1h30			10:30 p.m.	02:30		100%
	Metrology	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 2.1 Credits: 1 Coefficients: 1	Technical English	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 3		**30**	**17**	**1:30 p.m.**	**7:30 a.m.**	**4:00 a.m.**	**375h00**	**375h00**		

Semester 4

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
				Course	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 2.2.1 Credits: 6 Coefficients: 3	Ground Mecanic	4	2	1h30	1h30		45:00	55:00	40%	60%
	Construction materials	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		45:00	55:00	40%	60%
	Numerical methods	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF 2.2.3 Credits: 4 Coefficients: 2	Strength of materials	4	2	1h30	1h30		45:00	55:00	40%	60%
Methodological EU Code: UEM 2.2 Credits: 9 Coefficients: 5	TP Soil mechanics	2	1			1h30	10:30 p.m.	27:30	100%	
	TP construction materials	2	1			1h30	10:30 p.m.	27:30	100%	
	Computer Assisted drawing	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Numerical methods	2	1			1h30	10:30 p.m.	27:30	100%	
	TP MDF & RDM	1	1			1h00	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.	02:30		100%
	Topography 1	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 2.2 Credits: 1 Coefficients: 1	Expression and communication techniques	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 4		**30**	**17**	**12:00 p.m.**	**6:00 a.m.**	**7:00 a.m.**	**375h00**	**375h00**		

Semester 5

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 3.1.1 Credits: 12 Coefficients: 6	Resistance of Materials 2	4	2	1h30	1h30		45:00	45:00	40%	60%
	Reinforced Concrete 1	4	2	1h30	1h30		45:00	45:00	40%	60%
	Metal frame	4	2	1h30	1h30		45:00	45:00	40%	60%
Fundamental EU Code: UEF 3.1.2 Credits: 6 Coefficients: 3	Soil Mechanics 2	4	2	1h30	1h30		45:00	45:00	40%	60%
	Building Materials 2	2	1	1h30			10:30 p.m.	27:30		100%
Methodological EU Code: UEM 3.1 Credits: 9 Coefficients: 5	TP Topography	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Soil Mechanics 2	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Construction Materials2	2	1			1h30	10:30 p.m.	27:30	100%	
	Construction drawing	3	2			2h30	37:30	37:30	100%	
EU Discovery Code: UED 3.1 Credits: 2 Coefficients: 2	Topography 2	1	1	1h30			10:30 p.m.	02:30		100%
	General hydraulics	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 3.1 Credits: 1 Coefficients: 1	Construction techniques and rules	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 5		**30**	**17**	**12:00**	**6:00**	**7:00**	**375h00**	**375h00**		

				p.m.	**a.m.**	**a.m.**				

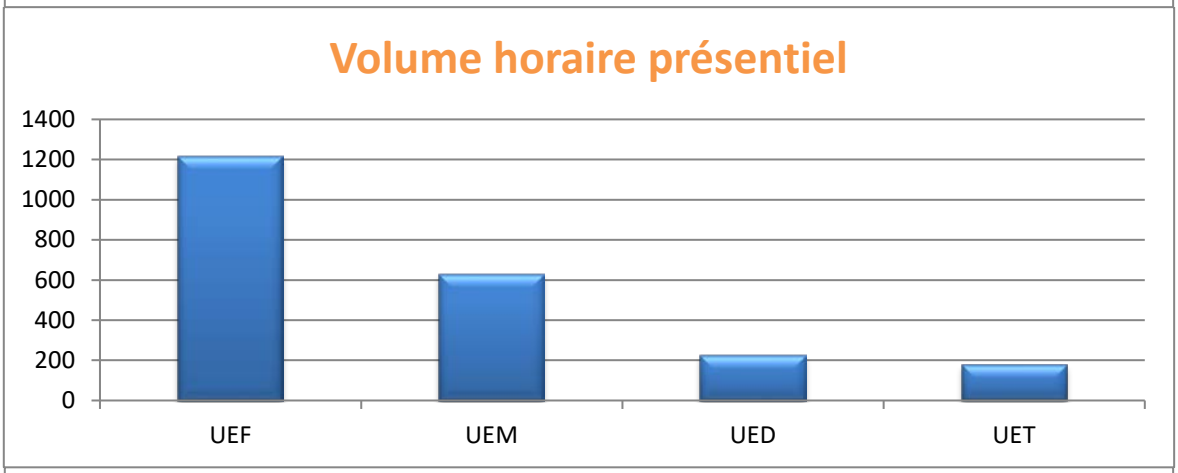
Semester 6

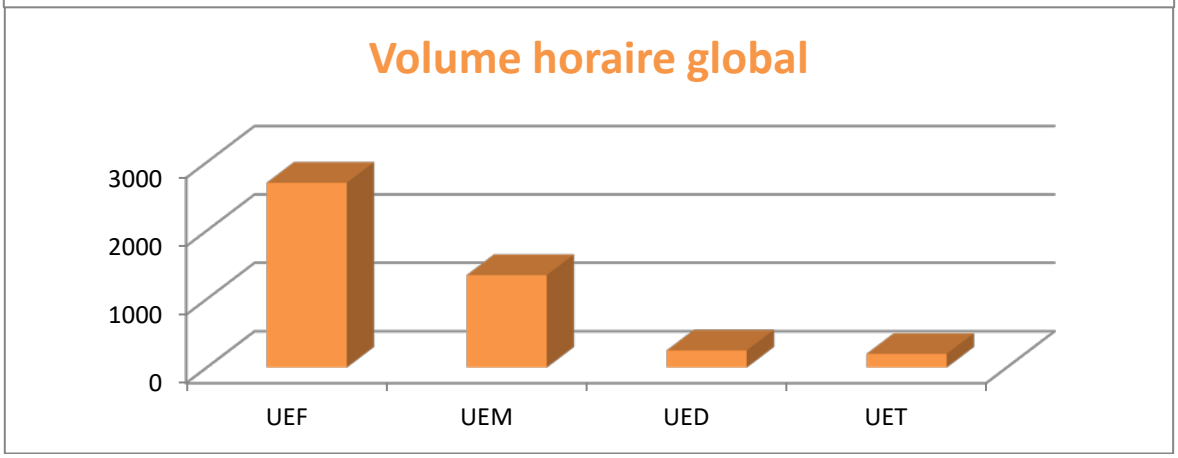
Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 3.2.1 Credits: 8 Coefficients: 4	Calculation of Structures	4	2	1h30	1h30		45:00	55:00	40%	60%
	Metal Constructions	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF 3.2.2 Credits: 10 Coefficients: 5	Reinforced Concrete 2	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Foundations and geotechnical works	4	2	1h30	1h30		45:00	55:00	40%	60%
Methodological EU Code: UEM 3.2 Credits: 9 Coefficients: 5	End of Cycle Project	4	2			3:00 a.m.	45:00	55:00	100%	
	Computer-assisted calculation	3	2			2h30	37:30	37:30	100%	
	Quantity and Estimate prices	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.	02:30		100%
	Organization of construction sites	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 3.2 Credits: 1 Coefficients: 1	**Professional projectand business management**	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 6		**30**	**17**	**1:30 p.m.**	**6:00 a.m.**	**5:30 a.m.**	**375h00**	**375h00**		

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

Overall summary of the training:

EU / V.H.	UEF	EMU	UED	UET	Total
Course	720h00	120h00	225h00	180h00	1245h00
T.D.	495h00	10:30 p.m.	---	---	517h30
TP	---	487h30	---	---	487h30
Personal work	1485h00	720h00	25:00	8:00 p.m.	2250h00
other (explain, list,)	---	---	---	---	---
Total	2700h00	1350h00	250h00	200h00	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: UEF1.1
Subject 1: Mathematics 1
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives

This first mathematics subject is notably devoted to the homogenization of the level of students upon 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

Mathematics basicsterminal classes(sets, functions, equations, etc.).

Material content:

Chapter 1.Methods of mathematical reasoning (1 week)
1-1 Direct reasoning. 1-2 Reasoning by contraposition. 1-3 Reasoning through the absurd. 1-4 Reasoning by counter example. 1-5 Reasoning by induction.

Chapter 2.Sets, Relations and Applications (2 weeks)
2.1 Set theory. 2-2 Order relation, Equivalence relations. 2-3 Injective, surjective, bijective application: definition of an application, direct image, reciprocal image, characteristic of an application.

Chapter 3. Real functions with a 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 (3 weeks)
4-1 Power function. 4-2 Logarithmic function. 4-3 Exponential function. 4-4 Hyperbolic function. 4-5 Trigonometric function. 4-6 Reverse function

Chapter 5. Limited development (2 weeks)
5-1 Taylor formula. 5-2 Limited development. 5-3 Applications.

Chapter 6. Linear algebra (4 weeks)
6-1 Laws and internal composition. 6-2 Vector space, base, dimension (definitions and elementary properties). 6-3 Linear application, kernel, image, rank.

Evaluation method:

Continuous monitoring: 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 – 2nd year of the 1st cycle preparatory classes, 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 of higher mathematics 1- Algebra, Dunod.
7- J. Quinet, Elementary course of higher mathematics 2- Usual functions, Dunod.
8- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.
9- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.

Semester: 1
Teaching unit: UEF 1.1
Subject 2: Physics 1
VHS: 67h30 (Class: 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

Concepts of mathematics and physics.

Material content:

Math reminders (2 weeks)

1- Equations with dimensions
2-Vector calculation: scalar product (norm), vector product, functions with several variables, derivation. Vector analysis: gradient, rotational operators, etc.

Chapter 1. Cinematic (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 the different coordinate systems. 4- Relative movement.

Chapter 2. Dynamics: (4 weeks)

1- Generality: Mass - Force - Moment of force – Absolute and Galilean Reference. 2- Newton's laws. 3- Principle of conservation of momentum. 4- Differential equation of motion. 5- Kinetic 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.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1. HAS. Gibaud,Mr. Henry;Physics course - Mechanics of the point - Courses 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: UEF1.1
Subject 3: Structure of matter
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives

The teaching of this subject allows the student to acquire basic formalisms in chemistry, particularly within the subject describing the atom and the chemical bond, the chemical elements and the periodic table with energy quantification.Make students better able to solve chemistry problems.

Recommended prior knowledge

Basic notions of mathematics and general chemistry.

Material content:

Chapter 1 :Fundamentals (2 weeks)
States and macroscopic characteristics of the states of matter, changes in states of matter, notions of atom, molecule, mole and Avogadro's number, atomic mass unit, atomic and molecular molar mass, molar volume, Weight law: Conservation of mass (Lavoisier), chemical reaction, Qualitative aspect of matter, Quantitative aspect of matter.

Chapter 2 :Main constituents of matter (3 weeks)
Introduction: 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 planetary model, Presentation and characteristics of the atom (Symbol, atomic number Z, mass number A, number of protons, neutrons and electrons), Isotopia and relative abundance of the 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 (radiationα,βAndγ), 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, Poly electronic atoms in wave mechanics.

Chapter 5:Periodic classification of elements (3 weeks)
Periodic classification of D. Mendeleiev, Modern periodic classification, Evolution and periodicity of the physicochemical properties of the elements, Calculation of radii (atomic and ionic), successive ionization energies, electron affinity and electronegativity (Mulliken scale) by Slater's rules.

Chapter 6:Chemical bonds(3 weeks)
The covalent bond in Lewis' theory, The polarized covalent bond, dipole moment and partial ionic character of the bond, Geometry of molecules: Gillespie theory or VSEPR, The chemical bond in the quantum model.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references

1. Ouahes, Devallez, General Chemistry, OPU.
2. SS Zumdhal et al., 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 TP 1
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives

Consolidate the theoretical knowledge brought to the course through a certain number of practical manipulations.

Recommended prior knowledge

Concepts of mathematics and physics.

Material content:

5 manipulations at least (3 hours / 15 days):

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

Evaluation method:

Continuous control: 100%.

Semester: 1
Teaching unit: UEM1.1
Subject 2: Chemistry TP 1
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives

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

Recommended prior knowledge

Basic concepts of Chemistry.

Material content:

1.Safety in the laboratory

2.Preparing 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: dosage of chloride ions using the Mohr method.

Evaluation method:

Continuous control: 100%

Semester: 1
Teaching unit: UEM1.1
Subject 3: Computer Science 1
VHS: 45h00 (Class: 1h30, TP: 1h30)
Credits: 4
Coefficient: 2

Objective and recommendations:
The objective of the subject is to allow students to learn to program with an advanced language (Fortran, Pascal or C). The choice of language is left to the discretion of each establishment. The notion of algorithm must be taken care of implicitly during language learning.

Recommended prior knowledge
Basic notions of web technology.

Material content:
Part 1. Introduction to Computer Science (5 weeks)
1- Definition of IT
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, etc.)
Programming languages, application software

Part 2. Algorithm and program concepts (10Weeks)
1- Concept of an algorithm
2- Organization 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 lab 1:
The objective of the practical exercises is to illustrate the concepts taught during the course. These must begin with lessons according to the following schedule:
•Initiation and training sessionsfamiliarization with the computing machine from a hardware and operating systems point of view (exploration of the different functionalities of the OS)
•Introductory practical work on using a programming environment (Editing, Assembly, Compilation, etc.)
• TPapplication of programming techniques seen in class.

Evaluation method:
Continuous monitoring: 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: UEM1.1
Subject 4: Writing methodology
VHS: 3:00 p.m. (Class: 1:00)
Credits: 1
Coefficient: 1

Teaching objectives

Familiarize and train students in current concepts of writing methodology in force in the Science and Technology profession. Among the skills to acquire: Knowing how to present yourself; Know how to write a CV and a cover letter; Know how to position yourself in writing or orally in relation to an opinion or an idea; Master syntax and spelling in writing.

Recommended prior knowledge

Basic French.Basic principle of writing a document.

Material content:

Chapter 1. Notions and generalities on writing techniques(2 weeks)
- Definitions, standards
-Applications: writing a summary, a letter, a request

Chapter 2. Information search, synthesis and exploitation (3 weeks)
-Searching for information in the library (Paper format: Books, Journals)
-Search for information on the Internet (Digital: Databases; Search engines, etc.).
-Applications

Chapter 3 Writing techniques and procedures (3 weeks)
-Basic Principle of Writing- Punctuation, Syntax, Sentences
-Sentence length
-Division into paragraphs
-Using 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 practical work

Evaluation method:

Control Review: 100%.

Bibliographic references:

1. J.-L. Lebrun, Practical guide to scientific writing, EDP Sciences, 2007.
2. M. Fayet, Succeeding in your reports, 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: UED1.1
Subject 1: Careers in Science and Technology 1
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Objective of the subject:
Introduce the student, in a first step, to all the sectors covered by the Field of Sciences and Technologies and in a second step a range of professions leading to these sectors. In the same context, this subject introduces the new challenges of sustainable development as well as the new professions that can result from them.

Recommended prior knowledge
None.

Content of the material:
1.What are engineering sciences? **(2 weeks)**
The engineering profession, history and challenges of the 21st century, Search for a profession/recruitment ad by keyword, develop a simple job description (job title, company, main activities, required skills (knowledge, know-how , relational

2.Sectors in Electronics, Telecommunications, Biomedical Engineering, Electrotechnics, Electromechanics, Optics & Precision Mechanics: **(2 weeks)**
- Definitions, areas of application (Home automation,embedded applications for automobiles,Video surveillance, Mobile telephony, Optical fiber, Advanced scientific instrumentation, Imagingand Instrumentationmedical, Giant mirrors, Contact lenses, Transport and distribution of electrical energy, Electricity production plants, Energy efficiency,Maintenance of industrial equipment,Elevators, wind turbines, …
- 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,Energy sector (oil, gas), …
- 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.), Depletion of biodiversity, etc.), SD diagram (Sustainable = Viable + Liveable + 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, valorization of resources (water, metals and minerals, etc.), sustainable production), 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 responsible for this subject can let his students know that he can always evaluate them by offering to prepare job descriptions. Ask students to watch at home a popular science film related to the chosen profession (after having given them either the film on electronic media or having indicated to them the internet link to this film) and ask them to then submit a written report or to make an oral presentation of the summary of this film, etc. The improvement of these activities is left to the discretion of the teacher and the training team whoare the only ones capable of defining the best way to take this personal work into account inthe overall score of the final exam.

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

Evaluation method:
100% review

Bibliographic references:
1- What jobs for tomorrow? Publisher: ONISEP, 2016, Collection: Les Dossiers.
2- J. Douënel and I. Sédès, Choosing a profession according to your profile, Editions d'Organization, 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- Jobs in the aeronautics and space industry, Collection: Course, Edition: ONISEP, 2017.
6- Electronics and robotics professions, Collection: Course, Edition: ONISEP, 2015.
7- The environment and sustainable development professions, Collection: Course, Edition: ONISEP, 2015.
8- Building and public works professions, Collection: Course, Edition: ONISEP, 2016.
9- Transport and logistics professions, Collection: Course, Edition: ONISEP, 2016.
10- Energy professions, Collection: Course, Edition: ONISEP, 2016.
11- Mechanical professions, Collection: Course, Edition: ONISEP, 2014.
12- Chemistry professions, Collection: Course, Edition: ONISEP, 2017.
13- Web professions, Collection: Course, Edition: ONISEP, 2015.
14- Biology professions, Collection: Course, Edition: ONISEP, 2016.

Semester: 1
Teaching unit: UET1.1
Subject 1: French language1
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:
The aim is to develop the following four skills in this subject: Oral comprehension, Written comprehension, Oral expression and Written expression through reading and studying texts.

Recommended prior knowledge:
Basic French.

Material content:
We offer below a set of themes that deal with fundamental sciences, technologies, economics, social facts, communication, sport, health, etc. The teacher can choose from this list of texts to develop them during the course. Otherwise, he is free to address other themes of his 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, oral and written expression. In addition, he must use this text to identify the grammatical structures that he will develop during the same class session. We recall here, by way of illustration, a set of grammatical structures which 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 can be detailed.

Examples of themes	Grammatical structures
Climate change Pollution The electric car The robots Artificial intelligence Nobel prize Olympic Games Sports at school The Sahara The currency The line work Ecology Nanotechnologies The optical fiber The profession of engineer The power plant Energetic efficiency The smart building Wind energy Solar energy	The punctuation. Proper nouns, Articles. Grammatical functions: The noun, The verb, The pronouns, The adjective, The adverb. The complement pronoun ''the, the, the, him, their, y, en, me, te,...'' Agreements. The negative sentence. Don't... don't, Don't... yet, Don't... again, Don't... ever, Don't... not,... 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 tenses of the indicative, Present, Future, past perfect, simple past, Imperfect. …

Evaluation method:
Review: 100%.

Bibliographic references:

1. M. Badefort, Objective: International French Test, Edulang, 2006.
2. O. Bertrand, I. Schaffner, Succeeding in the TCF, Exercises and training activities, 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. M. 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, Presses de l'Université du Québec, 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, Abridged Rules of Grammar and Spelling, Presses de l'Université du Québec, 2001.
12. J.-P. Colin, Simply French, Eyrolles, 2010.
13. Collective, French assessment test, Hachette, 2001.
14. Y. Delatour et al., Practical French grammar in 80 sheets with corrected exercises, Hachette, 2000.
15. Ch. Descotes et al., L'Exercisier: French expression for the intermediate level, Presses Universitaires de Grenoble, 1993.
16. H. Jaraush, C. Tufts, Sur le Vif, Heinle Cengage Learning, 2011.
17. J. Dubois et al, The essentials – Orthography, Larousse, 2009.

Semester: 1
Teaching unit: UET1.1
Subject 1: English Language1
VHS: 10:30 p.m. (Class: 1h30)
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 Heat Treatment of Steel. Lubrication of Bearings. The Lathe. Welding. Steam Boilers. Steam Locomotives. Condensation and Condensers. Centrifugal Governors. Impulse Turbines. The Petro Engine. The Carburation System. The Jet Engine. The Turbo-Prop Engine. Aerofoil.	Make + Noun + Adjective Quantity, Contents Enable, Allow, Make, etc. + Infinitive Comparative, Maximum and Minimum The Use of Will, Can and May Prevention, Protection, etc., Classification The Impersonal Passive Passive Verb + By + Noun (agent) Too Much or Too Little Instructions (Imperative) Requirements and Necessity Means (by + Noun or –ing) Time Statements Function, Duty Alternatives

Fashion rating:
Review: 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 of the press: Vocabulary and expressions of the economic, social and political world, Fernand Nathan, 2006.

Semester: 2
Teaching unit: UEF1.2
Subject 1: Mathematics 2
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives

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

Recommended prior knowledge

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

Material content:

Chapter 1: Matrices and determinants (3 weeks)
1-1 Matrices (Definition, operation). 1-2 Matrix associated with a linear application. 1-3 Linear application associated with a matrix. 1-4 Change of base, passage matrix.

Chapter 2: Systems of linear equations (2 weeks)
2-1 General. 2-2 Study of all the solutions. 2-3 Methods for solving a linear system. Resolution by Cramer's method. Solved by the inverse matrix method. Resolution by Gauss' method

Chapter 3: Integrals (4 weeks)
3-1Indefinite integral, property.3-2Integration of rational functions.3-3Integration of exponential and trigonometric functions.3-4The integral of polynomials.3-5Integration defined

Chapter 4: Differential equations (4 weeks)
4-1 ordinary differential equations. 4-2 differential equations of order 1. 4-3 differential equations of order 2. 4-4 ordinary differential equations of second order with constant coefficient.

Chapter 5: Functions with several variables (2 weeks)
5-1 Limit, continuity and partial derivatives of a function. 5-2 Differentiability. 5-3 Double, triple integrals.

Evaluation method:

Continuous monitoring: 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. Piskounov, Differential and integral calculus, Volume 1, Moscow edition
6- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.

7- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.
8- J. Quinet, Elementary course of higher mathematics 2- Usual functions, Dunod.
9- J. Quinet, Elementary course of 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 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives
Introduce the student to the physical phenomena underlying the laws of electricity in general.

Recommended prior knowledge
Mathematics 1, Physics 1.

Material content:
Mathematical reminders:(1 week)
1- Elements of length, surface, volume in Cartesian, cylindrical, spherical coordinate systems. Solid angle,The 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 flow. 5- Gauss's theorem. 6- Conductors in balance. 7- Electrostatic pressure. 8- Capacity of a conductor and a capacitor.

Chapter II. Electrokinetics:(4 weeks)
1- Electrical conductor. 2- Ohm's law. 3- Joule's law. 4- Electric 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, Ampère's theorem, Calculation of magnetic fields created by permanent currents.
2- Induction phenomena: Induction phenomena (circuit in a variable magnetic field and mobile circuit in a magnetic fieldpermanent), FLorentz gold,FLaplace orce, Faraday's law, Lenz's law, Application to coupled circuits.

Evaluation method:
Continuous monitoring: 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: UEF1.2
Subject 3: Thermodynamics
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives

Provide the necessary foundations of classical thermodynamics with a view to applications to combustion and thermal machines. Homogenize student knowledge. The skills to be understood 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.

Material content:

Chapter 1: General information on thermodynamics (3 weeks)

1-Fundamental properties of state functions. 2- Definitions of thermodynamic systems and the external environment. 3- Description of a thermodynamic system. 4- Evolution and states of thermodynamic equilibrium 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 ideal gas laws.

Chapter 2: The 1st principle of thermodynamics: (3 weeks)

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

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

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

Chapter 4: The 2nd law of thermodynamics (3 weeks)

1- The 2nd principle for a closed system. 2. Statement of the 2nd principle: Entropy of a closed isolated system. 3. calculation of the entropy variation: 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- Energy and free enthalpy. 3- Chemical balances

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

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

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

Semester: 2
Teaching unit: UEM 1.2
Subject 1: Physics TP 2
VHS: 45h00 (TP: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives

Consolidate the theoretical concepts covered in the Physics 2 course through Practical Work sessions.

Recommended prior knowledge

Mathematics 1, Physics 1.

Material content:

5 manipulations at least (3h00 / 15 days)

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

Evaluation method:

Continuous control: 100%

Semester: 2
Teaching unit: UEM1.2
Subject 2: Chemistry TP 2
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives

Consolidate the theoretical concepts covered in the Thermodynamics course through Practical Work sessions.

Recommended prior knowledge

Thermodynamics.

Material content:

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 melting 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.

Evaluation method:

Continuous control: 100%

Semester: 2
Teaching unit: UEM1.2
Subject 3: Computer Science 2
VHS: 45h00 (Class: 1h30, TP: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives

Master basic programming and algorithmic techniques. Acquire the fundamental concepts of computer science. The skills to be acquired are: Programming with a certain autonomy; The design of 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.

Material content:

Chapter 1 :Indexed variables (4Weeks)
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, call of functions
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 (concept of fields)
3- Manipulation of record structures
4- Concept of file
5- File access modes
6- Reading and writing to a file

Computer science lab 2:

Plan a certain number of practical exercises to concretize the programming techniques seen during the course.
- TPapplication of programming techniques seen in class.

Evaluation method:

Continuous monitoring: 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: UEM1.2
Subject 4: Presentation methodology
VHS: 3:00 p.m. (Class: 1:00)
Credits: 1
Coefficient: 1

Teaching objectives

Give the main bases for a successful oral presentation.Among the skills to acquire: Knowing how to prepare a presentation; Know how to present a presentation; Know how to capture the attention of the audience; Learn about the pitfalls of plagiarism and understand intellectual property regulations.

Recommended prior knowledge

Expression and communication techniques and writing methodology.

Material content:

Chapter 1: The oral presentation (3 weeks)
Communication. Preparation of an oral presentation. Different types of plans.

Chapter 2: Presentation of an oral presentation (3 weeks)
Structure of an oral presentation. Presentation of an oral presentation.

Chapter 3: Plagiarism and Intellectual Property (3 weeks)
1- Plagiarism: Definitions of plagiarism, sanction of 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)
- Present written work. Applications: presentation of an oral presentation.

Evaluation 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, Succeeding in a presentation. Prepare impactful slides and communicate well in public. Eyrolles, 2009.
5. H. Biju-Duval, C. Delhay, All speakers, Eyrolles, 2011.
6. C. Eberhardt, Practical work with PowerPoint. Create and layout slides, Dunod, 2014.
7. F. Cartier, Written and oral communication, Edition GEP- Groupe Eyrolles, 2012.
8. L. Levasseur, 50 exercises for speaking in public, 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: UED1.2
Subject 1: Careers in Science and Technology 2
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Objective of the subject:
Introduce the student, in a first step, to all the sectors covered by the Field of Sciences and Technologies and in a second step a range of professions leading to these sectors. In the same context, this subject introduces the student to the new challenges of sustainable development as well as the new professions that can result from them.

Recommended prior knowledge
None.

Content of the material:
1.Industrial Hygiene and Safety (HSI) sectorsand Gmining industry: (2 weeks)
- Definitions andapplication areas (Security of goods 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, Smart buildings,Safety in transport, 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, Large road and rail infrastructures, Bridges, Airports, Dams, Drinking water supply and Sanitation, Hydraulic flows, Water resources management, Public works and land use planning, Smart cities, …)
- Role of the specialist in these areas.

4.Aeronautics, Mechanical Engineering, Maritime Engineering and Metallurgy sectors: (2 weeks)
- Definitions and areas of application (Aeronautics, Avionics, Automotive industry, Ports, Dykes,Production of industrial equipment,Steel industry,Metal processing,…)
- Role of the specialist in these areas.

5. Approaches to sustainable production: (2 weeks)
Industrial ecology, Remanufacturing, Ecodesign.

6. Measure 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 company as an economic entity (concepts of profit, costs, performance) and social (concept of corporate social responsibility), Impact of economic activities on the environment (examples), Issues/benefits of SD for the company, Means of engagement in a SD approach (e.g. ISO 14001 certification, labeling (e.g. energy labeling, Ecolabel, Organic/AB Label, FSC Label, etc.), strategic SD plan, Global Reporting Initiative (GRI)…), Global rankings of the most sustainable companies (Dow Jones Sustainable Index, Global 100, …), Company case studiesefficient/eco-responsible in the ST sectors (e.g. SIEMENS, Cisco, Henkel AG & Co, TOTAL, Peugeot, Eni SPA ...).

Student's personal work for this subject:

- Work in groups/pairs: Reading articles on sustainable development and/or reports from successful and sustainable companies and developing summaries of the main actions undertaken in the field of SD.

Examples of documents for reading and synthesis:

- 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-organizations-2009-1-page-201.htm)
- Mireille Chiroleu-Assouline. Corporate sustainable development strategies. Ideas, The journal of economic and social sciences, CNDP, 2006, p 32-39 (free online access:http://halshs.archives-ouvertes.fr/hal-00306217/document)
- Web page on environmental and societal commitmentsTOTAL:https://www.total.com/fr/engagement
- Innovationssustainable mobilityfrom the PSA group:http://www.rapportannuel.groupe-psa.com/rapport-2015/engagements/dessolutions-innovantes-pour-des-transports-durables/

Evaluation method:

100% review.

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: Human Sciences, 2017.
3- Y. Veyret, J. Jalta and M. Hagnerelle, Sustainable developments: All the issues in 12 lessons, Edition: Otherwise, 2010.
4- L. Grisel and Ph. Osset, Life cycle analysis of a product or service: Applications and putting into practice, 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-balance, 3rd Edition: PPUR, 2017.
6- G. Pitron and H. Védrine, The war over rare metals: The hidden face of the energy and digital transition, Edition: Links that liberate, 2018.
7- The environment and sustainable development professions, Collection: Course, Edition: ONISEP, 2015.

Semester: 2
Teaching unit: UET1.2
Subject 1: French language 2
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:
The aim is to develop the following four skills in this subject: Oral comprehension, Written comprehension, Oral expression and Written expression through reading and studying texts.

Recommended prior knowledge:
Basic French.

Material content:
We offer below a set of themes that deal with fundamental sciences, technologies, economics, social facts, communication, sport, health, etc. The teacher can choose from this list of texts to develop them during the course. Otherwise he is free to address other themes of his 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, oral and written expression. In addition, he must use this text to identify the grammatical structures that he will develop during the same class session. We recall here, by way of illustration, a set of grammatical structures which 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 can be detailed.

Examples of themes	Grammatical structures
Pharmaceutical industry Food industry The national employment agency ANEM Sustainable development Renewable energies Biotechnology The stem cells Road safety Dams Water – Water resources Avionics 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	The subjunctive. The conditional. The imperative. The past participle. Passive form. Possessive adjectives, Possessive pronouns. Demonstratives, Demonstrative pronouns. The expression of quantity (several, a few, enough, many, more, less, as much, etc.). Numbers and measurements. The pronouns ''who, that, where, whose''. Subordinate preposition of time. The cause, the consequence. The goal, the opposition, the condition. Comparisons, superlatives. …

The advertisement Autism	

Evaluation method:

Review: 100%.

Bibliographic references:

1. M. Badefort, Objective: International French Test, Edulang, 2006.
2. O. Bertrand, I. Schaffner, Succeeding in the TCF, Exercises and training activities, 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. M. 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, Presses de l'Université du Québec, 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, Abridged Rules of Grammar and Spelling, Presses de l'Université du Québec, 2001.
12. J.-P. Colin, Simply French, Eyrolles, 2010.
13. Collective, French assessment test, Hachette, 2001.
14. Y. Delatour et al., Practical French grammar in 80 sheets with corrected exercises, Hachette, 2000.
15. Ch. Descotes et al., L'Exercisier: French expression for the intermediate level, Presses Universitaires de Grenoble, 1993.
16. H. Jaraush, C. Tufts, Sur le Vif, Heinle Cengage Learning, 2011.
17. J. Dubois et al., The essentials – Orthography, Larousse, 2009.

Semester: 2
Teaching unit: UET1.2
Subject 1: English Language 2
VHS: 10:30 p.m. (Class: 1h30)
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 readings:	**Examples of Word Study: Patterns**
Radioactivity. Chain Reaction. Reactor Cooling System. Conductor and Conductivity. Induction Motors. Electrolysis. Liquid Flow and Metering. Liquid Pumps. Petroleum. Road Foundations. Rigid Pavements. Batteries for Foundations. Suspension Bridges.	Explanation of Cause Results Conditions (if), Conditions (Restrictive) Eventuality Manner When, Once, If, etc. + Past Participle It is + Adjective + to Ace It is + Adjective or Verb + that… Similarity, Difference In Spite of, Although Formation of Adjectives Phrasal Verbs

Fashion rating:
Review: 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 of the press: Vocabulary and expressions of the economic, social and political world, Fernand Nathan, 2006.

Semester: 3
Teaching unit: UEF 2.1.1
Subject 1:Mathematics 3
VHS: 67h30 (Class: 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 convergence conditions as well as the different types of convergence.

Recommended prior knowledge

Mathematics 1 and Mathematics 2

Content of the material:

Chapter 1: Simple and multiple integrals **3 weeks**
1.1 Reminders on the Riemann integral and on 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 weeks**
2.1 Integrals of functions defined on an unbounded interval. 2.2 Integrals of functions defined on a bounded interval, infinite at one of the ends.

Chapter 3: Differential equations **2 weeks**
3.1 Reminder 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 Integer series, Fourrier series.

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

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

Evaluation method:

Continuous monitoring: 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. Piskounov, Differential and integral calculus, Volume 1, Moscow edition
6- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.
7- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.
8- MR Spiegel, Laplace Transforms, Courses and problems, 450 Corrected exercises, McGraw-Hill.

Semester: 3
Teaching unit: UEF 2.1.1
Subject 2: Waves and Vibrations
VHS: 45h00 (Class: 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 split into two parts, the Waves part and the Vibrations part, which can be approached independently of the 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 sectors (Group A). While for students of Groups B and C (Civil Engineering, Mechanical Engineering and Process Engineering), it is wise 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 asked to go over all the parts of the course which require demonstrations or theoretical developments and to focus only on the application aspects. Furthermore, demonstrations can be the subject of auxiliary work to be asked of students as activities within the framework of the student's personal work. On this subject, consult the paragraph ''G- Student evaluation through continuous assessment and personal work'' present in this training offer.*

Part A: Vibration

Chapter 1: Introduction to Lagrange equations **2 weeks**

1.1 Lagrange equations for a particle
1.1.1 Lagrange equations
1.1.2 Case of conservative systems
1.1.3 Case of speed-dependent friction forces
1.1.4 Case of an external force depending on time
1.2 System with several degrees of freedom.

Chapter 2: Free oscillations of systems at a degree offreedom 2 weeks

2.1 Undamped oscillations
2.2 Free oscillations of damped systems

Chapter 3: Forced oscillations of systems with one degree of freedom 1 week

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

Chapter 4: Free oscillations of systems with two degrees of freedom 1 week

4.1 Introduction
4.2 Systems with two degrees of freedom

Chapter 5: Forced oscillations of systems with two degrees of freedom 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 2 weeks
1.1 General and basic definitions
1.2 Propagation equation
1.3 Solution of the propagation equation
1.4 Sinusoidal traveling wave
1.5 Superposition of two progressive sinusoidal waves

Chapter 2: Vibrating strings 2 weeks
2.1 Wave equation
2.2 Harmonic traveling waves
2.3 Free oscillations of a string of finite length
2.4 Reflection and transmission

Chapter 3: Acoustic waves in fluids 1 week
3.1 Wave equation
3.2 Speed of sound
3.3 Sinusoidal traveling wave
3.4 Reflection-Transmission

Chapter 4: Electromagnetic waves 2 weeks
4.1 Wave equation
4.2 Reflection-Transmission
4.3 Different types of electromagnetic waves

Evaluation method:
Continuous monitoring: 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 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objective:

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 which will be studied.

Recommended prior knowledge:

Content of the material:

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

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

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

Chapter 3 Dynamics of Perfect Incompressible Fluids **(4 weeks)**

Permanent 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 **(4 weeks)**

Flow regimes, 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

Evaluation method:

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

Bibliographic references:

1- R. Comolet, 'Experimental fluid mechanics', Volume 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, 'Engineering fluid mechanics', Wiley & sons
6- 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 Course and corrected exercises', Ed. Dunod.

Semester: 3
Teaching unit: UEF 2.1.2
Subject 2: Rational mechanics
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The student will be able to understand 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 material:

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

Chapter 2. General and basic definitions (2 weeks)

2.1 Definition and physical meaning of force
2.2 Mathematical representation of force
2.3 Force operations (composition, decomposition, projection)
2.4 Type of force: point, linear, surface, volume
2.5 Classification of forces: internal forces, external forces.
2.6 Mechanical models: the material point, the solid body

Chapter 3. Static. (3 weeks)

3.1 Axioms of statics
3.2 Connections, supports and reactions
3.3 Axiom of connections
3.4 Equilibrium conditions:
3.4.1 Contributing forces
3.4.2 Parallel forces
3.4.3 Plane forces

Chapter 4. Kinematics of the rigid solid. (3 weeks)

4.1 Brief reminders of the kinematic quantities for a material point.
4.2 Solid body kinematics
4.2.1 Translation 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 hardware system
5.1.1 Continuous system
5.1.2. Discreet 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 theorems
5.3. Moment and product of inertia of solids
5.4. Inertia tensor of a solid
5.4.1 Special cases
5.42 Main axes of inertia
5.5. Huyghens' theorem
5.6. Moment of inertia of solids relative to any axis.

Chapter 6. Dynamics of the rigid solid. (3 weeks)

6.1 Brief reminders of dynamic quantities for a material point.
6.2 Element of rigid body kinetics:
6.2.1 Quantity of movement
6.2.2 Angular momentum
6.2.3 Kinetic energy
6.3 Dynamics equation for a solid body
6.4 Angular momentum theorem
6.5 Kinetic energy theorem
6.6 Applications:
6.6.1 Case of pure translation
6.6.2 Case of rotation around a fixed axis
6.6.3 Combined case of translation and rotation

Evaluation method:

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

Bibliographic references:

1. Elements of Rational Mechanics. S.Targ. Mir Moscow Editions
2. Mechanics for engineers. STATIC. Russell Edition. Ferdinand P. Beer
3. General mechanic. Courses and corrected exercises. Sylvie Pommier. Yves Berthaud. DUNOD.
4. General mechanics - Theory and application, Serial editions. MURAY R. SPIEGEL schaum, 367p.
5. General mechanics – Exercises and solved problems with course reminders, Office of University Publications, Tahar HANI 1983, 386p.

Semester: 3
Teaching unit: UEM 2.1
Subject 1: Probability & Statistics
VHS: 45h00 (Class: 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 over a finite universe and random variables.

Recommended prior knowledge

Mathematics 1 and Mathematics 2

Material content:

Part A: Statistics

Chapter 1: Basic Definitions **(1 week)**

A.1.1 Concepts of population, sample, variables, modalities
A.1.2 Different types of statistical variables: qualitative, quantitative, discrete, continuous.

Chapter 2: One-variable statistical series **(3 weeks)**

A.2.1 Number, Frequency, Percentage.
A.2.2 Cumulative number, Cumulative frequency.
A.2.3 Graphical representations: bar chart, circular chart, bar chart. Polygon of numbers (and frequencies). Histogram. Cumulative curves.
A.2.4 Position characteristics
A.2.5 Dispersion characteristics: extent, variance and standard deviation, coefficient of variation.
A.2.6 Shape characteristics.

Chapter 3: Statistical series in two variables **(3 weeks)**

A.3.1 Data tables (contingency table). A cloud of dots.
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 fit.

Part B: Probabilities

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

B.1.1Arrangements
B.1.2Combinations
B.1.3Permutations.

Chapter 2: Introduction to Probability **(2 weeks)**

B.2.1Algebra of events
B.2.2Definitions
B.2.3Probable spaces
B.2.4General probability theorems

Chapter 3: Conditioning and independence **(1 week)**

B.3.1Conditioning,
B.3.2Independence,
B.3.3Bayes formula.

Chapter 4: Random variables **1 week**

B.4.1Definitions and properties,
B.4.2Distribution function,
B.4.3Expectation,
B.4.4Covariance and moments.

Chapter 5: Usual discrete and continuous probability laws **3 weeks**

Bernoulli, binomial, Poisson, ... ; Uniform, normal, exponential,...

Evaluation method:

Continuous monitoring: 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 calculation and statistics. Handout ENSTA, 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. Mathematical statistics course. Economica, 1988.
7. A. Montfort. Introduction to statistics. Polytechnic School, 1991

Semester: 3
Teaching unit: UEM 2.1
Subject 2: Computer science 3
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Subject objectives

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

Recommended prior knowledge

Computer science 1 and 2

Content of the material:

TP 1: Presentation of a scientific programming environment	**(1 week)**
Lab 2: Script Files and Types of Data and Variables	**(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)**
Lab 6: Function files	**(2 weeks)**
TP 7: Graphics (Management of graphic windows, plot	**(2 weeks)**
Lab 8: Using Toolbox	**(2 weeks)**

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. get started 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 calculation in Python and Scilab scientific preparatory classes 1st and 2nd years /Thierry Audibert, ;Amar Oussalah;Maurice Nivat, . -Paris: Ellipses, 2010. - 520p

Semester: 3
Teaching unit: UEM 2.1
Subject 3: Technical drawing
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives

This teaching will allow students to acquire the principles of representing parts in industrial drawing. Even more, this subject will allow the student to represent and read the plans.

Recommended prior knowledge

Content of the subject

Chapter 1. General. **(2 weeks)**

1.1 Usefulnesstechnical drawings and different types of drawings.
1.2 Drawing materials.
1.3 Standardization(Types of lines, Writing, Scale, Drawing and folding format, Cartridge, etc.).

Chapter 2.Elements of descriptive geometry **(6 weeks)**

2.1 Notions of descriptive geometry.
2.2 Orthogonal projections of a point - Sketch of a point - Orthogonal projections of a straight line (any and particular) - Sketch of a straight line - Traces of a straight line - Projections of a plane (Any and particular positions) - Traces of a plan.
2.3 Views: Choice and arrangement of views – Dimensions – Slope and conicity – Determination of the 3rd view from two given views.
2.4 Method of executing a drawing (layout, 45° straight line, etc.)
Application exercises and evaluation (TP)

Chapter 3. Perspectives **(2 weeks)**

Different types of perspectives (definition and goal). Application exercises and evaluation (TP).

Chapter 4. Cuts and sections **(2 weeks)**

4.1 Sections, standardized representation rules (hatching).
4.2 Projections and sections of simple solids (Projections and sections of a cylinder, a prism, a pyramid, a cone, a sphere, etc.).
4.3 Half-cut, Partial cuts, broken cuts, Sections, etc.
4.4 Technical vocabulary (terminology of machined shapes, profiles, piping, etc.
Application exercises and evaluation (TP).

Chapter 5. Quotation **(2 weeks)**

5.1 General principles.
5.2 Rating, tolerance and adjustment.
Application exercises and evaluation (TP).

Chapter 6. Concepts on definition and assembly drawings and parts lists. **(1 week)**

Application exercises and evaluation (TP).

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. Industrial designer's guide Chevalier A. Edition Hachette Technique;
2. Technical drawing 1st part descriptive geometry Felliachi d. and Bensaada s. Edition OPU Algiers;
3. Technical drawing part 2 industrial drawing Felliachi d. and bensaada s. Edition OPU Algiers;
4. First notions of technical drawing AndreRicordeauEditionAndreCasteilla;
5. المدخل إلى الرسم الصناعي ماجد عبد الحميد ديوان المطبوعات الجامعية الجزائر
6. مبادئ أساسية في الرسم الصناعي عمر أبو حنيك المعهد الجزائري للتقيي سالملكية الصناعية طبع الحميد ديوان المطبوعات الجامعية الجزائر.

Semester: 3
Teaching unit: UEM 2.1
Subject 4: TP Waves and Vibrations
VHS: 3:00 p.m. (TP: 1:00 a.m.)
Credits: 1
Coefficient: 1

Teaching objectives

The objectives assigned by this program concern the initiation of students to put 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.1Spring mass
TP.2 Simple pendulum
TP.3 Torsion pendulum
TP.4 Oscillating electric circuit in free and forced regime
TP.5 Coupled pendulums
TP.6 Transverse oscillations in vibrating strings
TP.7 Groove pulley according to Hoffmann
TP.8 Electromechanical systems (The electrodynamic loudspeaker)
TP.9 Pohl's pendulum
TP.10 Propagation of longitudinal waves in a fluid.

Noticed: It is recommended to choose at least 5 TPs among the 10 offered.

Evaluation method:

Continuous control: 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 technology
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives

This teaching will allow students to acquire knowledge on the processes for obtaining and manufacturing parts and their assembly techniques.

Recommended prior knowledge

Content of the subject

Chapter 1. Materials **(3 weeks)**

1.1 Metals and alloys and their designations
1.2 Plastic materials (polymers)
1.3 Composite materials
1.4 Other materials

Chapter 2. Processes for obtaining parts without material removal **(4 weeks)**

2.1 Casting, Forging, stamping, Rolling, Wire drawing, extrusion…. Etc
2.2 Cutting, bending and stamping, etc.
2.3 Sintering and powder metallurgy
2.4 Profiles and Pipes (steel, aluminum);
- Workshop visits.

Chapter 3. Processes for obtaining parts by material removal **(4 weeks)**

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

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

Bolting, riveting, welding, etc....

Evaluation 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, Ed. Casteilla
5. 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
9. الجزائر الجامعية المطبوعات ديوان .د فواز و ز خرير التصنيع عمليات تكنولوجيا.

Semester: 3
Teaching unit: UED 2.1
Subject 2: Metrology
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives

Teach the student the precision criteria for manufacturing and assembling parts; Know and know how 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, optical and other.

Content of the subject

Chapter 1. General information on metrology (2 weeks)

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

Chapter 2. The international SI measurement system (3 weeks)

2.1 Basic quantities and their units of measurement;
2.2 Additional sizes;
2.3 Derived quantities.

Chapter 3. Metrological characteristics of measuring devices (6 weeks)

3.1 Error and uncertainty (Accuracy, precision, reliability, reproducibility of a measuring device
3.2 Classification of measurement errors: (Raw value; Systematic errors; Corrected raw value)
3.3 Accidental 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 inspection;
3.9 Basic concepts 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, gauge blocks);
4.3 Control of dimensions (use of buffers, jaws, etc.);
4.4 Measuring and control machines used in mechanical workshops (use of pneumatic comparator, profile projector and roughness meter.

Evaluation 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, Ed. Casteilla
5. 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
9. ديوان المطبوعات الجامعية الجزائر .Remove the water from the water

Semester: 3

Teaching unit: UET 2.1
Subject 1: Technical English
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives

This course must allow the student to have a language level where he will be able to use a scientific document and talk about his specialty and sector in English at least with ease and clarity.

Recommended prior knowledge

English 1 and English 2

Content of the subject

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

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

Evaluation method:

Final exam: 100%.

Bibliographic references:

Semester: 4
Teaching unit: UEF 2.2.1
Subject 1: Soil mechanics
VHS: 45h00 (Class: 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

Material content:

Chapter 1. Introduction to soil mechanics (2 weeks)

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

Chapter 2. Soil identification and classification (4 weeks)

Physical characteristics, Particle size 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 equipment and processes, Compaction requirements and control.

Chapter 4: Water in the ground (5 weeks)

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

Evaluation method:

Continuous Control: 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 in soil mechanics, Volume 1, Dunod, 1983.
3. AMAR S. and MAGNAN JP “Soil mechanics tests in the laboratory and in place,” 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: Building materials
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

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

Recommended prior knowledge:

All fundamental subjects of the common core S1 and S2.

Content of the material:

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

History of construction materials, Classification of construction materials, Properties of construction materials.

Chapter 2: Aggregates **(4 weeks)**

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

Chapter 3: Binders **(6 weeks)**

Classification, Aerial binders (aerial 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.

Evaluation method:

Review: 100%.

Bibliographic references:

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

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

Teaching objectives:

This course covers the differential and integral calculus of complex functions of a complex variable. The student mustmaster the different techniques for solving functionsand integrals tocomplex and special variables.

Recommended prior knowledge:

Mathematics 1, Mathematics 2 and Mathematics 3.

Content of the subject:

Functions with complex variables and Special Functions

Chapter 1: Holomorphic functions. Cauchy Riemann Terms3 weeks

Chapter 2: Entire series3 weeks

Convergence radius. Convergence domain. Development in whole series. Analytical Functions. Laurent series and development in Laurent series

Chapter 3: Cauchy theory 3 weeks

Cauchy's theorem; Cauchy formulas. Singular point of functions, general method for calculating complex integrals

Chapter 4: Applications 4weeks

Equivalence between holomorphy and Analyticity. Maximum Theorem. Liouville's theorem. Rouche's theorem. Residue Theorem. Calculation of integrals using the Residue method.

Chapter 5: Special Functions 2weeks

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

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1- Henri Catan, Elementary theory of analytical 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 work.
4- Walter Rudin, Real and complex analysis. Masson, Paris, 1975. Graduate manual.

Semester: S4
Teaching unit: UEF 2.2.2
Subject 2: Numerical methods
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

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

Content of the material:

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 (2 weeks)

General introduction, Lagrange polynomial, Newton polynomials.

Chapter 3: Function approximation: (2 weeks)

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

Chapter 4: Digital integration (2 weeks)

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

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

General introduction, Euler method, Improved Euler method, Runge-Kutta method.

Chapter 6: Direct solution method for systems of linear equations (2 weeks)

Introduction and definitions, Gauss method and pivot, LU factorization method, ChoeleskiMMt factorization method, Thomas algorithm (TDMA) for three-diagonal systems.

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

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

Evaluation method:

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

References:

1- C. Brezinski, Introduction to the practice of numerical calculation, Dunod, Paris 1988.
2- G. Allaire and SM Kaber, Digital 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. Presses Universitaires de Grenoble, 1996.
8- E. Hairer, SP Norsette and G. Wanner, Solving Ordinary Differential Equations, Springer, 1993.
9- PG Ciarlet, Introduction to matrix numerical analysis and optimization, Masson, Paris, 1982.

Semester: 4
Teaching unit: UEF 2.2.3

Material: Resistance of materials
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

Rational mechanics and analysis of functions.

Content of the material:

Chapter 1. Introduction and general information (2 weeks)

Goals and hypotheses of the resistance of materials, Different types of loading, Connections (supports, embeddings, hinges), General principle of equilibrium -Equilibrium equations, Method of sections -Notion 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 straight section, Transformation of moments of inertia. Central principal axes, principal moments of inertia.

Chapter 3. Simple traction and compressionsimple (3 weeks)

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

Chapter 4. Simple bending (4 weeks)

Definitions and hypotheses, Shear force, Bending moments, Differential relationship between the 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 the tangential stress.

Chapter 5. Shear (2 weeks)

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

Chapter 6. Twist (2 weeks)

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

Evaluation method:

Continuous Control: 40%; Exam: 60%.

Bibliographic references:

1. F. Beer, Mechanics for engineers – statics, McGraw-Hill, 1981.
2. G. Pissarenko et all, Material resistance cheat sheet.
3. I. Mirolioubov et al, “Problems of resistance of materials”, Moscow Editions.
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, Editions MIR; Moscow, 1986.
7. S. Timoshenko, Resistance of materials, Dunod, 1986.
8. William and Nash, Strength of materials, course and problem, Schaum series, 1983.

Semester: 4
Teaching unit: UEM 2.2
Subject 1: TP Soil mechanics
VHS: 10:30 p.m. (TP: 1:30 a.m.)

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 material:

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

Evaluation method:

Continuous control: 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: TP Construction materials
VHS: 10:30 p.m., (TP: 1:30 a.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 material:

TP1: Densities of cement, sand and gravel
TP2: Particle size analysis of sand and gravel
TP3: Water content and abundance of sand
TP4: Porosity of sand and gravel
TP5: Volumetric coefficient of gravel
TP6: Equivalent of sand
TP7: Cement consistency and setting test

Evaluation method:

Continuous control: 100%.

Semester: 4
Teaching unit: UEM 2.2
Subject 3: Computer-aided drawing
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives: This teaching will allow students to acquire the pprinciples of representing parts in industrial drawing. Even more, this subject will allow the student to represent and read the plans.

Recommended prior knowledge: Technical drawing..

Content of the subject:

1. PRESENTATION OF THE CHOSEN SOFTWARE **(4weeks)**
(SolidWorks, Autocad, Catia, Inventor, etc.)
1.1 Introduction and history of the DAO;
1.2 Configuration of the chosen software (interface, shortcut bar, options, etc.);
1.3 Software reference elements (software help, tutorials, etc.);
1.4 Backup of files (part file, assembly file, drawing file, backup procedure for delivery to the teacher);
1.5 Communication and interdependence between files.

2. CONCEPT OF SKETCHES **(3 weeks)**
2.1 Sketching tools (point, line segment, arc, circle, ellipse, polygon, etc.);
2.2 Sketch relationships (horizontal, vertical, equal, parallel, hillside, fixed, etc.);
2.3 Dimensions of sketches and geometric constraints.

3.3D MODELING **(3 weeks)**
3.1 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 (Delete, Shift, Copy, Mirror, Adjust, Extend, Move):
3.6 Creating 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 Object layouts and properties (hatching, dimensioning, text, tables, etc.)

5. ASSEMBLIES **(2weeks)**
5.1 Assembly constraints (parallel, coincidence, coaxial, fixed, etc.):
5.2 Production of assembly drawings:
5.3 Assembly drawing and part nomenclature:
1. Exploded view.

Evaluation method:
Continuous control: 100%.

References:

- Solidworks bible 2013 Matt Lombard, Edition Wiley,
- Technical drawing, Saint-Laurent, GIESECKE, Frederick E. Éditions du renouveau pedagogical Inc., 1982.
- Drawing exercises for mechanical parts and assemblies with SolidWorks software,Jean-Louis Berthéol,Francois Mendes,
- CAD accessible to all with SolidWorks: from creation to completion volume 1Pascal Rétif,
- Industrial designer's guide, ChevalierA, Edition Hachette Technique,

Semester: S4
Teaching unit: UEM 2.2
Subject 4: Practical work on digital methods
VHS: 10:30 p.m. (TP: 1:30 a.m.)
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 material:

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: Digital integrations **(3 weeks)**

1. Rectangle method, 2. Trapeze method, 3. Simpson method

Chapter 4: Differential equations **(2 weeks)**

1.Euler method, 2. Runge-Kutta methods

Chapter 5: Systems of linear equations **(4 weeks)**

1. Gauss-Jordon method, 2. Crout decomposition and LU factorization, 3. Jacobi method, 4. Gauss-Seidel method

Evaluation method:

Continuous control: 100%.

References:

1. Algorithmics and numerical calculation: solved practical work and programming with Scilab and Python software /José Ouin, . -Paris: Ellipses, 2013. - 189 p.
2. Mathematics with Scilab: calculation guide, programming graphic representations; complies with the new MPSI program /Bouchaib Radi, ;Abdelkhalak El Hami. -Paris: Ellipses, 2015 . - 180 p.
3. Applied numerical methods: for the scientist and the engineer /Jean-Philippe Grivet, - Paris: EDP sciences, 2009. - 371 p.

Semester: 4
Teaching unit: UEM 2.2
Material 5: TP MDF and RDM
VHS: 3:00 p.m. (TP: 1:00 a.m.)
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 material:

Part I: Practical work: Fluid mechanics

TP No. 1: Measurement of density and density of liquids
TP No. 2: Measurement of viscosity of liquids
TP No. 3: Measuring liquid pressure and calibrating a pressure gauge
TP No. 4: Hydrostatic force measurement and determination of the center of thrust
TP No. 5: Liquid flow measurement

Part II: Practical work: Resistance of materials

TP No. 1. Tensile – simple compression tests
TP No. 2. Torsion test
TP No. 3. Simple bending test
TP No. 4. Resilience test
TP No. 5. Hardness test

Evaluation method:

Continuous control: 100%.

Semester: 4
Teaching unit: UED2.2
Subject 1: Geology
VHS: 10:30 p.m. (Class: 1h30)
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

Content of the subject:
Chapter 1: Introduction to geology (2 weeks)
- 1.1 Definition of Geology
- 1.2 Paleontology
- 1.3 Origin of the earth
- 1.4 Geology Division

Chapter 2: Minerals and rocks (4 weeks)
- 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 weeks)
- 3.1 Action of air on rocks
- 3.2 Action of water on rocks
- 3.3 Action of glaciers on rocks

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

Chapter 5: Adaptation of geological techniques to the needs of civil engineering **(3 weeks)**
- 5.1 Geological cartography
- 5.2 The use of graphic constructions
- 5.3 Geological survey of discontinuity surfaces

5.4 Use of stereographic projection

Evaluation method:
Review: 100%.

References:
1. Hydrogeology and notions of engineering geology,G. BOGOMOLOV
2.Geology: Basics for the engineer, Aurèle Parriauxand Marcel Arnould, 2009
3.Engineering geology. Bilingual French/English, Roger CojeanAndMartine Audiguier, 2011
4. Hydrogeology, engineering geology, Éditions du BRGM, 1984.
Faucault A. Raoult JF (1995) – Dictionary of geology, 4 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: 1h30)
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 implementation of a construction, leveling, measurement of angles and coordinates, drawing of topographical plans

Recommended prior knowledge:

Mathematics ; Physics 1; Technical drawing

Content of the material:

Chapter 1. General **(3 weeks)**

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

Chapter 2. Measuring distances **(3 weeks)**

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

Chapter 3. Measuring 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 area of a polygon, Determination of the areas of the contours represented on the plan, Planimeter and measurement of areas.

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

Direct Leveling, Indirect Leveling.

Evaluation method:

Review: 100%.

Bibliographic references:

1. Antoine, P., Fabre, D., Modern topography and topometry (Volume 1 and 2) – Serge Milles and Jean Lagofun, 1999.
2. Bouquillard, Topography Course BepTech.geo T1, 2006
3. Dubois, F. and Dupont, G. (1998) precise 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, Specialty Topography.

Semester: S4
Teaching unit: UET 2.2
Subject 1: Expression and Communication Techniques
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

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

Recommended prior knowledge:

Languages (Arabic; French; English)

Content of the material:

Chapter 1: Find, analyze and organize information (3 weeks)

Identify and use places, tools and documentary resources, Understand and analyze documents, Create and update documentation.

Chapter 2: Improving Expression Ability (3 weeks)

Take into account the Communication situation, Produce a written message, Communicate orally, Produce a visual and audiovisual message.

Chapter 3: Improving communication ability in interaction situations (3 weeks)

Analyze the Interpersonal communication process, Improve face-to-face communication ability, Improve group communication ability.

Chapter 4: Develop autonomy, organizational and communication skills within the framework of a project approach (6 weeks)

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

Evaluation method:

Final exam: 100%.

References:

1- Jean-Denis Commeignes 12 methods of written and oral communications – 4th edition, Michelle Fayet and Dunod 2013.
2- Denis Baril; Sirey, Techniques of written and oral expression; 2008. 3- Matthieu Dubost Improving your written and oral expression all the keys; Edition Ellipses 2014.

Semester: 5
Teaching unit: UEF 3.1.1
Subject 1:Material resistance 2
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

This subject constitutes a continuation of the Resistance of materials taught in the fourth semester, we will approach compound stresses, energy methods and hyperstatic systems.

Recommended prior knowledge:

RDM 1, materials science, Mathematics.

Content of the material:

Chapter 1: Plane bending of symmetrical beams – reminder (2 weeks)

- Bending moment reminder – 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 constant section beams
- Initial Parameters Method
- Moment of area methods
- Overlay method

Chapter 3: General theorems of elastic systems (Applications) (3 weeks)

- Tensile elastic strain energy
- Elastic deformation energy in torsion
- Elastic deformation energy in shear
- Elastic deformation energy in bending
- General expression of elastic strain energy
- Castigliano's theorem
- Generalized fictitious force method

Chapter 4: compound requests (3 weeks)

- General
- Deflected bending (general, constraints, deformations)
- Compound Flexion
- Bending – twisting

Chapter5:Resolution of hyperstatic systems (4 weeks)

- General (bar systems, nodes, joints, frames, portals, etc.)
- Initial Parameters Method
- Force effects superposition method
- Method of 3-moment equations

- Forces method

Chapter 6: Sizing examples -Applications (1 week)

Evaluation method: Continuous monitoring: 40%; Examination: 60%.

Bibliographic references:

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

Claude Chèze.*Resistance of materials - Sizing 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 (Class: 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 (traction, compression and simple bending) according to BAEL, CBA93 rules.

Recommended prior knowledge:

Resistance of materials 1, Building materials.

Material content:

Chapter 1. Formulation and mechanical properties of reinforced concrete (2 weeks)
Definition and generalities, Constituents of reinforced concrete, Mechanical properties.

Chapter 2. Regulatory requirements (3 weeks)
Rule of pivots, Limit states, Combinations of actions, Condition of non-fragility

Chapter 3. Adhesion and anchoring (3 weeks)
Adhesion stress, Anchoring of a straight insulated bar, Anchoring by curvature, Covering

Chapter 4. Simple Compression (4 weeks)
Ultimate resistance limit state, service limit state

Chapter5. Single pull (3 weeks)
Ultimate resistance limit state, service limit state

Evaluation method:

Continuous Control: 40%; Exam: 60%.

Bibliographic references:

1. DTR-BC2-41, “Design and calculation rules for 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 framework
VHS: 45h00 (Class: 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 on the sizing philosophy and operation of assemblies.

Recommended prior knowledge:

Applied mathematics, rational mechanics, Resistance of materials 1.

Content of the material:

Chapter 1. General **(1 week)**

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

Chapter 2. Basics and security **(3 weeks)**

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

Chapter 3. Assemblies **(4 weeks)**

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

Chapter 4. Calculation of parts loaded in simple tension **(3 weeks)**

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

Chapter 5. Calculation of deflected parts **(4 weeks)**

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

Evaluation method:

Continuous monitoring: 40%; Examination: 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 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The objective of this teaching is to allow 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 soil reconnaissance methods.

Recommended prior knowledge:

Soil mechanics 1, Resistance of materials1.

Material content:

Chapter 1. Stresses and strains (3 weeks)

Introduction to the mechanics of continuous media, Principal stresses, Distribution of stresses according to the orientation of the facets around a point, Mohr's 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 resistance of soils (4 weeks)

Notions on the plasticity of soils, Intrinsic curve, Shear tests in the laboratory: Casagrande box test and triaxial test (Determination of the cohesion and the internal friction angle of a soil), Drained and undrained behavior: distinction between grainy soils and fine soils.

Chapter 4. Soil recognition and exploration (3 weeks)

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

Evaluation method:

Continuous control: 40%; Exam: 60%.

Bibliographic references:

1. COSTET J. AND SANGLERAT G, “Practical course in soil mechanics”, Dunod, 1981.
2. AMAR S., MAGNAN JP, “Soil mechanics tests in the laboratory and on site”, Aide-mémoire, 1980,
3. FILLIAT G, “The practice of soils and foundations”, Editions du Moniteur. nineteen eighty one
4. SCHLOSSER F, “Elements of soil mechanics, Presses de l’Ecole Nationale des Ponts et Chaussées”, 1988.
5. J. COLLAS and M. HAVARD, “Geotechnics Guide: Glossary and Essays”, Editions Eyrolles, 1983.

Semester: 5
Teaching unit: UEF 3.1.2
Subject 2: Building materials 2
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

The objective is to allow the student to continue with the material taught in S4, particularly on concrete components 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 for developing 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 subject:

Chapter 1. Concretes **(7 Weeks)**

Definition and classification, Physical and/or mechanical characteristics, Additions, Admixtures, Formulation of concrete, Tests on fresh concrete, Tests on hardened concrete, Concepts on new concretes and their applications.

Chapter 2. Ceramic products **(4 weeks)**

General, Classification of ceramic products, Raw materials, Manufacturing of ceramic products (bricks, tiles, wall and floor covering tiles, sanitary ceramics, etc.).

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

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

Chapter 4. Glass **(2 weeks)**

Elaboration, Manufacturing process, Properties and uses.

Evaluation method :

Review: 100%.

Bibliographic references:

1. Materials Volume 1, "Properties, applications and design: courses and exercises: License 3, master, engineering schools", Edition, Dunod, 2013.
2. “Concrete admixtures”, Afnor, 2012.
3. “Aggregates, soils, cements and concretes: characterization of civil engineering materials by laboratory tests: Engineering schools”, Castilla, 2009.
4. G. Dreux, “The new guide to concrete”. Editions Eyrolles.
5. “Current cements and concretes”, CIIC, Paris, 1987.

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

Teaching objectives:

The themes 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 transfers known in the topography material.

Recommended prior knowledge:

Knowledge acquired in Topography 1 and 2 subjects.

Material content:

TP.1: Measuring angles and distances

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

TP.2: Polygonation

Recognition of locations, Choice of stations, Location sketch, Measurements (Angles and distances), Calculations and report

TP.3: Tacheometry

Establishment of the field sketch, Detail survey by radiation, Calculations and report

TP.4: Survey by abscissa and ordinate and quasi-ordinate

Choice of operation lines, Measurements, Calculations and reporting

TP.5: Lateral oblique measurements

Establishment of the field sketch, Detail survey by radiation, Calculations and report

TP.6: Implementation

Implementation of alignments: Preliminary calculations (Office), Implementation on the ground, Implementation of a bend, Preliminary calculations (Office), Implementation on the ground, Implementation of a building.

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. L. Lapointe, G. Meyer, “Topography applied to public works, buildings and urban surveys”, Eyrolles, Paris, 1986.
2. R. D'Hollander, "General topographies, volumes 1 and 2", Eyrolles, Paris, 1970.
3. M. Brabant, “Mastering topography”, Eyrolles, Paris, 2003.

Semester: 5
Teaching unit: UEM 3.1
Subject 2: TP Soil Mechanics 2
VHS: 10:30 p.m. (TP: 1:30 a.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.

Material content:

TP N.1: Soil permeability

Constant head and variable head permeameters.

TP N.2: Compressibility test using an oedometer

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

Evaluation method:

Continuous control: 100%.

Bibliographic references:

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

Semester: 5
Teaching unit: UEM 3.1
Subject 3:TP Materialsconstruction2
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives:

The main objective of these TPs 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 acquainted with a key material in the field of civil engineering: concrete. Put the student directly with laboratory techniques.

The student having acquired basic notions in terms of practical work on materials, it becomes necessary to deepen his knowledge through more specific tests on concrete.

Recommended prior knowledge:

Construction materials, TP Construction materials, Resistance of materials1.

Content of the material:

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

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

TP.3:making and testing mortars.

TP.4: Abrams cone workability test.

TP.5: Crush test on concrete.

TP.6: Non-destructive testing.

Evaluation method:

Continuous control: 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 using graphics),
- Know current vocabulary and graphic representation conventions,
- Take into account the design/execution link (feasibility).

Recommended prior knowledge:

Technical drawing

Material content:

Chapter 1. Principles of technical drawings (3 weeks)

Technical drawing convention (Lines, Hatching, Writing, Formats, Cartridge), Presentation of objects (Scales, Orthogonal projections, Sections, sections, Dimensions, Perspectives).

Chapter 2. Drawing of buildings (4 weeks)

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

Chapter 3. Special rules and conventions for the presentation of drawings (5 Weeks)

Land development and soil reconnaissance (conventional representation of the land, lithological legend of the foundation soils, geological section, surveys of reconnaissance surveys), masonry (principle of representation of the different categories of masonry), reinforced concrete and prestressed concrete (plans formwork and reinforcement), Metal framework (Overall drawings, Assemblies)

Chapter 4. Drawing of sanitation works (3 weeks)

Sanitation works (network plans, general rules for presenting networks).

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. G. Kienert and J. Pelletier, "Technical drawing of public works and building". 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: 1h30)
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 in the field.

Recommended prior knowledge

Knowledge acquired in the subject Topography 1 in semester 4

Material content:

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 work: Its destination, Basic document; Reconnaissance of locations: Canvas, Field sketch; Field work: Composition of a brigade, Field measurements; Office work: Calculations, Report

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

Definitions, Survey method, Calculations.

Chapter 4. Lateral Oblique Survey **(2 weeks)**

Definitions, Survey method, Calculations.

Chapter 5. Implementation **(4 weeks)**

Definitions, Implementation of straight alignments, Implementation of curves (circular connections), Implementation of Buildings.

Evaluation method:

Review: 100%.

Bibliographic references:

1. AGHeerbrugg, "Topography and navigation, laica – wild GPS system", gosystms 1992
2. L. Lapointe, G. Meyer "Topography applied to public works, buildings and urban surveys", Eyrolles, Paris, 1986.
3. R. D'hollander, "General topographies, 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: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives

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

Recommended prior knowledge:

Fluid mechanics

Material content:

Chapter 1. Hydrostatics **(2 weeks)**
- Physical characteristic 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)**
- Current lines, current tube.
- Continuity equation
- BERNOULLI's theorem
- VENTURI phenomenon
- PITOT tube

Chapter 3. Dynamics of real liquids **(3 weeks)**
- Flow of liquids
- Load losses
- Generalized BERNOULLI theorem
- Energy diagram

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

Chapter 5. Flow through orifices **(2 weeks)**
- Flow through the Orifices
- Flow under constant load
- Flow under variable load

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

Evaluation method:

Review: 100%.

Bibliographic references

1. "Fluid mechanics and hydraulics (courses 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
Matter :Construction techniques and rules
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

This material is made up 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 notions of the different 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.

VScontent 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 work, choice of site and installation of works, geotechnical investigations.

Chapter 2. Site preparation techniques (3 weeks)

Preparation of work and techniques for organizing building sites, staking and demarcation of the site, earthworks and embankments, techniques for carrying out earth removal, well excavations, ramming, recovery of topsoil, trenches and armoring, sloping

Chapter 3. Techniques for producing reinforced concrete works (2 weeks)

Techniques for executing surface foundations and deep foundations. Formwork and reinforcement techniques for building structures.

Chapter 4. Metal and mixed structures (2 weeks)

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

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

General and Necessity of regulations, Introduction to the different construction standards, BAEL standards and Eurocodes.

Chapter 6. RPA 99 seismic rules version 2003 (1 Weeks)

(General rules for seismic zone design, criteria for classifying structures).

Chapter 7. Justification of reinforced concrete structures (2 weeks)

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

Chapter 8. Specification of structural elements (2 weeks)

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

Evaluation 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 processes Volume 2: Foundation and structures”, ENPC, Eyrolles.
3. J. MATHIVAT and JF BOUGARD, “General construction processes Volume 3: Underground Works”, ENPC, Eyrolles.
4. Algerian seismic rules RPA 99 version 2003. DTR –BC-2.48.

Semester: 6
Teaching unit: UEF 3.2.1
Subject 1:Calculation of structures
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

Material Strength 1, Material Strength 2.

Content of the material:

Chapter 1. Isostatic Lattice Systems **(4 weeks)**

General; Calculation of the forces in the bars; Analytical method ; Node method; Method of sections.

Chapter 2. Isostatic gantries **(2 weeks)**

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

Chapter 3 Lines of influence **(3 weeks)**

Definition and Principle of the line of influence, Principle of the moving charge. 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)**

General, Degree of hyperstaticity, Force method, Application to hyperstatic gantries.

Evaluation method:

Continuous monitoring: 40%; Examination: 60%.

Bibliographic references:

1. F. Beer, Mechanics for engineers – statics, McGraw-Hill, 1981.
2. G. Pissarenko et all, Material resistance cheat sheet.
3. I. Mirolioubov et al, “Problems of resistance of materials”, Moscow Editions.
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, Editions MIR; Moscow, 1986.
7. S. Timoshenko, Resistance of materials, Dunod, 1986.
8. William and Nash, Strength of materials, course and problem, Schaum series, 1983.
9. R. Soltani, Lines of influence of isostatic beams and arcs, OPU, 2003.

Semester: 6
Teaching unit: UEF 3.2.1
Subject 2:Metal constructions
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

At the end of the teaching of this subject, the knowledge acquired in metal framing (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 CM1 su S5 and to have knowledge of the theory of elastic stability.

Material content:

Chapter 1. Elastic instability phenomena (2 weeks)

Presentation of instability; different types of instability; regulations.

Chapter 2. Calculation of parts stressed in simple compression (5 weeks)

Use of compressed parts, theory of buckling, buckling length, notions of slenderness and imperfection, verification of compressed parts at the ELU.

Chapter 3. Calculation of parts stressed in compound buckling (6 weeks)

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

Chapter 4. Spill of metal parts (2 weeks)

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

Evaluation method:

Continuous monitoring: 40%; Examination: 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, "Metal and Mixed Steel – Concrete Construction – Volumes 1 and 2", EYROLLES.
4. MY HIRT; R. BEZ, "Metal Construction – Volumes 10 and 11" - Presses Polytechniques et Universitaires Romandes.
5. "Design rules for steel structures", CCM97 CGS edition, Algiers, 1999.
6. "Practical calculation of metal structures", Office of University Publications, Algiers.
7. J. BROZZETTI; MY 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 (Class: 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 support for the action of shear force and torsion.

Recommended prior knowledge:

Resistance of materials, Construction materials, Reinforced concrete 1.

Material content:

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

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

Chapter 2. Shear force (3 weeks)

Calculationof transverse reinforcement, Checks in the areas of application of concentrated forces, Checking resistance to punching, Checks in the junction zones with the web of the beams.

Chapter 3. Calculation of RC sections subjected to compound bending (7 Weeks)

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

Chapter 4. Twist (2 weeks)

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

Evaluation method:

Continuous Control: 40%; Exam: 60%.

Bibliographic references:

1. DT R-BC2-41, “Design and calculation rules for 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 works
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

In this subject, the student will have the opportunity to acquire knowledge of foundations and geotechnical works. It will be able to calculate and check the stability of certain structures, such as: retaining structures, foundations and embankments.

Recommended prior knowledge:

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

Material content:

Chapter 1. Limit equilibrium states (3 weeks)

Rankine's lower and upper limit balances (thrust and earth thrust coefficients), Boussinesq balance (general case), Prandtl balance (thrust due to overloads). Determination of failure planes using Mohr's circle in the cases of thrust and thrust.

Chapter 2. Retaining structures (4 weeks)

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

Chapter 3. Superficial foundations (4 weeks)

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

Chapter 4. Slope stability (4 weeks)

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

Evaluation method:

Continuous monitoring: 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 in soil mechanics, Volume 2, Dunod, 1983.
3. G. Phillipponat, B. Hubert “Foundations and earthworks”, Edition Eyrolles, 1997
4. F. Schlosser, “Elements 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 de l’Ecole Nationale des Ponts et Chaussées.

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 for in the program. They are more particularly devoted to putting concepts into practice. They tend to encourage the intellectual openness of students. They favorably develop a 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 Drawing, CAD, Foundation and geotechnical works

Material content:

- Presentation and description of the project
- Presentation of the different stages of calculating a project
- Calculation assumptions
- Used materials
- Standards and regulations used
- Choice of carrier system
- Pre-sizing of structural elements and evaluation of loads
- Calculation of floor reinforcement (hollow body floors, slabs)
- Calculation of secondary elements (a balcony, parapet)
- 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

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. A. GUERRIN, RC LAUVAUR, “Treatise on reinforced concrete Volume 1-3-4-11”, Edition Dunod.
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.

Semester: 6
Teaching unit: UEM 3.2
Subject 2: Computer-assisted calculation
VHS: 37h30 (TP: 2h30)
Credits: 3
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

Computer science 1 and 2 and computer science 3

Material content:

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

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

End of cycle project preferred

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. Host software user manual.

Semester: 6
Teaching unit: UEM 3.2
Subject 3: Quantity measurement and price estimation
VHS: 10:30 p.m. (Class: 1h30)
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 quantity survey and a quote as well as knowledge of the different quantity surveying acts.

Prior knowledge:

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

Material content:

Chapter 1. General concepts (1 week)

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

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

Summary estimates, quotes, attachments, work situations, accounts and reports.

Chapter 3. Method of taking measurements and preliminary measurements of works (2 weeks)

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

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

Before taking measurements of excavations for foundations, calculation of earthwork quantities

Chapter 5. Pre-measurement of masonry (2 weeks)

Rubble masonry, brick masonry or agglomerates.

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

Concrete, formwork, reinforcements.

Chapter 7. Price study (3 weeks)

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

Evaluation method:

Review: 100%.

Bibliographic references:

1. Michel Manteau,"Building Survey", 7th Edition, Eyrolles, 1990.
2. Jena-PierreGousset, Jean-Claude Capdebielle, René Pralat, "Le Métré, CAD-CAD 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: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

In this subject, the student will learn all the works and infrastructure works relating to the construction and development of access and circulation 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

Material content:

Chapter 1. Road works **(3 weeks)**

The definition, classification, characteristics of the road; The layout of the roads, the composition of the roadways (the different layers of the roadway); Parking areas (sidewalks, pedestrian paths, curbs, inclusion of disabled people; lanes reserved for emergency vehicles, machine 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 collection works, ancillary works.

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.

Evaluation method:

Review: 100%.

Bibliographic references:

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

Semester: 6
Teaching unit: UED 3.2
Subject 2: Organization of construction sites
VHS: 10:30 p.m. (Class: 1h30)
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.

Prior knowledge:

Knowledge acquired in the subject General construction processes.

Material content:

Chapter 1. Site installation **(1 week)**

Installation and preparation of sites, Particularities of construction sites.

Chapter 2. Construction equipment **(1 week)**

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

Chapter 3. Work planning **(3 weeks)**

Definition of unit labor time, Material yield, Relationship between the TU of MO and Material yield, Determination of unit labor times and yields, Calculation of the total forecast time of MO and Material.

Chapter 4. Planning and scheduling **(3 weeks)**

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

Chapter 5. PERT Language **(3 weeks)**

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

Chapter 6. Site management **(4 weeks)**

Key installations, Determination of the detailed and simplified execution program, Determination of the simplified execution program, Site monitoring and work controls.

Evaluation method:

Review: 100%.

Bibliographic references:

1. "Organization and management of work: 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 for 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 1:Professional projectand business management
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Prepare and master the methodological tools necessary for professional integration at the end of your studies, prepare for the job search. Be aware of entrepreneurship by presenting an overview of management knowledge useful for creating activities and being able to implement a project.

Content of the subject:

Chapter 1: Business and society (3 weeks)

The company: Definition and objectives of the company. Different business forms, company structure, personnel and company partners.
Different types of company (VSE, SME, SMI, ETI, GE)
The society : Definition and objectives of the company
Different types of company (SARL, EURL, SPA, SNC, etc.)
Difference between business and society.

Chapter 2: Operation and organization of the company (2 weeks)

Method of organization and operation of the company
The main functions of the company (production, service company, etc.)
Business structure (definition and characteristics)
Different types of structures (functional, divisional, multidivisional structure, Hierarchical-functional ''staff and line'').
Additional activities of the company (partnership, subcontracting, etc.).

Chapter 3: How to gain access to a company (3 weeks)

The needs and quality of personnel (senior executives, managers, technicians, workers, etc.)
Where to find the job offer (ANEM, section, internet, etc.)
How to go about it (the application, the CV)
The different types of job interviews and how to go about it.
Types of employment contract (CDI and CDD)
Salary (how to calculate a pay slip).

Chapter 4: How to start your own business (3 weeks)

The journey of the business creator (the idea, capital, financial assistance, etc.)
How to find a good idea.
Financial aid schemes for investment (ANSEJ, CNAC, ANDI, ANGEM, PNR)

Chapter 5: Study of a business creation project (4 weeks)

Studying a business creation project requires the promoter to plan and write in detail the phases and steps he will have to take to get his business off the ground.

Market research(sales department, marketing, etc.).
Technical study(location, equipment and machine requirements, production capacity, etc.).
Financial study(turnover, salary costs, expenses and consumption, taxes, etc.).
Mini project for the study of a business creation project

Evaluation method:100% review

Bibliographic references:

1. *-Antoine Melo ''Business management'' edition Melo France 2016*
2. *-Thomas Durand ''Business management'' Paperback edition 2016*
3. *-Philippe Guillermic ''Business management step by step'' Pocket edition 2015*
4. *-Guy Raimbault ''Management tools'' edition Chihab Alger 1994*
5. *-Institute of financial technology ''Accounting initiation'' OPU Algiers 1993*
6. *-Christian Bultez ''Guide and instructions for use of the procedures'' edition Nathan Paris 1993*

1.

IV- Agreements / Conventions

STANDARD LETTER OF INTENT

(In case of license co-sponsored by another academic establishment)

(Official paper on the header of the university establishment concerned)

Subject: Approval of co-sponsorship of the license entitled:

The university (or academic center) hereby declares that it co-sponsors the above-mentioned license throughout the license authorization period.

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,
- Participating in seminars organized for this purpose,
- By participating in defense juries,
- By working to pool human and material resources.

SIGNATURE of the legally authorized person:

FUNCTION :

Date :

STANDARD LETTER OF INTENT

(If licensed in collaboration with a user sector company)

(Official company letterhead)

OBJECT : Approval of the project to launch a License training course entitled:

Provided to:

The company hereby declares its willingness to demonstrate its 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 educational programs,
- Participate in seminars organized for this purpose,
- Participate in defense juries,
- Facilitate as much as possible the reception of interns either as part of end-of-study theses or as part of tutored projects.

The means necessary to carry out the tasks incumbent on us to achieve these objectives will be implemented on a material and human level.

Mr. (or Madam)*……..is designated as external coordinator of this project.

SIGNATUREof the legally authorized person:

FUNCTION :

Date :

OFFICIAL STAMP or COMPANY SEAL

V - Opinions and Visas from Administrative and Consultative Bodies

Title of the Degree: Civil Engineering

Department Head + Domain Team Manager
Date and visa:Date and visa:
Dean of the faculty (or Institute Director)
Date and visa:
Head of university establishment
Date and visa:

VI – Opinion and Visa of the Regional Conference

VII – Opinion and Visa of the National Educational Committee of the Domain

Semester sheets for organizing common core lessons

Divided into Teaching Units

- State engineer course (specific to TM baccalaureate holders) -

-Science and Technology field –

Civil Engineering sector

Annex to Order No. of
Setting the program of Common Core courses with a view to obtaining the State Engineer diploma (specific to TM baccalaureate holders) from the "Science and Technology" domain , Civil Engineering sector

Semester 1:

Units Teaching	Subject titles	Coded	Credits	Coefficients	Hourly volume Weekly			Half-yearly Hourly Volume (15 weeks)	Evaluation mode	
					Course	T.D.	TP		Continuous monitoring	Final exam
Fundamental EU Code: UEF1.1.1 Credits: 10 Coefficients: 5	Analysis 1	IST 1.1	6	3	1h30	3:00 a.m.		67h30	40%	60%
	Algebra 1	IST 1.2	4	2	1h30	1h30		45:00	40%	60%
Fundamental EU Code: UEF1.1.2 Credits: 14 Coefficients: 8	Elements of Chemistry (structure of matter)	IST 1.3	7	4	1h30	3:00 a.m.	1h30	90:00	40% (20% TD + 20% TP)	60%
	Mechanical Elements (Physics 1)	IST 1.4	7	4	1h30	3:00 a.m.	1h30	90:00	40% (20% TD + 20% TP)	60%
Methodological EU Code: UEM1.1 Credits: 4 Coefficients: 4	Probability and statistics	IST 1.5	2	2	1h30	1h30		45:00	40%	60%
	Scomputer structure and applications	IST 1.6	2	2			3:00 a.m.	45:00	100%	
Transversal EU Code: UET1.1 Credits: 2 Coefficients: 2	Ethical and deontological dimension (Foundations)	IST 1.7	1	1	1h30			10:30 p.m.		100%
	Foreign language 1 (French or English)	IST 1.8	1	1		1h30		10:30 p.m.	100%	
Total Hourly Volume for semester 1			**30**	**19**	**9:00 a.m.**	**1:30 p.m.**	**6:00 a.m.**	**427h30**		

Annex to Order No. of
setting the program of Common Core lessons with a view to obtaining the State Engineer diploma (specific to TM baccalaureate holders) in the "Science and Technology" field,Civil engineering sector

Semester 2:

Teaching Units	Subject titles	Coded	Credits	Coefficients	Hourly volume Weekly			Half-yearly Hourly Volume (15 weeks)	Evaluation mode	
					Course	T.D.	TP		Continuous monitoring	Final exam
Fundamental EU Code: UEF.12.1 Credits: 10 Coefficients: 5	Analysis 2	IST 2.1	6	3	1h30	3:00 a.m.		67h30	40%	60%
	Algebra 2	IST 2.2	4	2	1h30	1h30		45:00	40%	60%
Fundamental EU Code: UEF.12.2 Credits: 14 Coefficients: 8	Electricity and Magnetism (Physics 2)	IST 2.3	7	4	1h30	3:00 a.m.	1h30	90:00	40% (20% TD + 20% TP)	60%
	Thermodynamics	IST 2.4	7	4	1h30	3:00 a.m.	1h30	90:00	40% (20% TD + 20% TP)	60%
Methodological EU Code: UEM.12 Credits: 4 Coefficients: 4	Technical drawing	IST 2.5	2	2			3:00 a.m.	45:00	100%	
	Programming (Computer Science 2)	IST 2.6	2	2			3:00 a.m.	45:00	100%	
Transversal EU Code: UET.12 Credits: 1 Coefficients: 1	Foreign language 2 (English)	IST 2.7	1	1		1h30		10:30 p.m.	100%	
EU Discovery Code: UED.12 Credits: 1 Coefficients: 1	Engineering professions	IST 2.8	1	1	1h30			10:30 p.m.		100%
Total Hourly Volume for semester 2			**30**	**19**	**7:30 a.m.**	**12:00 p.m.**	**9:00 a.m.**	**427h30**		

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Semester 3:

Teaching units	Materials	Coded	Credits	Coefficients	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Evaluation mode	
	Titled				Course	T.D.	TP		Continuous monitoring	Final exam
Fundamental EU Code: UEF 3.1 Credits: 15 Coefficients: 8	Applied mathematics	GC3.1	6	3	1h30	3:00 a.m.		67h30	40%	60%
	Waves and vibrations	GC3.2	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
Fundamental EU Code: UEF 3.2 Credits: 9 Coefficients: 5	Material resistance 1	GC3.3	6	3	1h30	3:00 a.m.		67h30	40%	60%
	Building materials 1	GC3.4	3	2	1h30		1h30	45:00	40%	60%
	Fluid mechanics	GC3.5	4	2	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
Methodological EU Code: UEM 3.1 Credits: 3 Coefficients: 3	Computer science 3	GC3.6	2	2	1h30		1h30	45:00	40%	60%
EU Discovery Code: UED3.1 Credits: 2 Coefficients: 2	General construction processes	GC3.7	1	1	1h30			10:30 p.m.		100%
	Geology	GC3.8	1	1	1h30			10:30 p.m.		100%

Transversal EU Code: UET 3.1 Credits: 1 Coefficients: 1	Technical English	GC3.9	1	1		1h30		10:30 p.m.	40%	60%
Total Hourly Volume for semester 3			**30**	**19**	**12:00 p.m.**	**10:30 a.m.**	**6:00 a.m.**	**427h30**		

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Semester 4:

Units teaching	**Materials**	**Coded**	**Credits**	**Coefficients**	**Weekly hourly volume**			**Half-yearly Hourly Volume (15 weeks)**	**Evaluation mode**	
	Titled				**Course**	**T.D.**	**TP**		**Continuous monitoring**	**Final exam**
Fundamental EU Code: UEF 4.1 Credits: 15 Coefficients: 8	Soil mechanics 1	GC4.1	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
	Reinforced concrete 1	GC4.2	6	3	1h30	3:00 a.m.		67h30	40%	60%
	Material resistance 2	GC4.3	5	3	1h30	1h30	1h30	45:00	40% (20% TD + 20% TP)	100%
Fundamental EU Code: UEF 4.2 Credits: 9 Coefficients: 5	Topography 1	GC4.4	3	2	1h30		1h30	67h30	40% (20% TD + 20% TP)	60%
	General hydraulics	GC4.5	4	2	1h30	1h30		45:00	40%	60%
	Metal frame 1	GC4.6	2	1	1h30			10:30 p.m.		100%
Methodological EU	Numerical methods	GC4.7	3	3	1h30		1h30	45:00	40%	60%

Code: UEM 4.1 **Credits: 4** **Coefficients: 4**	Computer-aided drawing	GC4.8	1	1			1h30	10:30 p.m.	100%	
EU Discovery **Code: UED4.1** **Credits: 1** **Coefficients: 1**	Standards and regulations	GC4.9	1	1	1h30			10:30 p.m.		100%
Transversal EU **Code: UET 4.1** **Credits: 1** **Coefficients: 1**	Information, expression and communication techniques	GC4.10	1	1	1h30			10:30 p.m.		100%
Total Hourly Volume for semester 4			**30**	**19**	**1:30 p.m.**	**7:30 a.m.**	**7:30 a.m.**	**427h30**		

- Detailed program by subject for semester 1

Semester: 1
Teaching unit: UEF 1.1
Subject 1: Analysis 1
VHS: 67h30 (Class: 1h30, tutorial: 3h00)
Credits: 6
Coefficient: 3

Teaching objectives:

The objective of this course is to make a transition between the knowledge in analysis accumulated in high school and the bases which will form one of the pillars in the training in mathematical analysis of the license. Given that recruitment in the first year of analysis will be reserved only for holders of a technical mathematical baccalaureate, it seems quite wise to start by recalling the elementary notions which will be used throughout this course, so as not to lose anyone along the way.

Recommended prior knowledge

Elementary High School Mathematics

Content of the material:

Chapter 1: Properties of the set R (03 weeks)

1. Increased, reduced and bounded part.
2. Maximum element, minimum element.
3. Upper terminal, lower terminal.
4. Absolute value, integer part.

Chapter 2: Real numerical sequences (04 weeks)

1. Convergent sequences.
2. Comparison theorems.
3. Monotone convergence theorem.
4. Extracted sequences.
5. Adjoining suites.
6. Particular sequences (arithmetic, geometric, recurring)

Chapter 3: Functions of a real variable (04 weeks)

1. Definitions (monotony, parity, periodicity)
2. Limitations:
3. Continuity
4. Derivability

Chapter 4: Usual functions (04 weeks)

1. Reciprocal circular functions.
2. Hyperbolic functions.
3. Reciprocal hyperbolic functions.

Evaluation method:

Written quizzes, homework, final exam

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. Piskounov, Differential and integral calculus, Volume 1, Moscow edition
6- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.
7- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.
8- J. Quinet, Elementary course of higher mathematics 2- Usual functions, Dunod.
9- J. Quinet, Elementary course of higher mathematics 1- Algebra, Dunod.
10- J. Rivaud, Algebra: Preparatory classes and University Volume 1, Exercises with solutions, Vuibert.

Semester: 1
Teaching unit: UEF 1.1
Subject 2: Algebra 1
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

-Ensure the progressivity of the transition to higher education, taking into account the high school programs, of which it consolidates and broadens the acquired knowledge;
- Consolidate the training of students in the areas of logic, reasoning and calculation techniques which are essential tools in both mathematics and scientific disciplines and an introduction to algebraic structures.
- Present rich new concepts, so as to arouse the interest of students

Recommended prior knowledge

Basic Mathematics

Content of the material:

Chapter 0: Reminder chapter (02 weeks)

This essential chapter will allow students to upgrade their knowledge.

1. Polynomial equations and inequalities of degree greater than or equal to 2.
2. Rational equations and inequalities.
3. Equations and inequalities with radicals.
4. Trigonometric equations and inequalities.
5. Systems of nonlinear equations.

Chapter 1: Methods of reasoning (02 week).

1. Direct reasoning.
2. Reasoning by contraposition.
3. Reasoning through the absurd.
4. Reasoning by a counterexample
5. Reasoning by induction.

Chapter 2: Binary relationships and applications (04 weeks)

1. Binary relations: Definitions (binary relation and its properties), Order relation, Equivalence relation
2. Functions and applications, Definitions (function, domain of definition, application, compound), Direct image and reciprocal image of a set, Injection, surjection, bijection and reciprocal application

Chapter 3: Algebraic structures (02 weeks)

1. Definitions (internal decomposition law and its properties).
2. Groups, subgroup and group morphism.
3. Rings and bodies.

Chapter 4: Complex number bodies (02 weeks)

1. Definition of a complex number as a pair of real numbers

2. Presentations of a complex number: Algebraic presentation, Trigonometric presentation and Moivre formula, Geometric presentation, Exponential presentation (application: linearization of cosp.sinq)
3. Roots of a complex number: Square roots and solving the equation
az2 + bz + c = 0, Nth roots of a complex number

Evaluation method:
Written quizzes, homework, final exam

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. Piskounov, Differential and integral calculus, Volume 1, Moscow edition
6- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.
7- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.
8- J. Quinet, Elementary course of higher mathematics 2- Usual functions, Dunod.
9- J. Quinet, Elementary course of higher mathematics 1- Algebra, Dunod.
10- J. Rivaud, Algebra: Preparatory classes and University Volume 1, Exercises with solutions, Vuibert.

Semester: 1
Teaching unit: UEF 1.2
Subject 1: Elements of Chemistry
VHS: 90h00 (Class: 1h30, TD: 3h00, TP: 1h30)
Credits:7
Coefficient:4

Teaching objectives

The teaching of this subject allows the student to acquire basic formalisms in chemistry, particularly within the subject describing the atom, the chemical elements and the periodic table with energy quantification.Make students better able to solve general chemistry problems.

Recommended prior knowledge

Basic notions of mathematics and physics.

Content of the material:

Chapter 1: Fundamentals (3 weeks):

I. Definition of Matter
II. Changes in the state of matter
III. Classification of matter
IV. Concept of atom, molecules, mole and Avogadro number
V. Law of conservation of mass (Lavoisier), chemical reaction
VI. Qualitative and quantitative aspect of the material

Chapter 2: Structure of the atom (3 weeks):

I. Electron: Evidence: Experiment of JJ Thomson, Properties of cathode rays
II. Core:Highlighted: Rutherford's experiment, Constitution of the atomic nucleus
III. Identification of elements: Representation, Atomic mass, Relative atomic mass

Chapter 3: Radioactivity (3 weeks):

I. Natural radioactivity
II. Artificial radioactivity and nuclear reactions: Nuclear fission, Nuclear fusion, Transmutation
III. Kinetics of radioactive decay: Radioactive decay law: Activity of a radioactive nucleus, Radioactive half-life or half-life time

Chapter 4: Electronic structure of the atom (4 weeks):

I. Production of atomic emission spectra
II. Electromagnetic radiation
III. The theory of photons: Emission spectrum of the hydrogen atom, Empirical relation of Balmer-Rydberg
IV. Bohr model
V. Energy of the electron in a stationary orbit

Chapter 5: Periodic classification of the elements (2 weeks):

I. Description of Mendeleev's periodic table: Characteristics of some families, Periodicity of properties

Practical work “Structure of matter”

TP No. 1: Preliminary practical work: Safety in the chemistry laboratory and description of equipment and glassware.
TP No. 2: Change of state of water: Transition from liquid state to solid state and from liquid state to vapor state.

TP No. 3: Determination of the quantity of material.
TP No. 4: Determination of molecular mass.
TP No. 5: Calculation of uncertainties - Determination of the ionic radius
TP No. 6: Determination of partial molar volumes in a binary solution.
TP No. 7: Qualitative Analysis of Cations (1er, 2th, 3thand 4thband).
TP No. 8: Qualitative analysis of Anions.
TP No. 9: Identification of metal ions by the flame method
TP No. 10: Separation and recrystallization of benzoic acid.
TP No. 11: Construction and study of some compact structures.
TP No. 12: Study of ionic structures

Evaluation method:
Written quizzes, homework, final exam

Bibliographic references
1. Ouahes, Devallez, General Chemistry, OPU.
2. SS Zumdhal et al., 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: UEF 1.2
Subject 2: Elements of Mechanics
VHS: 90h00 (Class: 1h30, TD: 3h00, TP: 1h30)
Credits:7
Coefficient:4

Teaching objectives

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

Recommended prior knowledge

Basic concepts of mathematics and physics.

Material content:

Math reminders (2 weeks)

1- Equations with dimensions

2-Vector calculation: scalar product (norm), vector product, functions with several variables, derivation. Vector analysis: gradient, rotational operators, etc.

Chapter 1. Cinematic (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 the different coordinate systems. 4- Relative movement.

Chapter 2. Dynamics: (4 weeks)

1- Generality: Mass - Force - Moment of force – Absolute and Galilean Reference. 2- Newton's laws. 3- Principle of conservation of momentum. 4- Differential equation of motion. 5- Kinetic 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.

Practical work:

- Measurement and calculations of uncertainties - Free fall - Inclined plane - Circular movement - Simple pendulum - Oscillating pendulum - Solid-solid friction

Evaluation method:

Written quizzes, homework, final exam

Bibliographic references:

1.A.Gibaud,Mr. Henry;Physics course - Mechanics of the point - Courses 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: UEM 1.1
Subject 1: Probability and Statistics
VHS: 45h00 (Class: 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 over a finite universe and random variables.

Recommended prior knowledge

The basics of programming acquired in Math 1 and Math 2

Content of the material:

Part A: Statistics

Chapter 1: Basic Definitions (1 week)

A.1.1 Concepts of population, sample, variables, modalities
A.1.2 Different types of statistical variables: qualitative, quantitative, discrete, continuous.

Chapter 2: One-variable statistical series (3 weeks)

A.2.1 Number, Frequency, Percentage.
A.2.2 Cumulative number, Cumulative frequency.
A.2.3 Graphical representations: bar chart, circular chart, bar chart. Polygon of numbers (and frequencies). Histogram. Cumulative curves.
A.2.4 Position characteristics
A.2.5 Dispersion characteristics: extent, variance and standard deviation, coefficient of variation.
A.2.6 Shape characteristics.

Chapter 3: Statistical series in two variables (3 weeks)

A.3.1 Data tables (contingency table). A cloud of dots.
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 fit.

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 (2 weeks)

B.2.1 Algebra of events
B.2.2 Definitions
B.2.3 Probabilized spaces
B.2.4 General probability theorems

Chapter 3: Conditioning and independence (1 week)

B.3.1 Packaging,
B.3.2 Independence,
B.3.3 Bayes formula.

Chapter 4: Random variables (1 week)

B.4.1 Definitions and properties,
B.4.2 Distribution function,
B.4.3 Mathematical expectation,
B.4.4 Covariance and moments.

Chapter 5: Usual discrete probability laws (1 week)

Bernoulli, binomial, Poisson, ...

Chapter 6: Usual continuous probability laws (2 weeks)

Uniform, normal, exponential,...

Evaluation method:

Written questions, homework, final exam.

Bibliographic references:

[1] Pierre Dagnelie. Theoretical and applied statistics. De BoeckUniversity, 1998.
[2] Rick Durrett. Elementary probability for applications. Cambridge University Press, 2009.
[3] Richard Arnold Johnson and Gouri K. Bhattacharyya. Statistics: principles and methods. Wiley, 1996.
[4] Aurelio Mattei. Statistical inference and decision: theory and application to business management. P. Lang, 2000.
[5] Sheldon M. Ross. Introduction to probability. French-speaking polytechnic and university presses, 2007.
[6] Gilbert Saporta. Probability, data analysis and statistics. Technip, 1990

Semester 1
Teaching unit: UEM 1.1
Subject 2: Structure of computers and applications
VHS: 45h00 (TP: 3h00)
Credits: 2
Coefficient: 2

Teaching objectives:
The objective of the subject is to allow students to learn to program with an advanced language (PYTHON). The notion of algorithm must be taken care of implicitly during language learning.

Recommended prior knowledge
Basics of web technology

Content of the material:

Part 1. Introduction to Computer Science (2 weeks)

1- Definition of IT
3- Information coding systems
4- Operating principle of a computer

Part 2. Notions of algorithm and program (13 Weeks)

1- Concept of an algorithm/program (1 Week)
2- The approach and analysis of a problem (2 Weeks)
3- Data structure: Constants and variables, Data types (1 Week)
4- Operators: assignment operator, Relational operators, Logical operators, Arithmetic operations, Priorities in operations (1 Weeks)
5- Entry/exit operations (2 Weeks)
6- Control structures: Conditional control structures, Repetitive control structures (3 Weeks)
7- functions/modules: (3 Weeks)
Predefined modules, import and use
Function types (built-in, user), function declaration, function callbacks Local variables, global variables, docstring…..

Practical work:
The objective of the practical exercises is to illustrate the concepts taught during the course. These must begin with lessons according to the following schedule:

- Practical initiation and familiarization with the computing machine from a hardware and operating systems 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 the application of programming techniques seen in class.

Evaluation method:
Written quizzes, homework, final exam

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.
4- H. Bhasin PYTHON BASICS, , Virginia Boston, Massachusetts 2019

5- Joe THOMSON: Python's Companion the Most Complete Step-by-Step Guide to Python Programming 2016

Semester 1
Teaching unit: UET 1.1
Subject 1:Ethical dimension and professional conduct (The foundations)
VHS: 10:30 p.m. (class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

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

Recommended prior knowledge:

None

Content of the material:

I. Fundamentals –مفاهم أساسية (2 weeks)

Definitions:

1. Moral:
2. Ethics:
3. Ethics "Theory of Duty":
4. The law:
5. Distinction between the different notions
   - A. Distinction between ethics and morality
   - B. Distinction between ethics and professional conduct

II. The Repositories –المرجعيات (2 weeks)

Philosophical references
The religious reference
The evolution of civilizations
The institutional reference

III.The University Franchise –الحرم الجامعي (3 weeks)

The Concept of University Franchises
Regulatory texts
University Franchise Royalties
University campus actors

IV. University Values –القيم الجامعية (2 weeks)

Social Values
Community Values
Professional Values

V. Rights and Duties (2 weeks)

Student Rights
Student homework
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 relationships
Student – student relations
Student – Staff Relations
Student Relations – Association Members

VII. Practices (2 weeks)
Good practices For the teacher
Good practices For the student

Evaluation method:

Questions, homework, final exam

Bibliographic references

1. Collection of ethics and professional conduct courses from Algerian universities.
2. BARBERI (J.-F.), 'Morality and corporate law',*Small Posters,*No. 68, June 7, 1995.
3. J.Russ,*Contemporary ethical thought*, Paris, poof,*What do I know?*1995.
4. LEGAULT, GA, Professionalism and ethical deliberation, Quebec, Presses de l'Université du Québec, 2003.
5. SIROUX, D., 'Deontology', in M. Canto-Sperber (dir.), Dictionary of ethics and moral philosophy, Paris, Quadrige, 2004.
6. Prairat, E. (2009). Teaching professions in the age of ethics. Education and Societies, 23.
7. https://elearning.univannaba.dz/pluginfile.php/39773/mod_resource/content/1/Cours%20Ethique%20et%20la%20d%C3%A9ontologie.pdf.

Semester 1
Teaching unit: UET1.1
Subject 2: Foreign language 1
VHS: 10:30 p.m. (Class: 1h30)
Credits:1
Coefficient:1

Teaching objectives:
The aim is to develop the following four skills in this subject: Oral comprehension, Written comprehension, Oral expression and Written expression through reading and studying texts.

Recommended prior knowledge:
Basic French.

Content of the material:
We offer below a set of themes that deal with fundamental sciences, technologies, economics, social facts, communication, sport, health, etc. The teacher can choose from this list of texts to develop them during the course. Otherwise, he is free to address other themes of his 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 to develop their linguistic skills: listening, comprehension, oral and written expression. In addition, he must use this text to identify the grammatical structures that he will develop during the same class session. We recall here, by way of illustration, a set of grammatical structures which 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 can be detailed.

Examples of themes	Grammatical structures
Climate change	The punctuation. Proper nouns, Articles.
Pollution	Grammatical functions: The noun, The verb, The pronouns,
The electric car	The adjective, The adverb.
The robots	The complement pronoun ''the, the, the, him, their, y, en,
Artificial Intelligence	me, te,...''
Nobel prize	Agreements.
Olympic Games	The negative sentence. Don't... don't, Don't... yet, Don't...
Sports at school	again, Don't... ever, Don't... not,...
The Sahara	The interrogative sentence. Question with ''Who, What,
The currency	What'', Question with ''When, Where, How Much, Why,
The line work	How, Which, Which''.
Ecology	The exclamatory sentence.
Nanotechnologies	Reflexive verbs. Impersonal verbs.
The optical fiber	The tenses of the indicative, Present, Future, past perfect,
The profession of engineer	simple past, Imperfect.
The power plant	…
Energetic efficiency	
The smart building	
Wind energy	
Solar energy	

Evaluation method:

Questions, homework, final exam

Bibliographic references:

1. M. Badefort, Objective: International French Test, Edulang, 2006.
2. O. Bertrand, I. Schaffner, Succeed in the TCF, Exercises and training activities, 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. M. 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, Presses de l'Université du Québec, 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, Abridged Rules of Grammar and Spelling, Presses de l'Université du Québec, 2001.
12. J.-P. Colin, Simply French, Eyrolles, 2010.
13. Collective, French assessment test, Hachette, 2001.
14. Y. Delatour et al., Practical French grammar in 80 sheets with corrected exercises, Hachette, 2000.
15. Ch. Descotes et al., L'Exercisier: French expression for the intermediate level, Presses Universitaires de Grenoble, 1993.
16. H. Jaraush, C. Tufts, Sur le Vif, HeinleCengage Learning, 2011.

- Detailed programs by subject for semester 2

Semester 2
Teaching unit: UEF 2.1
Subject 1:Analysis 2
VHS: 90h00 (Class: 1h30, tutorial: 3h00)

Credits:6
Coefficient:3

Teaching objectives

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

Recommended prior knowledge

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

Content of the material:

Chapter 1: Limited developments (04 weeks)

1. Comparison relationships
2. Developments limited to the neighborhood of zero2.1 Definitions of a DL and the Taylor-Lagrange theorem2.2 Usual limited expansions2.3 Operations on DLs
3. DL in the neighborhood of a point, in the neighborhood of the in…ni and generalized DL
4. Applications of DL (calculation of limits, tangent and asymptote equations)

Chapter 2: Calculation of primitives (05 weeks)

1. Definitions and properties (primitive, integral and definite integral)
2. Integration methods
   Integration by parts
   Integration by change of variable
3. Integration of a rational fraction
4. Integration of a rational fraction in sin and cos
5. Integration of a rational fraction into exponential
6. Integration of a rational in sin(h) with fraction cos(h)

Chapter 3: Differential equations (03 weeks)

1. Definitions
2. First order differential equations.2.1 Differential equations with separable variables.2.2 Linear differential equations.2.3 Bernoulli differential equations.2.4 Homogeneous differential equations with respect to x and y:
3. Second order linear differential equations with constant coefficients.

Evaluation method:

Written questions, homework, final exam.

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. Piskounov, Differential and integral calculus, Volume 1, Moscow edition
6- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.
7- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.
8- J. Quinet, Elementary course of higher mathematics 2- Usual functions, Dunod.
9- J. Quinet, Elementary course of higher mathematics 1- Algebra, Dunod.
10- J. Rivaud, Algebra: Preparatory classes and University Volume 1, Exercises with solutions, Vuibert.

Semester 2
Teaching unit: UEF 2.1
Subject 2:Algebra 2
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits:4
Coefficient:2

Teaching objectives

The program is organized around two objectives:
- Study of fundamental concepts relating to finite-dimensional vector spaces such as base, dimension, rank, and teach the student the scaling process which will be very useful later.
-Acquire the necessary knowledge concerning linear applications, their matrix representations, pass matrices, the calculation of determinants, the characteristic polynomial and the eigenvalues of a matrix, the diagonalization and trigonalization of a matrix and the reduction of quadratic forms .

Recommended prior knowledge

Algebra1 Basics

Content of the material:

Chapter 1: Vector spaces and linear applications (04 weeks)

I Vector spaces, vector subspaces.
- I.1 Definitions
- I.2 Free families, generating families and bases

II Linear applications
- II.1 Definitions
- II.2 Rank theorem

Chapter 2: Matrix calculation (04 weeks)

1. Definitions (matrix, particular matrices, matrix associated with a linear application).
2. Operations on matrices.
3. Invertible matrices.
4. Determinant of a square matrix.
5. Determining the inverse of an invertible matrix
   - 5.1 Method of determinants
   - 5.2 Pivot or stagger method
6. Rank of a matrix

Chapter 3: Systems of linear equations (04 weeks)

1. Definitions (system of linear equations, associated matrix)
2. Solving a system of linear equations2.1 case where the associated matrix is invertible2.2 case where the associated matrix is not invertible

Evaluation method:

Written questions, homework, final exam.

Bibliographic references

1- A. Kurosh: Higher algebra course. MIR MOSCOW Edition.
2- D. Fadeev and I. Sominsky: Collection of exercises in higher algebra. MIR MOSCOW Edition.
3- J. Rivaud: Exercises with solutions volume 1 VUIBERT.
4- J. Rivaud: Exercises with solutions volume 2 VUIBERT.
5- Jean-Pierre Escofier: All the algebra of the license. Courses and corrected exercises. Dunod.
6- J.Lelong-Ferrand, JMArnaudiès: Mathematics lessons. Volume 1 Algebra 3rd edition. Preparatory classes for 1st university cycle. Dunod.
7- A. Doneddu: Algebra and Geometry 7 Special mathematics First university cycle. VUIBERT.
8- COLLET Valérie: MATHS Throughout the second year. Ellipses

Semester 2
Teaching unit: UEF 2.2
Subject 1: Electricity and Magnetism
VHS: 90h00 (Class: 1h30, TD: 3h00, TP: 1h30)
Credits:7
Coefficient:4

Teaching objectives

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

Recommended prior knowledge
Mathematics, Physics.

Content of the material:
Mathematical reminders:(1 week)
1- Elements of length, surface, volume in Cartesian, cylindrical, spherical coordinate systems. Solid angle,The 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 flow. 5- Gauss's theorem. 6- Conductors in balance. 7- Electrostatic pressure. 8- Capacity of a conductor and a capacitor.

Chapter II. Electrokinetics:(4 weeks)
1- Electrical conductor. 2- Ohm's law. 3- Joule's law. 4- Electric 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, Ampère'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 magnetic fieldpermanent), FLorentz gold,FLaplace orce, Faraday's law, Lenz's law, Application to coupled circuits.

Content of Practical Work:

5 manipulations at least (3h00 / 15 days)

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

Evaluation method:

Questions, homework, final exam

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 2.2
Subject 2: Thermodynamics
VHS: 90h00 (Class: 1h30, TD: 3h00, TP: 1h30)
Credits:7
Coefficient:4

Teaching objectives
Provide the necessary foundations of classical thermodynamics with a view to applications to combustion and thermal machines. Homogenize student knowledge. The skills to be understood 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.

Material content:

Chapter 1: General information on thermodynamics (3 weeks)

1-Fundamental properties of state functions. 2- Definitions of thermodynamic systems and the external environment. 3- Description of a thermodynamic system. 4- Evolution and states of thermodynamic equilibrium 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 ideal gas laws.

Chapter 2: The 1st principle of thermodynamics: (3 weeks)

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

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

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

Chapter 4: The 2nd law of thermodynamics (3 weeks)

1- The 2nd principle for a closed system. 2. Statement of the 2nd principle: Entropy of a closed isolated system. 3. calculation of the entropy variation: 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- Energy and free enthalpy. 3- Chemical balances

Content of the practicals:

1- Ideal gas law: verification of the Boyle-Mariotte law
Materials (*): Graduated glass tubes (Ø = 1.5 cm approx.) with tap, flexible hose, large ruler, mercury and supports.

2- Measurement of the coefficient ϒ = Cp/Cv: determination by the Clément –Désormés methodMaterials: carboy with tap, glass tubes (Ø= 3-5mm), flexible tubes, air pumps, U-shaped glass tubes, stopwatch, mercury, large graduated ruler, taps and supports.

3- Thermal expansion of solids
Materials: Tubes (steel, brass, copper, glass, etc.) L=65cm and Ø= 7mm, dial pyrometer, comparator, digital thermometers, flexible hose and circulation thermostat from 30 to 100°C.

4- Calorimetry: Measure the quantities of heat or thermal transfers between different bodies using several types of calorimetry (ice, resistance, etc.) Materials: Dewar vase with lid, copper shot, lead, glass, etc. (approx. 100 g of each), thermometers, balance, steam generator 220V/550W, beaker, calorimeter, heating set with lid and accessories, aluminum beaker, Bunsen burner, ice and supports.

5- Determination of latent heat of vaporization
Equipment: Devices for determining water vapor pressures (boiler), a 60 atm pressure gauge, a 0-250°C thermometer and a gas burner (Bunsen burner)

6- Calibration of a thermocouple (measurement of its thermoelectric power)
Materials: Wires (copper and constantin, two beakers, thermometers (0-100°C) digital microvoltmeter, a gas burner, ice and a candle.

7- Propagation of heat in a cylindrical metal bar Materials: Metal tubes l = 1.5 m and Ø = 2 cm, digital thermometers, stopwatch, tubular oven and supports.

8- Heat transport: thermal convection Materials: Thermosiphon, Bunsen burner, powdered coloring and supports.
9- Thermal insulation
Materials: Heat chamber with accessories.
10- Kinetic theory of gases: variation of the volume of gases as a function of pressure at constant temperature (Boyle-Mariotte law).

Evaluation method:
Written quizzes, homework, final exam

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

Semester 2
Teaching unit: UEM2.1
Subject 1: Technical Drawing
VHS: 45h00 (TP: 3h00)
Credits:2
Coefficient:2

Course description and objectives:
Introduction to technical drawing, standards and conventions, reading plans. Introduction to 3D drawing and modeling of mechanical parts. Introduction to engineering design techniques and problem solving through drawing.

Prerequisites: Basic geometric shapes

The content of the material:

Chapter 1: Technical drawing

1.1 General Introduction
1.2 Scriptures
1.3 Presentations of the drawings
1.4 Features
1.5 Scales

Chapter 02: Geometric plots

2.1 Intersections
2.2 Connections

Chapter 03: Descriptive geometry

3.1 Point projection
3.2 Projection of a line on a plane
    3.2.1 Straight line parallel to the plane
    3.2.2 Straight line perpendicular to the plane
3.3 Projection of a surface onto a plane
    3.3.1 Surface parallel to the plane
    3.3.2 Surface inclined relative to the plane
    3.3.3 Surface perpendicular to the plane

Chapter 04: orthogonal projections

4.1 Projection of prismatic parts
4.2 Projection of cylindrical parts
4.3 Projection of conical parts
4.4 Projections of mixed pieces

Chapter 05: Perspective drawing

5.1 Cavalier perspectives
5.2 Isometric perspectives

Chapter 06: Quotes

6.1 General listing rules
6.2 Applications

Chapter 07: Sections and cuts

7.1 Simple cuts
7.2 Output sections
7.3 Folded sections

Chapter 08: Assembly drawings

8.1 Definition
8.2 Applications
8.3 Definition drawings of component parts

Evaluation method:

Written quizzes, homework, final exam

Bibliographic references:

1- Giesecke, Mitchell, Spencer, Hill, Dygdon and Novak, Technical Drawing, 12th edition, 2003, ISBN 0-13-008183-3
2- A. Chevalier; Industrial designer's guide. Technical hatchet; Paris, 2011.
3- A. Rcordeau, C. Corbet; Construction technology file; Casteilla; Paris, 2001

4- A.Ricordeau; Descriptive geometry applied to drawing; Casteilla; Paris, 2009

Semester 2
Teaching unit: UEM2.1
Subject 1: Programming (Computer Science 2)
VHS: 45h00 (TP: 3h00)
Credits:2
Coefficient:2

Teaching objectives:

Master basic programming and algorithmic techniques. Acquire the fundamental concepts of computer science. The skills to be acquired are: Programming with a certain autonomy; The design of 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: Indicated Variables (7 Weeks)

1-List: operations on lists, slicing….etc.

2- lists to implement vectors and matrices,

3-Introduction andarray of nympy (Ndarray vs List)

a- One-dimensional arrays: vector (1darray): Representation in memory, Operations on vectors

b- Two-dimensional tables; Matrix (2darray): Representation in memory, Operations on matrices

Chapter 2: Matrices and linear algebra: (4 Weeks)

Introduction to numpy. linalg: Matrix calculation: Determinant, trace; inverse, vector and eigenvalues, system of linear equations….etc

Chapter 3: Files (4 Weeks)

1- File access modes

2- Reading and writing to a text/binary file

3- The concept of context manager in files

4- Reading and writing csv files

Computer science lab 2:

- Plan a certain number of practical exercises to concretize the programming techniques seen during the course.
- Practical work on the application of programming techniques seen in class.

Evaluation method:

Written quizzes, homework, final exam

Bibliographic references:

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

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

1- Algorithms: Basic notions Book by Thomas H. Cormen 2013.

2- Joe THOMSON: Python's CompanionThe Most Complete Step-by-Step Guide to PythonProgramming 2016

3- Tim Hall and JP Stacey: Python 3 for Absolute Beginners 2009

Semester 2
Teaching unit: UED2.1
Subject 1: Engineering professions
VHS: 10:30 p.m. (class: 1h30)
Credits:1
Coefficient:1

Goals :

Introduce the student, in a first step, to all the sectors covered by the Field of Sciences and Technologies and in a second step a range of professions leading to these sectors. In the same context, this subject introduces the new challenges of sustainable development as well as the new professions that can result from them.

Content of the subject:

1. What are engineering sciences?

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

2. Electronics, Telecommunications, Biomedical Engineering, Electrotechnics, Electromechanics, Optics & Precision Mechanics sectors:

- Definitions, fields 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 , Electricity production plants, Energy efficiency, Maintenance of industrial equipment, Elevators, Wind turbines, etc.
- Role of the specialist in these areas.

3. Automation and Industrial Engineering sectors:

- 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:

- Definitions, Pharmaceutical industry, Food industry, Leather and textile industry, Biotechnologies, Chemical and petrochemical industry, Plastics industry, Energy sector (oil, gas), …
- Role of the specialist in these areas.

1. Industrial Hygiene and Safety (HSI) and Mining Engineering sectors:

- Definitions and areas of application (Security of goods and people, Environmental problems, Exploration and exploitation of mineral resources, etc.)
- Role of the specialist in these areas.

2. Climate Engineering and Transport Engineering sectors- Definitions, areas of application (Air conditioning, Smart buildings, Transport security, 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, Large road and rail infrastructures, Bridges, Airports, Dams, Drinking water supply and Sanitation, Hydraulic flows, Water resources management, Public works and land use planning, Smart cities, …)
- Role of the specialist in these areas.

4. Aeronautics, Mechanical Engineering, Maritime Engineering and Metallurgy Sector:

- Definitions and fields of application (Aeronautics, Avionics, Automotive industry, Ports, Dykes, Production of industrial equipment, Steel industry, Metal processing, etc.)
- Role of the specialist in these areas.

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

Student's personal work for this subject:

The teacher responsible for this subject can let his students know that he can always evaluate them by offering to prepare job descriptions. Ask students to watch at home a popular science film related to the chosen profession (after having given them either the film on electronic media or having indicated to them the internet link to this film) and ask them to then submit a written report or to make an oral presentation of the summary of this film, etc. The improvement of these activities is left to the discretion of the teacher and the training team who are the only ones able to define the best way to take this personal work into account in the overall mark of the final exam.

Evaluation mode:

Continuous assessment, final exam,

Bibliographic references:

1- What jobs for tomorrow? Publisher: ONISEP, 2016, Collection: Les Dossiers.

2- J. Douënel and I. Sédès, Choosing a profession according to your profile, Editions d'Organization, 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- Jobs in the aeronautics and space industry, Collection: Course, Edition: ONISEP, 2017.
6- Electronics and robotics professions, Collection: Course, Edition: ONISEP, 2015.
7- Building and public works professions, Collection: Course, Edition: ONISEP, 2016.
9- Transport and logistics professions, Collection: Course, Edition: ONISEP, 2016.
9- Energy professions, Collection: Course, Edition: ONISEP, 2016.
10- Mechanical professions, Collection: Course, Edition: ONISEP, 2014.
11- Chemistry professions, Collection: Course, Edition: ONISEP, 2017.
12- Web professions, Collection: Course, Edition: ONISEP, 2015.

Semester 2
Teaching unit: UET2.1
Subject 2: Foreign language 1 (French or English)
VHS: 10:30 p.m. (class: 1h30)
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 readings:	**Examples of Word Study: Patterns**
Radioactivity.	Explanation of Cause
Chain Reaction.	Results
Reactor Cooling System.	Conditions (if), Conditions (Restrictive)
Conductor and Conductivity.	Eventuality
Induction Motors.	Manner
Electrolysis.	When, Once, If, etc. + Past Participle
Liquid Flow and Metering.	It is + Adjective + to
Liquid Pumps.	Ace
Petroleum.	It is + Adjective or Verb + that…
Road Foundations.	Similarity, Difference
Rigid Pavements.	In Spite of, Although
Batteries for Foundations.	Formation of Adjectives
Suspension Bridges.	Phrasal Verbs

Fashion rating:
Workhome, final Exam

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 of the press: Vocabulary and expressions of the economic, social and political world, Fernand Nathan, 2006.

Semester: 3
Teaching unit: UEF 3.1
Subject 1:Applied Mathematics
VHS: 45h00 (Class: 1h30, Tutorial: 3h00)
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 convergence conditions as well as the different types of convergence.

Recommended prior knowledge
Analysis 1 & 2 and Algebra 1 & 2

Content of the material:

Chapter 1: Simple and multiple integrals **3 weeks**

1.1 Reminders on the Riemann integral and on 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 weeks**

2.1 Integrals of functions defined on an unbounded interval.

2.2 Integrals of functions defined on a bounded interval, infinite at one of the ends.

Chapter 3: Differential equations **2 weeks**

3.1 Reminder 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 Integer series, Fourrier series.

Chapter 5: Fourier Transform **3 weeks**

5.1 Definition and properties. 5.2 Application to the resolution of differential equations.

Chapter 6: Laplace Transformation **2 weeks**

6.1 Definition and properties. 6.2 Application to the resolution of differential equations.

Evaluation mode:

Written questions, homework, final exam.

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. Piskounov, Differential and integral calculus, Volume 1, Moscow edition

6- J. Quinet, Elementary course of higher mathematics 3- Integral calculation and series, Dunod.

7- J. Quinet, Elementary course of higher mathematics 4- Differential equations, Dunod.

8- MR Spiegel, Laplace Transforms, Courses and problems, 450 Corrected exercises, McGraw-Hill.

Semester: 3
Teaching unit: UEF 3.1
Subject 2: Waves and vibrations
VHS: 67h30 (Class: 1h30, TD: 1h30, TP: 1h30)
Credits:5
Coefficient:3

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

Concepts of Mathematics and Physics of the 1st year

Content of the subject:

Part A: Vibration

Chapter 1: Introduction to Lagrange equations 2 weeks
Lagrange equations for a particle, Lagrange equations, Case of conservative systems, Case of friction forces depending on speed, Case of an external force depending on time, System with several degrees of freedom.

Chapter 2: Free oscillations of systems with one degree of freedom 2 weeks
Undamped oscillations, Free oscillations of damped systems

Chapter 3: Forced oscillations of systems with one degree of freedom 1 week
Differential equation, Mass-spring-damper system, Solution of the differential equation, Harmonic excitation, Periodic excitation, Mechanical impedance

Chapter 4: Free oscillations of systems with two degrees of freedom 1 week
Introduction, Systems with two degrees of freedom

Chapter 5: Forced oscillations of systems with two degrees of freedom 2 weeks
Lagrange equations, Mass-spring-damper system, Impedance, Applications, Generalization to systems with n degrees of freedom

Part B: Waves

Chapter 1: One-dimensional propagation phenomena 2 weeks
General information and basic definitions, Propagation equation, Solution of the propagation equation, Sinusoidal traveling wave, Superposition of two sinusoidal traveling waves

Chapter 2: Vibrating strings 2 weeks
Wave equation, Harmonic progressive waves, Free oscillations of a finite length string, Reflection and transmission

Chapter 3: Acoustic waves in fluids 1 week
Wave equation, Speed of sound, Sinusoidal traveling wave, Reflection-Transmission

Chapter 4: Electromagnetic waves 2 weeks
Wave equation, Reflection-Transmission, Different types of electromagnetic waves

Content of the TP:

TP1.Spring mass
TP2. Simple pendulum
TP3. Torsion pendulum
TP4. Oscillating electrical circuit in free and forced mode
TP5. Coupled pendulums
TP6. Transverse oscillations in vibrating strings
TP7. Groove pulley according to Hoffmann
TP8. Electromechanical systems (The electrodynamic loudspeaker)
TP9. Pohl's pendulum
TP10. Propagation of longitudinal waves in a fluid.

Evaluation mode:
Written questions, homework, final exam.

Bibliographic references:

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

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

Semester: 3
Teaching unit: UEF 3.1
Subject 1: Strength of materials I
VHS: 67h30 (Class: 1h30, tutorial: 3h00)
Credits: 6
Coefficient: 3

Teaching objectives:

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

Recommended prior knowledge:

Rational mechanics and analysis of functions.

Content of the material:

Chapter 1. Introduction and general information (2 weeks)

Goals and hypotheses of the resistance of materials, Different types of loading, Connections (supports, embeddings, hinges), General principle of balance -Equations of balance, Method of sections -Notion 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 straight section, Transformation of moments of inertia. Central principal axes, principal moments of inertia.

Chapter 3. Simple traction and compressionsimple (3 weeks)

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

Chapter 4. Simple bending (4 weeks)

Definitions and hypotheses, Shear force, Bending moments, Differential relationship between the 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 the tangential stress.

Chapter 5. Shear (2 weeks)

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

Chapter 6. Twist (2 weeks)

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

Evaluation method:

Continuous Control: 40%; Exam: 60%.

Bibliographic references:

1. F. Beer, Mechanics for engineers – statics, McGraw-Hill, 1981.
2. G. Pissarenko et all, Material resistance cheat sheet.
3. I. Mirolioubov et al, “Problems of resistance of materials”, Moscow Editions.
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, Editions MIR; Moscow, 1986.
7. S. Timoshenko, Resistance of materials, Dunod, 1986.
8. William and Nash, Strength of materials, course and problem, Schaum series, 1983.

Semester:3
Teaching unit: UEF 3.1
Subject 2: Building materials 1
VHS: 45h00 (Class: 1h30, 1h30 TP)
Credits: 3
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

All fundamental subjects of the common core S1 and S2.

Content of the material:

Chapter 1: General (2 weeks)

History of construction materials, Classification of construction materials, Properties of construction materials.

Chapter 2: Aggregates (4 weeks)

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

Chapter 3: Binders (6 weeks)

Classification, Aerial binders (aerial 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.

Practical work:

TP1: Densities of cement, sand and gravel
TP2: Particle size analysis of sand and gravel
TP3: Water content and abundance of sand
TP4: Porosity of sand and gravel
TP5: Volumetric coefficient of gravel
TP6: Equivalent of sand
TP7: Cement consistency and setting test

Evaluation method:

Examination: 60%, continuous assessment: 40%

Bibliographic references:

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

Semester: 3
Teaching unit: UEF 3.2
Subject 2: Fluid mechanics1
VHS: 67h30 (Class: 1h30, TD: 1h30, TP: 1h30)
Credits:5
Coefficient:3

Teaching objective:

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 which will be studied.

Recommended prior knowledge:

Content of the material:

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

1. Physical definition of a fluid: States of matter, divided matter (dispersion suspensions, emulsions)
2. Perfect fluid, real fluid, compressible fluid and incompressible fluid.
3. Density, density
4. Rheology of a fluid, Viscosity of fluids, surface tension of a fluid

Chapter 2: Fluid Statics **4 weeks**

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

Chapter 3 Dynamics of Perfect Incompressible Fluids **4 weeks**

1. Permanent flow
2. Continuity equation
3. Mass flow and volume flow
4. Bernouilli's theorem, cases without work exchange and with work exchange
5. Applications to flow and speed measurements: Venturi, Diaphragms, Pitot tubes, etc.
6. Euler's theorem

Chapter 4: Dynamics of real incompressible fluids **4 weeks**

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

Practical work:

- Viscometer
- Determination of linear and singular pressure losses
- Flow measurement
- Water hammer and mass oscillations
- Verification of Bernoulli's theorem
- Jet Impact
- Flow through an orifice
- Visualization of flows around an obstacle
- Determination of Reynolds number: Laminar and turbulent flow

Evaluation mode:

Written quizzes, homework, final exam

Bibliographic references:

1- Fundamentals of fluidmechanics 6th Edition, 2009,BR Munson, DF Young TH Okiishi, WW Huebsch6th Edition John Wiley & Sons
2- Fluid mechanics,YA Cengel- 2010 - Tata McGraw-Hill Education
3- Fluid Mechanics Frank M. White Fourth Edition 2003 McGraw-Hill
4- Fluid mechanics and hydraulics 2nd edition, Ronald v. Giles, Jack B Evett, Cheng Liu, McGraw-Hill
5- S. Amiroudine,JL Battaglia**,** 'Fluid mechanics Courses and corrected exercises'Ed. Dunod
6- R. Comolet, 'Experimental fluid mechanics', Volume 1, 2 and 3, Ed. Masson et Cie.
7- R. Ouziaux, 'Applied fluid mechanics', Ed. Dunod, 1978

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

Semester: 3
Teaching unit: UEM 3.1
Subject 1: Computer science3
VHS: 45h00 (Class: 1h30, TP: 1h30)
Credits: 2
Coefficient: 2

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 digital methods in S4.

Recommended prior knowledge:
The basics of programming acquired in computer science 1 and 2.

Content of the subject:

TP 1: Presentation of a scientific programming environment(1 week)

(Matlab, Scilab, etc.)

Lab 2: Script Files and Types of Data and Variables (2 weeks)

TP 3: Reading, displaying and saving data (2 weeks)

TP 4: Vectors and matrices (2 weeks)

TP 5: Control instructions (for and while loops, if and switch instructions)(2 weeks)

Lab 6: Function files (2 weeks)

TP 7: Graphics (Management of graphic windows, plot) (2 weeks)

TP 8: Using toolbox (2 weeks)

Evaluation mode:
Written questions, homework, final exam.

Bibliographic references:

1. Jean-Pierre Grenier,Getting started in algorithms with MATLAB and SCILAB,Ellipses,2007.
2. Laurent Berger, Scilab from theory to practice, 2014.
3. Bégyn Arnaud, Gras Hervé, Grenier Jean-Pierre, Programming and simulation in Scilab, 2014.
4. Thierry Audibert,Amar Oussalah,Maurice Nivat, Computer science: Programming and scientific calculation in Python and Scilab scientific preparatory classes 1st and 2nd years, Ellipses, 2010.

Semester: 3
Teaching unit: UED 3.1
Subject 1: General construction processes
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

GoalsEducation:

This subject aims to present to students the technical and technological aspects of the most used construction operation and focused mainly on the construction and the construction site.
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Recommended prior knowledge:
Subjects taught in semesters 2 and 3.

Content of the material:

Chapter 1: Definitions of steel and concrete materials for construction (3 weeks)

Chapter 2: Concrete structures (4 weeks)
Earthworks and embankments, Techniques for creating foundations, Formwork and reinforcement for building structures, Methods for constructing piers of engineering structures,
Construction of concrete work decks: on fixed arch, self-launching arch, by pushing and by successive cantilevers.

Chapter 3: Metal and mixed structures (4 weeks)
Welding and bolting, Assemblies of metal structures in buildings and industrial halls, Installation of metal decks: launching and assemblies of successive sections, Construction of composite decks: connection and control of deformation of the slab.

Chapter 4: Construction site technologies (4 weeks)
Buildings, Bridges and viaducts, Dams, Tunnels

Fashionevaluation:
Review: 100%

Bibliographic references:

1. General construction processes Volume 1: Formwork and concreting, J. MATHIVAT and C.BOITEAU. ENPC, Eyrolles
2. 2. General construction processes Volume 2: Foundation and structures. MATHIVAT and FENOUX. ENPC, Eyrolles
3. General construction processes Volume 3: Underground Works, J. MATHIVAT and JFBOUGARD. ENPC, Eyrolles

Semester: 3
Teaching unit: UED 3.1
Subject 2: Geology
VHS: 10:30 p.m. (Class: 1h30)
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

Content of the subject:
Chapter 1: Introduction to geology (2 weeks)
- 1.1 Definition of Geology
- 1.2 Paleontology
- 1.3 Origin of the earth
- 1.4 Geology Division

Chapter 2: Minerals and rocks (4 weeks)
- 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 weeks)

3.1 Action of air on rocks
3.2 Action of water on rocks
3.3 Action of glaciers on rocks

Chapter 4: Concept of geodynamics (3 weeks)

4.1 Internal geodynamics (earthquakes, volcanoes, etc.)
4.2 External geodynamics (Alteration, Erosion, Falls and Sliding, etc.)

Chapter 5: Adaptation of geological techniques to the needs of civil engineering**(3 weeks)**

5.1 Geological cartography
5.2 The use of graphic constructions
5.3 Geological survey of discontinuity surfaces
5.4 Use of stereographic projection

Evaluation method:

Review: 100%.

References:

1. Hydrogeology and notions of engineering geology,G. BOGOMOLOV
2.Geology: Basics for the engineer, Aurèle Parriauxand Marcel Arnould, 2009
3.Engineering geology. Bilingual French/English, Roger CojeanAndMartine Audiguier, 2011
4. Hydrogeology, engineering geology, Éditions du BRGM, 1984.
Faucault A.Raoult JF (1995) – Dictionary of geology, 4 edition. Editions Masson, 325p
5. Pomerol C., Lagabrielle Y., Renard M. (2005) – Elements of Geology, 13th edition. Editions Dunod, 762p

Semester: 3
Teaching unit: UET 3.1
Subject 1: Technical English
VHS: 10:30 p.m. (TD: 1:30 a.m.)
Credits:1
Coefficient:1

Course description and objectives:

This is about refreshing and consolidating the basic levelstudentsin English in order to fmake friendswith scientific and technical subjects taught in this language (in oral or written form) and also to improve their in-depth understanding. This will allow them to confront and apply their learning to everyday situations by providing them with acomplete education. This training therefore offers them the opportunity to reach the intermediate levelwhich corresponds to levels B1 and B2. The latter follows the elementary level and precedes the operational level defined by the Common European Framework of Reference for Languages (CEFR).

Prerequisites: Basic knowledge required

The content of the material:

Chapter 1.Phonetics:

1. Pronunciation of the final (ed)

2. Silent letters: definition, spelling + pronunciation of each letter

Chapter 2. General Grammar:

1- Tenses

Simple present

Simple past

Simple future

Present continuous

Present perfect

Past perfect

2- Modals

eg: can, may, should, must…

3- Reported speech

4- Using English:

To compare

To define

To report

Chapter 3. Texts and Activities:

Activities, scientific or technical texts are included progressively, in which we focus on the application of the previous lessons.

3.1- Writing a Report in English

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

3.2- Oral presentation in English

Communication, Preparation of an oral presentation

Workshopsof the material" English language " :

English lessons can be recorded on video for distribution on different platforms (Moodle, YouTube channels,streaming media…..) or by sharing on different computer media for students who do not have access to an internet connection.The teacher responsible for this subject must organize a face-to-face workshop every weekmade up of two groups of students with compulsory attendance.

The workshops allow students to improve their communication in English, put into practice the skills they have acquired and strengthen their vocabulary. Additionally, these workshops help students improve their understandingin a communicative way. They will start according to this schedule:

- **Reading Workshop**:develop students' pronunciation (correct articulation, correct placement of accent, etc.),strengthening vocabulary and text comprehension
- **Oral Expression Workshop**: work on phonetics and pronunciation, learning to communicate in a professional environment, polite expressions, knowing how to listen and identify key sentences, knowing how to reformulate.Encourage student interaction, promote students' ability to express their ideas, and attitudes in a communicative manner
- **WorkshopWritten expression**:Strengthen student fluency through vocabulary and grammar practice(consolidation of basic grammatical knowledge and revision of tenses, exercises in writing

professional documents and note-taking….) writing emails/cards/…, Writing announcements and television commercials…

Evaluation method:

Written questions, homework

References:

1. Common European Framework of Reference for Languages: Learning, Teaching, Assessment - Companion volume (2020)

2. English Profile Introducing the CEFR for English (UCLES/CUP 2011)

3. CEFR-informed Learning, Teaching and Assessment: A Practical Guide (2020)

Semester: 4
Teaching unit: UEF 4.1
Subject 1: Soil mechanics 1
VHS: 45h00 (Class: 1h30, TD: 1h30, TP: 1h30)
Credits: 5
Coefficient: 3

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, 2 and 3

Material content:

Chapter 1. Introduction to soil mechanics (2 weeks)

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

Chapter 2. Soil identification and classification (4 weeks)

Physical characteristics, Particle size 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 equipment and processes, Compaction requirements and control.

Chapter 4: Water in the ground (5 weeks)

Water flow in soils: speed, gradient, flow, Darcy's law, permeability,

Measurement of permeability in the laboratory and in-situ, Principle of effective stress, Study of flow networks.

Practical work:

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

Evaluation method:

Continuous Control: 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 in soil mechanics, Volume 1, Dunod, 1983.
3. AMAR S. and MAGNAN JP "Soil mechanics tests in the laboratory and in place," published by LCPC, 1980.
4. SCHLOSSER F. "Elements of soil mechanics, 2nd Ed., Presses de l'ENPC", 1997.

Semester: 4
Teaching unit: UEF 4.1
Material 2: Reinforced concrete 1
VHS: 67h30 (Class: 1h30, tutorial: 3h00)
Credits: 6
Coefficient: 3

Teaching objectives:

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

Recommended prior knowledge:

Resistance of materials 1, Building materials.

Material content:

Chapter 1. Formulation and mechanical properties of reinforced concrete **(2 weeks)**
Definition and generalities, Constituents of reinforced concrete, Mechanical properties.

Chapter 2. Regulatory requirements **(3 weeks)**
Rule of pivots, Limit states, Combinations of actions, Condition of non-fragility

Chapter 3. Adhesion and anchoring **(3 weeks)**
Adhesion stress, Anchoring of a straight insulated bar, Anchoring by curvature, Covering

Chapter 4. Simple Compression **(4 weeks)**
Ultimate resistance limit state, service limit state

Chapter5. Single pull **(3 weeks)**
Ultimate resistance limit state, service limit state

Evaluation method:

Continuous Control: 40%; Exam: 60%.

Bibliographic references:

1. DTR-BC2-41, “Design and calculation rules for 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: 4
Teaching unit: UEF 4.1
Subject 3:Material resistance 2
VHS: 67h30 (Class: 1h30, TD: 1h30, TP: 1h30)
Credits: 5
Coefficient: 3

Teaching objectives:

This subject constitutes a continuation of the Resistance of materials taught in the fourth semester, we will approach compound stresses, energy methods and hyperstatic systems.

Recommended prior knowledge:

RDM 1, materials science, Mathematics.

Content of the material:

Chapter 1: Plane bending of symmetrical beams – reminder (2 weeks)

- Bending moment reminder – 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 constant section beams
- Initial Parameters Method
- Moment of area methods
- Overlay method

Chapter 3: General theorems of elastic systems (Applications) (3 weeks)

- Tensile elastic strain energy
- Elastic deformation energy in torsion
- Elastic deformation energy in shear
- Elastic deformation energy in bending
- General expression of elastic strain energy
- Castigliano's theorem
- Generalized fictitious force method

Chapter 4: compound requests (3 weeks)

- General
- Deflected bending (general, constraints, deformations)
- Compound Flexion
- Bending – twisting

Chapter5:Resolution of hyperstatic systems (4 weeks)

- General (bar systems, nodes, joints, frames, portals, etc.)
- Initial Parameters Method
- Force effects superposition method
- Method of 3-moment equations
- Forces method

Chapter 6: Sizing examples -Applications (1 week)

Practical work :

TP No. 1. Tensile – simple compression tests
TP No. 2. Torsion test
TP No. 3. Simple bending test
TP No. 4. Resilience test
TP No. 5. Hardness test

Evaluation method: Continuous monitoring: 40%; Examination: 60%.

Bibliographic references:

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

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

Semester: 4
Teaching unit: UEF 4.2
Subject 2: Topography 1
VHS: 10:30 p.m. (Class: 1h30, practical work: 1h30)
Credits: 3
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

Mathematics ; Physics 1; Technical drawing

Content of the material:

Chapter 1. General **(3 weeks)**

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

Chapter 2. Measuring distances **(3 weeks)**

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

Chapter 3. Measuring 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 area of a polygon, Determination of the areas of the contours represented on the plan, Planimeter and measurement of areas.

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

Direct Leveling, Indirect Leveling.

Practical work

TP.1: Measuring angles and distances

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

TP.2: Polygonation

Recognition of locations, Choice of stations, Location sketch, Measurements (Angles and distances), Calculations and report

TP.3: Tacheometry

Establishment of the field sketch, Detail survey by radiation, Calculations and report

TP.4: Survey by abscissa and ordinate and quasi-ordinate

Choice of operation lines, Measurements, Calculations and reporting

TP.5: Lateral oblique measurements

Establishment of the field sketch, Detail survey by radiation, Calculations and report

TP.6: Implementation

Implementation of alignments: Preliminary calculations (Office), Implementation on the ground, Implementation of a bend, Preliminary calculations (Office), Implementation on the ground, Implementation of a building.

Evaluation method:

Review: 100%.

Bibliographic references:

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

2. Bouquillard, Topography Course BepTech.geo T1, 2006
3. Dubois, F. and Dupont, G. (1998) precise 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, Specialty Topography.

Semester: 4
Teaching unit: UEF 4.2
Subject 2:General hydraulics
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives

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

Recommended prior knowledge:

Fluid mechanics

Material content:

Chapter 1. Hydrostatics **(2 weeks)**
- Physical characteristic 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)**
- Current lines, current tube.
- Continuity equation
- BERNOULLI's theorem
- VENTURI phenomenon
- PITOT tube

Chapter 3. Dynamics of real liquids **(3 weeks)**
- Flow of liquids
- Load losses
- Generalized BERNOULLI theorem
- Energy diagram

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

Chapter 5. Flow through orifices **(2 weeks)**
- Flow through the Orifices
- Flow under constant load
- Flow under variable load

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

Evaluation method:

Review: 100%.

Bibliographic references

1. "Fluid mechanics and hydraulics (courses and problems)" Schaum series.
2. Armando Lencastre, "General hydraulics", Edition: Eyrolles.
3. Michel Carlier, "General and applied hydraulics", Edition: Eyrolles.

Semester: 4
Teaching unit: UEF 4.2
Material 3: Metal framework
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

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 on the sizing philosophy and operation of assemblies.

Recommended prior knowledge:

Applied mathematics, rational mechanics, Resistance of materials 1.

Content of the material:

Chapter 1. General **(1 week)**

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

Chapter 2. Basics and security **(3 weeks)**

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

Chapter 3. Assemblies **(4 weeks)**

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

Chapter 4. Calculation of parts loaded in simple traction **(3 weeks)**

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

Chapter 5. Calculation of deflected parts **(4 weeks)**

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

Evaluation mode:

Continuous monitoring: 40%; Examination: 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 4
Teaching unit: UEM4.1
Subject 1:Numerical methods
VHS: 45h00 (Class: 1h30, TP: 1h30)
Credits:2
Coefficient:2

Teaching objectives:

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

Recommended prior knowledge:

Math1, Math2, Computer Science1 and Computer Science 2

Content of the material:

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

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

Chapter 2: Polynomial interpolation (2 weeks)

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

Chapter 3 Function Approximation: (2 weeks)

1. Approximation method and root mean square.
2. Orthogonal or pseudo-Orthogonal systems. Approximation by orthogonal polynomials

3. Trigonometric approximation

Chapter 4: Digital integration (2 weeks)

1. General introduction,
2. Trapezoid method,
3. Simpson method,
4. Quadrature formulas.

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

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

Chapter 6: Direct solution method for systems of linear equations (2 weeks)

1. Introduction and definitions,
2. Gauss method and rotation,
3. LU factorization method,
4. ChoeleskiMMt factorization method,
5. Thomas algorithm (TDMA) for three-diagonal systems.

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

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

Content of the practical work:

1. Solving nonlinear equations
   1.1. Bisection method
   1.2. Fixed point method
   1.3. Newton–Raphson method

2. Interpolation and approximation
    2.1. Newton interpolation
    2.2. Chebyshev approximation
3. Digital integrations
    3.1. Rectangle Method
    3.2. Trapeze method
    3.3. Simpson method

4. Differential equations
    4.1. Euler's method
    4.2. Runge-Kutta methods

5. Systems of linear equations
    5.1. Gauss-Jordon method
    5.2. Crout decomposition and LU factorization
    5.3. Jacobi method
    5.4. Gauss-Seidel method

Evaluation method:
Written questions, homework, final exam.

Bibliographic references:

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

Semester 4

Teaching unit: UEM4.1
Subject 2: Computer-aided drawing
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits:1
Coefficient:1

Teaching objectives

This teaching will allow students to acquire the principles of representing parts in industrial drawing. Even more, this subject will allow the student to represent and read the plans.

Recommended prior knowledge

Technical drawing

Content of the material:

Chapter 0: Reminders on technical drawing (3 weeks)

1- Sectional views
2- Developments and intersections
3- Assembled drawing
4- Geometric plots and connections
5- Cups

Chapter 1: PRESENTATION OF THE CHOSEN SOFTWARE (2 weeks)
(SolidWorks, Autocad, Catia, Inventor, etc..)

1.1 Introduction and history of the DAO
1.2 Configuration of the chosen software
1.3 Software reference elements (software help, tutorials, etc.)
1.4 Saving files (part file, assembly file, drawing file, saving procedure for delivery to the teacher)
1.5 Communication and interdependence between files.

Chapter2: CONCEPT OF SKETCHES (3 weeks)

2.1 Sketching tools (point, line segment, arc, circle, ellipse, polygon, etc.);
2.2 Sketch relationships (horizontal, vertical, equal, parallel, hilly, fixed, etc.);
2.3 Dimensions of sketches and geometric constraints.
2.4 3d modeling (1st part)

Chapter 3. 3D MODELING (3 weeks)

3.1 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 (Delete, Shift, Copy, Mirror, Adjust, Extend, Move)
3.6 Creating a sectional view of the model.

Chapter 4: PLANNING THE 3D MODEL (2 weeks)

4.1 Editing the plan and the title block
4.2 Choice of views and drawing
4.3 Object Skins and Properties (Thehatching, dimensioning, text, tables, etc.

Chapter5: ASSEMBLY (2 weeks)

5.1 Assembly constraints (parallel, coincidence, coaxial, fixed, etc.):
5.2 Creation of assembly drawings
5.3 Assembly drawing and part nomenclature
1. Exploded view.

Evaluation method:

Questions, homework, final exam

Bibliographic references:

1- Solidworks bible 2013 Matt Lombard, Wiley Edition.
2- Technical drawing, Saint-Laurent, GIESECKE, Frederick E. Éditions du renouveau pedagogical Inc., 1982.
3- Drawing exercises for mechanical parts and assemblies with SolidWorks software, Jean Louis Berthéol, François Mendes.
4- CAD accessible to all with SolidWorks: from creation to production volume 1 Pascal Rétif.
5- Industrial designer's guide, Chevalier A, Edition Hachette Technique.

Semester: 4
Teaching unit: UED 4.1
Standards and regulations
VHS: 10:30 p.m. (class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

This course should allow the student to discover the different standards and regulations applied in the field of civil engineering.

Recommended prior knowledge:

Requires knowledge of RDM, structural calculation and reinforced concrete

Content of the material:

Chapter 1: General and Necessity of Regulation (1 week)
Chapter 2: Introduction to the different regulations (2 weeks)
General information on regulations, Presentation of NA (IANOR) and DTR standards, Eurocodes
Chapter 3: Action of wind and snow (3 weeks)
Overall action of the wind on the construction; Calculation bases
According to Algerian regulation NV 99 (DTR C.2-4.7)
Chapter 4: The seismic calculation rules RPA 99 version 2003 (4 weeks)
Seismic design, calculation methods (static method and dynamic method, seismic actions)
Chapter 5: Action of wind and snow according to Eurocodes (3 weeks)
Overall action of wind and snow on the construction; Calculation bases;
Snow and wind rules NV 99 (Algerian)
Chapter 6: Action of fire (fire) on structures (2 weeks)

Evaluation method:

Review: 100%

Bibliographic references:

1. Algerian seismic rules RPA 99 version 2003. DTR –BC-2.48
2. Snow and wind regulations RNV 1999. DTR-C-2-4.7
3. Rules NV65 and N84 modified 95. Editions Eyrolles, 1998.
4. The Eurocodes.

Semester 4
Teaching unit: UET4.1
Subject 1: Information, expression and communication technology
VHS: 10:30 p.m. (Class: 1h30)
Credits:1
Coefficient:1

Teaching objectives:

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

Recommended prior knowledge:

Languages (Arabic; French; English)

Content of the material:

Chapter 1: Research, analyze and organize information (3 weeks)
Identify and use places, tools and documentary resources, Understand and analyze documents, Create and update documentation.

Chapter 2: Improving the ability to express (3 weeks)
Take into account the Communication situation, Produce a written message, Communicate orally, Produce a visual and audiovisual message.

Chapter 3: Improving communication ability in interaction situations

(3 weeks)
Analyze the Interpersonal communication process, Improve face-to-face communication ability, Improve group communication ability.

Chapter 4: Develop autonomy, organizational and communication skills within the framework of a project approach (6 weeks)
Position yourself in a project and communication approach, Anticipate action, Implement a project: Presentation of a report of practical work (homework).

Evaluation method:

Questions, homework, final exam

Bibliographic references:

1- Jean-Denis Commeignes 12 methods of written and oral communications – 4th edition, Michelle Fayet and Dunod 2013.
2- Denis Baril; Sirey, Techniques of written and oral expression; 2008.
3- Matthieu Dubost Improve your written and oral expression all the keys; Edition Ellipses 2014.