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

جامعة محمد خيضر
بسكرة
Mohamed University Khider of Biskra

TRAINING OFFER
LMD

ACADEMIC LICENSE

NATIONAL PROGRAM
2021–2022
(2thupdate)

Establishment	Faculty / Institute	Department
Mohamed Khider University of Biskra	***Faculty of Science and Technology***	***Civil and hydraulic engineering***

Domain	Sector	Speciality
Science and Technologies	***Public works***	***Public works***

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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
2022 - 2021

المؤسسة	الكلية /	القسم
جامعة محمد خيضر بسكرة	كلية العلوم والتكنولوجيا	الهندسة المدنية والري

الميدان	الفرع	التخصص
علوم وتكنولوجيا	اشغال عمومية	اشغال عمومية

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:

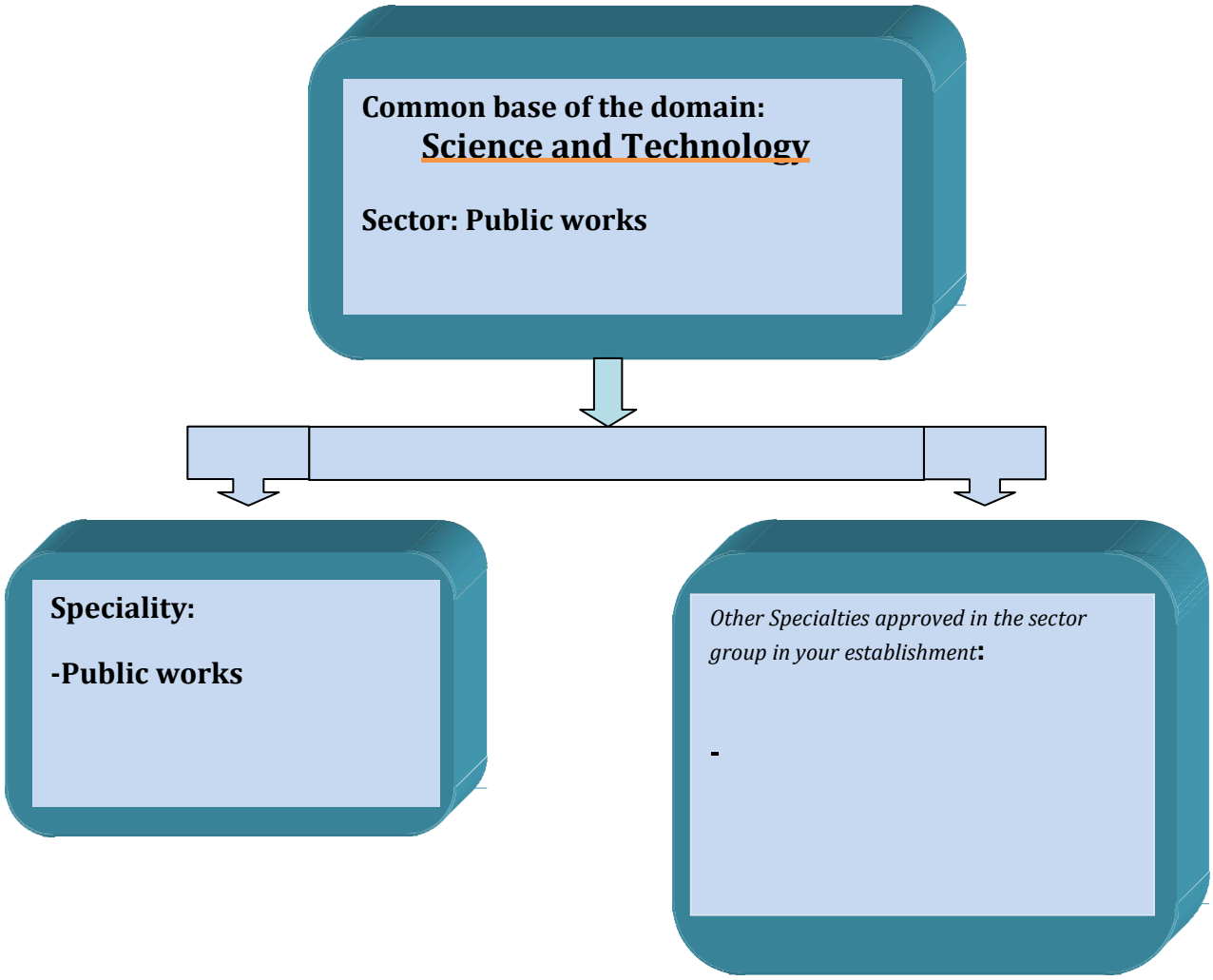
Businesses and other socio-economic partners:

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:

This training aims to provide students with versatile training in the Public Works sector (road and motorway infrastructure, railway network, port and airport infrastructure) which is experiencing considerable economic and social growth today, the result of a bold and sustainable development policy for the national territory. It also aims to ensure graduates have a certain socio-professional integration for the management of construction projects both in design offices and technical study laboratories as well as in public or private companies and administrations affiliated to the construction sector. Public Works. It also offers the possibility to students who have successfully completed their studies to continue their graduation studies to access the master's degree, or even post-graduation to access the doctoral degree in specific specialties.

The training is structured in 6 semesters, the first two of which (Common Core) concern all students in the Science and Technology field. The first year (semesters S1 and S2) is followed by two multidisciplinary semesters in Civil Engineering, Public Works and Hydraulics (semesters S3 and S4). During the third year, the student will receive specific training in the Public Works sector (semesters S5 and S6) allowing them to acquire knowledge in the field of road, rail, port and airport infrastructure.

C – Targeted profiles and skills:

The Public Works sector constitutes a promising niche in full technological evolution: new high-performance materials, new construction techniques and various construction methods, increasingly efficient design and calculation tools and an indisputable political will. This dynamic is amplified by an increased demand for various technical skills (design and management of projects, supervision of the implementation phases, decision-making, etc.). As such, the training in Public Works Degree supports these developments and contributes to sustainably supplying this sector with graduates capable of integrating into companies, into design or technical control offices and into local or local administrations. national organizations affiliated with it.

D – Regional and national employability potential:

Employability potential is numerous and varied. We mainly retain the following professions:

- ✓ Conduct of work in the public sector (local authorities, national administration);
- ✓ Design and calculation of works (design offices);
- ✓ Control and monitoring of works (control offices);
- ✓ Monitoring and execution of works (companies).

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

Sector group 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

Sector group 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

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

The 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 in 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 field at the end of semester 2.

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

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

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

F – Performance indicators expected from the training:

All training must meet the quality requirements of today and tomorrow. As such, to better assess the expected performance of the training offered on the one hand and by exploiting the flexibility and 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 degree as well as the assessments of university partners regarding the quality of graduates recruited and /or lessons 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. To do this, a report must be established, archived and 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 who have chosen this License (Supply/demand ratio).
- ✓ Rate and quality of students who 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.
- ✓ Rate of satisfaction of students on the lessons and THE methodsof teaching.

After the training:

- ✓ Student success rate per semester in this Degree.
- ✓ Student attrition rate (failures and withdrawals).
- ✓ Identification of the causes of student failure.
- ✓ Reorientation alternatives are offered to students in a situation of failure.
- ✓ Rate of students who graduate on time.
- ✓ Rate of students who 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 PWs carried out as well as the multiplication of the type of PWs per subject (diversity of PWs).
- ✓ 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 of indicators and methods 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 decree 712 of November 3, 2011, define and specify the modalities as well as the 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 to admit a real deficit in the effective management of this educational activity which required on our part a

serious reflection on this subject which, combined with proposals 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 for 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 PW. 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 PW:

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 them to prepare presentations, to make reports, to 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 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.

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 the series of exercises and Personnel work (duty to be exposed,...)	30%	06 points
Written questions (minimum 02 including one proposed by the teacher in charge of the subject)	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 a lever for success, is largely based on the personal work that they are required to do, by appropriating the resources and tools made available to them. 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)**

Laboratory title:

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 spaces and ICT available at department leveland the faculty:

II – Half-yearly organization sheets for teaching in the specialty

Semester 1

Teaching unit	Materials	Credits	Coefficient	Hourly volume weekly			Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode	
	Titles			**Course**	**TUTO**	**PW**			**Continuous monitoring**	**Exam**
Fundamental TU Code: FTU 1.1 Credits: 18 Coefficients: 9	Mathematics 1	6	3	3h00	1h30		67h30	82h30	40%	60%
	Physics 1	6	3	3h00	1h30		67h30	82h30	40%	60%
	Structure of matter	6	3	3h00	1h30		67h30	82h30	40%	60%
TU Methodological Code: MTU 1.1 Credits: 9 Coefficients: 5	PW Physics 1	2	1			1h30	22h00	27h30	100%	
	PW Chemistry 1	2	1			1h30	22h00	27h30	100%	
	Computer science 1	4	2	1h30		1h30	45h00	55h00	40%	60%
	Methodology of the writing	1	1	1h00			15h00	10h00		100%
UE Discovery Code: DTU 1.1 Credits: 1 Coefficients: 1	Careers in Science and Technology 1	1	1	1h30			22h00	02h30		100%
TU Transversal Code: TTU 1.1 Credits: 2 Coefficients: 2	Ethical and deontological dimension (the foundations)	1	1	1h30			22h00	02h30		100%
	Foreign language 1 (French or English)	1	1	1h30			22h00	02h30		100%
Total semester 1		**30**	**17**	**16h00**	**4h30**	**4h30**	**375h00**	**375h00**		

Semester 2

Teaching unit	Materials Titled	Credits	Coefficient	Hourly volume weekly			Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode	
				Course	**TUTO**	**PW**			**Control Continuous**	**Exam**
Fundamental TU Code: FTU 1.2 Credits: 18 Coefficients: 9	Mathematics 2	6	3	3h00	1h30		67h30	82h30	40%	60%
	Physics 2	6	3	3h00	1h30		67h30	82h30	40%	60%
	Thermodynamics	6	3	3h00	1h30		67h30	82h30	40%	60%
TU Methodological Code: MTU 1.2 Credits: 9 Coefficients: 5	PW Physics 2	2	1			1h30	22h00	27h30	100%	
	PW Chemistry 2	2	1			1h30	22h00	27h30	100%	
	Computer science 2	4	2	1h30		1h30	45h00	55h00	40%	60%
	Methodology of the presentation	1	1	1h00			15h00	10h00		100%
TU Discovery Code: DTU 1.2 Credits: 1 Coefficients: 1	Careers in science and technology 2	1	1	1h30			22h00	02h30		100%
Transversal TU Code: TTU 1.2 Credits: 2 Coefficients: 2	Foreign language 2 (French and/or English)	2	2	3h00			45h00	05h00		100%
Total semester 2		**30**	**17**	**16h00**	**4h30**	**4h30**	**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 mode	
	Titled			Course	TUTO	PW			Continuous monitoring	Exam
Fundamental TU Code: FTU 2.1.1 Credits: 10 Coefficients: 5	Mathematics 3	6	3	3h00	1h30		67h30	82h30	40%	60%
	Waves and vibrations	4	2	1h30	1h30		45h00	55h00	40%	60%
Fundamental TU Code: FTU 2.1.2 Credits: 8 Coefficients: 4	Fluid mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Rational mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
TU Methodological Code: MTU 2.1 Credits: 9 Coefficients: 5	Probability and statistics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Computer science 3	2	1			1h30	22h00	27h30	100%	
	Technical drawing	2	1			1h30	22h00	27h30	100%	
	PW Waves and vibrations	1	1			1h00	15h00	10h00	100%	
TU Discovery Code: DTU 2.1 Credits: 2 Coefficients: 2	Core technology	1	1	1h30			22h00	02h30		100%
	Metrology	1	1	1h30			22h00	02h30		100%
Transversal TU Code: TTU 2.1 Credits: 1 Coefficients: 1	Technical English	1	1	1h30			22h00	02h30		100%
Total semester 3		**30**	**17**	**13h30**	**7h30**	**4h00**	**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 mode	
				Course	TUTO	PW			Continuous monitoring	Exam
Fundamental TU Code: FTU 2.2.1 Credits: 6 Coefficients: 3	Soil Mecanics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Construction materials	2	1	1h30			22h00	27h30		100%
Fundamental TU Code: FTU 2.2.2 Credits: 8 Coefficients: 4	Mathematics 4	4	2	1h30	1h30		45h00	55h00	40%	60%
	Numerical methods	4	2	1h30	1h30		45h00	55h00	40%	60%
Fundamental TU Code: FTU 2.2.3 Credits: 4 Coefficients: 2	Strength of materials	4	2	1h30	1h30		45h00	55h00	40%	60%
TU Methodological Code: MTU 2.2 Credits: 9 Coefficients: 5	PW Soil mechanics	2	1			1h30	22h00	27h30	100%	
	PW construction materials	2	1			1h30	22h00	27h30	100%	
	Computer Assisted drawing	2	1			1h30	22h00	27h30	100%	
	PW Numerical methods	2	1			1h30	22h00	27h30	100%	
	PW Mechanics of fluids and Strength of Materials	1	1			1h00	15h00	10h00	100%	
TU Discovery Code: DTU 2.2 Credits: 2 Coefficients: 2	Geology	1	1	1h30			22h00	02h30		100%
	Topography	1	1	1h30			22h00	02h30		100%
Transversal TU Code: TTU 2.2 Credits: 1 Coefficients: 1	Expression, information and communication techniques	1	1	1h30			22h00	02h30		100%
Total semester 4		**30**	**17**	**12h00**	**6H00**	**7H00**	**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 mode	
	Titled			Course	TU TO	P W			Continuous monitoring	Exam
Fundamental TU Code: FTU 3.1.1 Credits: 12 Coefficients: 6	Beams and trellises	4	2	1h30	1h30		45h00	55h00	40%	60%
	Reinforced concrete	4	2	1h30	1h30		45h00	55h00	40%	60%
	Metallic structures	4	2	1h30	1h30		45h00	55h00	40%	60%
Fundamental TU Code: FTU 3.1.2 Credits: 6 Coefficients: 3	Roads 1	4	2	1h30	1h30		45h00	55h00	40%	60%
	Road materials	2	1	1h30			22h00	27h30		100%
TU Methodological Code: MTU 3.1 Credits: 9 Coefficients: 5	Applied technical drawing	3	2			2h30	37:30	37:30	100%	
	Road geotechnics	2	1			1h30	22h00	27h30	100%	
	Applied topography	4	2	1h30		1h30	45h00	55h00	40%	60%
TU Discovery Code: DTU 3.1 Credits: 2 Coefficients: 2	Rail infrastructure	1	1	1h30			22h00	02h30		100%
	Underground infrastructure	1	1	1h30			22h00	02h30		100%
Transversal TU Code: TTU 3.1 Credits: 1 Coefficients: 1	Public works machinery	1	1	1h30			22h00	02h30		100%
Total semester 5		**30**	**17**	**13h30**	**6H00**	**5H30**	**375h00**	**375h00**		

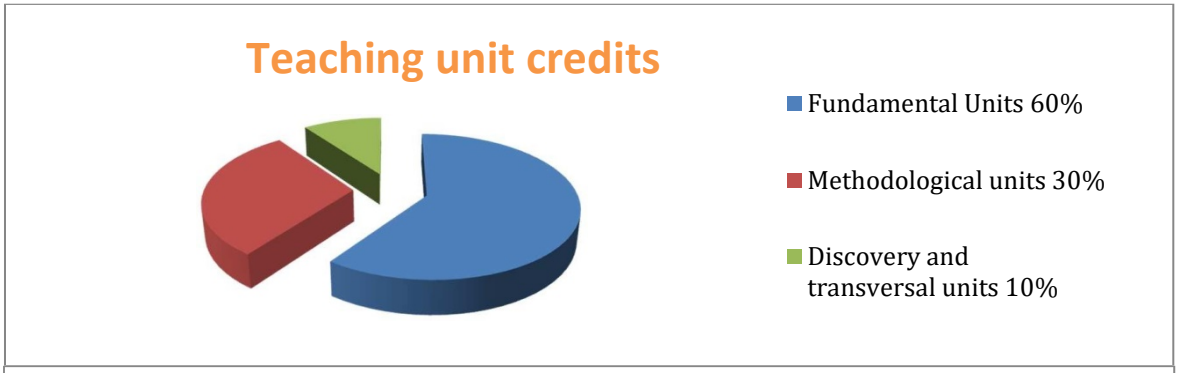
Semester 6

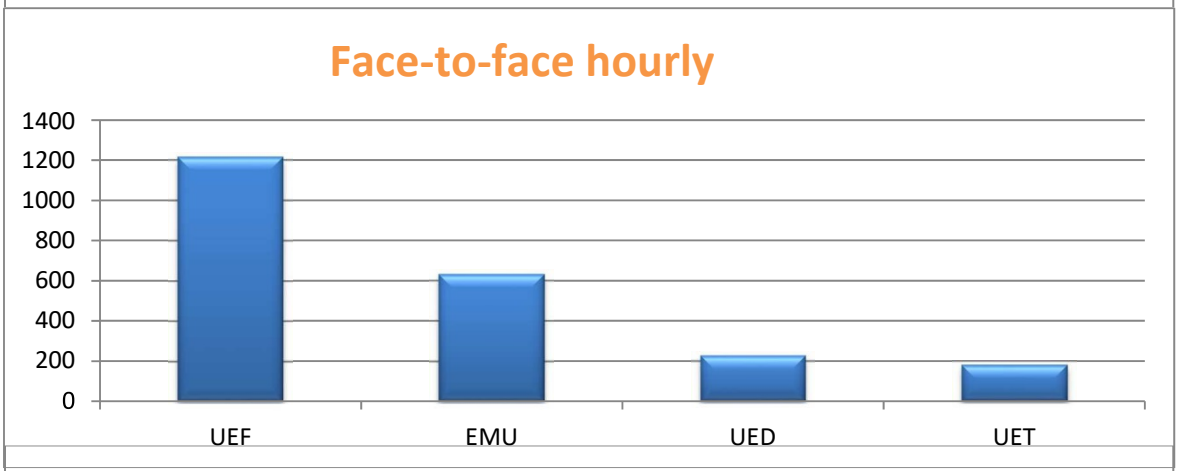
Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode	
	Titled			**Course**	**TUTO**	**PW**			**Continuous monitoring**	**Exam**
Fundamental TU Code: FTU 3.2.1 Credits: 10 Coefficients: 5	Reinforced and prestressed concrete	4	2	1h30	1h30		45h00	55h00	40%	60%
	Bridges	6	3	3h00	1h30		67h30	82h30	40%	60%
Fundamental TU Code: FTU 3.2.2 Credits: 8 Coefficients: 4	Foundations and earthworks	4	2	1h30	1h30		45h00	55h00	40%	60%
	Roads 2	4	2	1h30	1h30		45h00	55h00	40%	60%
TU Methodological Code: MTU 3.2 Credits: 9 Coefficients: 5	End of Cycle Project	4	2			3h00	45h00	55h00	100%	
	PW Road materials	3	2			2h30	37:30	37:30	100%	
	Geographic Information Systems	2	1	1h30			22h00	22h00		100%
TU Discovery Code: DTU 3.2 Credits: 2 Coefficients: 2	Notions about airport infrastructure	1	1	1h30			22h00	02h30		100%
	Applied hydraulics	1	1	1h30			22h00	02h30		100%
Transversal TU Code: TTU 3.2 Credits: 1 Coefficients: 1	Entrepreneurship and business management	1	1	1h30			22h00	02h30		100%
Total semester 6		**30**	**17**	**13h30**	**6H00**	**5H30**	**375h00**	**375h00**		

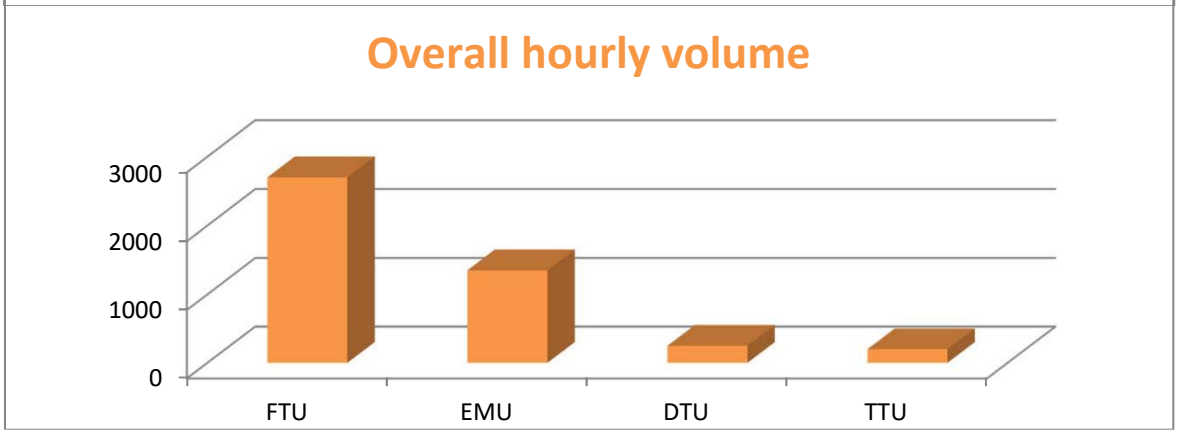
The evaluation methods presented in these tables are given for information purposes only; the establishment's training team may suggest other weightings.

Overall training summary :

TU V.H.	FTU	MTU	DTU	TTU	Total
Course	720h00	120h00	225h00	180h00	1245h00
TUTO	495h00	22h00	---	---	517h30
PW	---	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 TU	60%	30 %	10%		100%







III - Detailed program by subject

Semester: 1
Teaching unit: FTU 1.1 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

Basic notions of mathematics for Terminale 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: FTU 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. Cinematics (5 weeks)

1- Position vector in coordinate systems (Cartesian, cylindrical, spherical, curvilinear) - law of motion - Trajectory. 2- Velocity and acceleration in coordinate systems. 3- Applications: Movement of the material point in 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. A. Gibaud, M. 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: FTU 1.1 Subject 3:
Structure of the VHS subject: 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 proton, neutrons and electron), 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 (α, β and γ radiation), Artificial radioactivity and nuclear reactions, Kinetics of radioactive decay, Applications of radioactivity.

Chapter 4: Electronic structure of the atom (2 weeks)
Wave-particle duality, Interaction between light and matter, Bohr's atomic model: hydrogen atom, The hydrogen atom in wave mechanics, Poly electronic atoms in wave mechanics.

Chapter 5: Periodic classification of the 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, 3eedition, 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: MTU 1.1 Subject 1: TP Physics 1
VHS: 22h30 (PW: 1h30)
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 PW reports and calculating errors.
- Checking 2thNewton's law
- Free fall
- Simple pendulum
- Elastic collisions
- Inelastic collisions
- Moment of inertia
- Centrifugal force

Evaluation method:
Continuous control: 100%.

Semester: 1
Teaching unit: MTU 1.1 Subject 2: Chemistry PW 1
VHS: 22h30 (PW: 1h30)
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 meter.

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: MTU 1.1 Subject 3: Computer science 1
VHS: 45h00 (Class: 1h30, PW: 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 (10 Weeks)

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:
- Introductory and familiarization work 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:
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: MTU 1.1
Subject 4: Writing methodology
VHS: 15h:00 (Course: 1h00)
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, 3eedition, 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, 3eedition, Dunod, 2008.
7. E. Riondet, P. Lenormand, The big book of letter models, Eyrolles, 2012.
8. R. Barrass, Scientist must write – A guide to better writing for scientists, engineers and students, 2d edition, Routledge, 2002.
9. G. Andreani, The practice of correspondence, Hachette, 1995.
10. Ph. Rubens, Science & Technical Writing, A Manual of Style, 2d edition, Routledge, 2001.
11. A. Wallwork, User Guides, Manuals, and Technical Writing – A Guide to Professional English, Springer, 2014.

Semester: 1
Teaching unit: UED 1.1
Subject 1: Careers in Science and Technology 1
VHS: 22h30 (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 subject :

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, fields 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 industry, 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/eco-mobility, valorization of resources (water, metals and minerals, etc.), production

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

Student's personal work for this subject :

The teacher 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.

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/Discover-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 mode:

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: Parcours, Edition: ONISEP, 2017. 6- Jobs in electronics and robotics, Collection: Parcours, Edition: ONISEP, 2015.
7- Environmental and sustainable development professions, Collection: Course, Edition: ONISEP, 2015.
8- The construction and public works professions, Collection: Parcours, Edition: ONISEP, 2016. 9- The transport and logistics professions, Collection: Parcours, Edition: ONISEP, 2016.
10- Energy professions, Collection: Course, Edition: ONISEP, 2016.
11- The professions of mechanics, Collection: Parcours, Edition: ONISEP, 2014.
12- The professions of chemistry, Collection: Parcours, Edition: ONISEP, 2017.
13- Web professions, Collection: Course, Edition: ONISEP, 2015.
14- Biology professions, Collection: Course, Edition: ONISEP, 2016.

Semester: 1
Teaching unit: TTU 3.1
Subject: Ethical and deontological dimension (the foundations)
VHS: 22h30 (Course: 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 allows todevelop students' awareness of ethical principles. Introduce them to the rules that govern life at the 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 and explain to them the risks of moral evils such as corruption and how to combat them.

Recommended prior knowledge:

None

Material content:

I. Fundamentals –(2 weeks)

Definitions:

1. Moral :
2. Ethics :
3. Ethics "Theory of Duty":
4. The right :

5. Distinction between the different notions
   - A. Distinction between ethics and morality
   - B. Distinction between ethics and deontology

II. The Frameworks – (2 weeks)

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

III. The University Franchise –(3 weeks)

The Concept of University Franchises
Regulatory Texts
Royalties from university franchises
University campus stakeholders

IV. University Values – (2 weeks)

Social Values
Community Values
Professional Values

V. Rights and duties (2 weeks)

Student Rights Student
Duties Teacher Rights
Obligations of the professor-researcher
Obligations of administrative and technical staff

VI. University Relations (2 weeks) Definition of the concept of university relations Student-teacher relations
Student – student relations
Student – staff relations
Student Relations – Association Members

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

Bibliographic references

1. Collection of ethics and professional conduct courses from Algerian universities.
2. BARBERI (J.-F.), 'Morality and corporate law', Les Petites Boîtes, n° 68, June 7, 1995.
3. J. Russ, Contemporary ethical thought, Paris, puf, Que sais-je?, 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.univ-annaba.dz/pluginfile.php/39773/mod_resource/content/1/Cours%20Ethique%20et%20la%20d%C3%A9ontology.pdf.

Semester: 1
Teaching unit: TTU 1.1
Subject 1: French language1
VHS: 22h30 (Course: 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 Robots Artificial intelligence The Nobel Prize The Olympic Games Sport at school The Sahara Currency Assembly line work Ecology Nanotechnologies Optical fiber The profession of engineer The power plant Energy efficiency The intelligent 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,...'' The 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: TTU 1.1
Subject 1: English Language1
VHS: 22h30 (Course: 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	Make + Noun + Adjective
Heat Treatment of Steel.	Quantity, Contents
Lubrication of Bearings.	Enable, Allow, Make, etc. + Infinitive
The Lathe.	Comparative, Maximum and Minimum
Welding.	The Use of Will, Can and May
Steam Boilers.	Prevention, Protection, etc., Classification
Steam Locomotives.	The Impersonal Passive
Condensation and Condensers.	Passive Verb + By + Noun (agent)
Centrifugal Governors.	Too Much or Too Little
Impulse Turbines.	Instructions (Imperative)
The Petro Engine.	Requirements and Necessity
The Carburation System.	Means (by + Noun or –ing)
The Jet Engine.	Time Statements
The Turbo-Prop Engine.	Function, Duty
Aerofoil.	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: FTU 1.2
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)
3-1 Indefinite integral, property. 3-2 Integration of rational functions. 3-3 Integration of exponential and trigonometric functions. 3-4 The 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: FTU 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, 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 permanent magnetic field), Lorentz force, Laplace force, 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: FTU 1.2
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, the standard enthalpy of formation, the enthalpy of dissociation, the enthalpy of change of physical state, the enthalpy of a chemical reaction, Hess' 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: MTU 1.2
Subject 1: Physics PW 2
VHS: 45h00 (PW: 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: MTU 1.2
Subject 2: Chemistry PW 2
VHS: 22h30 (PW: 1h30)
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. Calorimeter water value.
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: MTU 1.2
Subject 3: Computer science 2
VHS: 45h00 (Class: 1h30, PW: 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 **(4 weeks)**1- One-dimensional arrays: Representation in memory, Operations on arrays 2- Two-dimensional arrays: Representation in memory, Operations on two-dimensional arrays

Chapter 2: Functions and procedures **(6 weeks)**

1- Functions: Types of functions, declaration of functions, function calls
2- Procedures: Concepts of global variables and local variables, simple procedure, procedure with arguments

Chapter 3: Recordings and files **(5 weeks)**

1- Heterogeneous data structure
2- Structure of a record (concept of fields) 3- Manipulation of record structures
4- File concept
5- File access methods
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.

- Practical work on the application 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: MTU 1.2
Subject 4: presentation methodology
VHS: 15h00 (Course: 1h00)
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, 3eedition, 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, Succeed 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: DTU 1.2
Subject 1: Careers in Science and Technology 2
VHS: 22h30 (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 subject :

1. Industrial Hygiene and Safety (HSI) and Mining Engineering sectors: (2 weeks)
- 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: (2 weeks)
- 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, etc.)
- Role of the specialist in these areas.

4. Aeronautics, Mechanical Engineering, Maritime Engineering and Metallurgy sectors: (2 weeks)
- Definitions and fields 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. Measuring the sustainability of a process/product/service: (2 weeks) Environmental analysis, Life cycle analysis (LCA), Carbon footprint, case studies/applications.

7. Sustainable development and business: (3 weeks) Definition of the 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)…), World rankings of the most sustainable companies (Dow Jones Sustainable Index, Global 100, etc.), Studies of

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

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
- Innovations mobility sustainable of band PSA : http://www.rapportannuel.groupe-psa.com/rapport-2015/engagements/dessolutions-innovantes-pour-des-transports-durables/

Evaluation mode:

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

Semester: 2
Teaching unit: TTU 1.2
Subject 1: French language 2
VHS: 22h30 (Course: 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
The pharmaceutical industry The food industry The national employment agency ANEM Sustainable development Renewable energies Biotechnology Stem cells Road safety Roadblocks 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 Advertising Autism	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. …

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: TTU 1.2
Subject 1: English Language 2
VHS: 22h30 (Course: 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:
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: FTU 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 **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 :

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: FTU 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 with one degree of freedom **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 excitement
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-shock absorber 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 Generalities 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 mode :
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.

7- H. Djelouah; Electromagnetism ; Office of University Publications, 2011..

Semester: 3
Teaching unit: FTU 2.1.2
Subject 1: Fluid mechanics
VHS: 45h00 (Course: 1h30, Tutorial:1h30)
Credits: 4
Coefficient: 2

Objective of teaching :

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.

Prior knowledge recommended :

Content of the subject :

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 in 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, tubes Pitot...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 mode :

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, McGraw 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: FTU 2.1.2
Subject 2: Rational mechanics
VHS: 45h00 (Course: 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 subject :

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 kinematic quantities for a material point.
4.2 Solid body kinematics
4.2.1 Translational movement
4.2.2 Rotational movement around a fixed axis
4.2.3 Plane movement
4.2.4 Compound movement.

Chapter 5. Mass geometry. (3 weeks)

5.1 Mass of a 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 center of mass formulation
5.2.3 GULDIN's theorems
5.3. Moment and product of inertia of solids
5.4. Inertia tensor of a solid
5.4.1 Special cases
5.42 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 about dynamic quantities for a material point.
6.2 Element of rigid body kinetics:
6.2.1 Amount of movement
6.2.2 Cinematic moment
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 Pure translation case
6.6.2 Case of rotation around a fixed axis
6.6.3 Combined case of translation and rotation

Evaluation mode :

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: MTU 2.1
Subject 1: Probability & Statistics
VHS: 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Subject objectives

This module allows students to see the essential notions of probability and statistics, namely: statistical series with one and two variables, probability 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 Notions 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 headcount, Cumulative frequency.
A.2.3 Graphical representations: bar chart, circular chart, bar chart. Polygon of numbers (and frequencies). Histogram. Cumulative curves.
A.2.4 Positional 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 Probable spaces
B.2.4 General probability theorems

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

B.3.1 Conditioning,
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 Expectation,
B.4.4 Covariance and moments.

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

Evaluation mode :

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: MTU 2.1
Subject 2: Computer science 3
VHS: 22h30 (PW: 1h30)
Credits: 2
Coefficient: 1

Subject objectives

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

Recommended prior knowledge

Computer science 1 and 2

Content of the subject :

PW 1: Presentation of a scientific programming environment	**(1 week)**
PW 2: Script files and Types of data and variables	**(2 weeks)**
PW 3: Reading, displaying and saving data	**(2 weeks)**
PW 4: Vectors and matrices	**(2 weeks)**
PW 5: Control Instructions (For and While Loops, If and Repeat Instructions)	**(2 weeks)**
PW 6: Function files	**(2 weeks)**
PW 7: Graphics (Management of graphic windows, plot	**(2 weeks)**
Lab 8: Using Toolbox	**(2 weeks)**

Evaluation mode :

Continuous control: 100%.

Bibliographic references:

1. Getting 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: MTU 2.1
Subject 3: technical drawing
VHS: 22h30 (PW: 1h30)
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 knowledgeContent of the subject

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

1.1 Usefulness of technical drawings and different types of drawings.
1.2 Drawing materials.
1.3 Standardization (Line types, 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 mode :

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 AndreRicordeau Edition AndreCasteilla;
5. المدخل إلى الرسم الصناعي ماجد عبد الحميد ديوا ن المطبوعات الجامعية الجزائر
6. ئدابم ةيساسأ يف مسرلا يعانصلا رمع وبأ كينح لا دهعم يرئازجلا سييقتلا ةيكلملاو ةيعانصلا عبط ا ديمحل نواويد تاعوبطملا ةيعماجلا.

Semester: 3
Teaching unit: MTU 2.1
Subject 4: TP Waves and Vibrations
VHS: 15h00 (PW: 1h00)
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.1 Spring 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 The Pohl 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 mode :

Continuous control: 100%.

Bibliographic references:

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

Semester: 3
Teaching unit: DTU 2.1
Subject 1: Basic technology
VHS: 22h30 (Course: 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 knowledgeContent 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, folding 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 mode :

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. تكنولوجيا عمليات التصنيع خرير ز و فواز د.نواويد تاعوبطملا ةيعماجلا رئازجلا

Semester: 3
Teaching unit: DTU 2.1
Subject 2: Metrology
VHS: 22h30 (Course: 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 (Industrial said of laboratory, legal, Scientist);
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, fidelity, repeatability, 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 Basics of calibers, gauges and simple measuring instruments.

Chapter 4. Measurement and control (4 weeks)

4.1 Direct measurement of lengths and angles (use of ruler, caliper, micrometer and protractor);
4.2 Indirect measurement (use of comparator, gauge blocks);
4.3 Dimensions control (use of buffers, jaws, etc.);
4.4 Measuring and control machines used in mechanical workshops (use of pneumatic comparator, profile projector and roughness meter.

Evaluation mode :

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 . تكنولوجيا عمليات التصنيع خرير ز و فواز د.ناويد تاعوبطملا ةيعماجلا رئازجلا

Semester: 3
Teaching unit: TTU 2.1
Subject 1: Technical English
VHS: 22h30 (Course: 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: FTU 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. He will also learn about soil settlement and consolidation.

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 (3 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 (3 weeks)
Water flow in soils: speed, gradient, flow rate, Darcy's law, permeability, Measurement of permeability in the laboratory and in-situ, Principle of effective stress.

Chapter 5. Soil Compaction and Consolidation (3 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.

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’Ecole Nationale des Ponts et Chaussées”, 1997.

Semester: 4
Teaching unit: FTU 2.2.1
Subject 2: Construction materials
VHS: 22h30 (Course: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives :

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

Recommended prior knowledge :

Fundamental subjects of Semesters 1, 2 and 3

Content of the subject :

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 mode :

Final exam: 100%.

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: FTU 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 must master the different techniques for solving functions and integrals with complex and special variables.

Recommended prior knowledge :
Mathematics 1, Mathematics 2 and Mathematics 3.

Content of the subject :
Functions with complex variables and Special Functions

Chapter 1: Holomorphic functions. Cauchy Riemann Terms **3 weeks**

Chapter 2: Entire series **3 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 **4 weeks**
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 **2 weeks**
Special Euler functions: Gamma, Beta functions, applications to integral calculations

Evaluation mode :
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: FTU 2.2.2
Subject 2: Numerical methods
VHS: 45h00 (Lecture: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

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

Recommended prior knowledge:

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

Content of the subject :

Chapter 1: Solving nonlinear equations f(x)=0 (3 weeks) Introduction to calculation errors and approximations, Introduction to methods for solving nonlinear equations, Bisection method, Method of successive approximations (fixed point), Newton-Raphson method.

Chapter 2: Polynomial Interpolation (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, Gaussian method and pivot, LU factorization method, ChoeleskiMM factorization method^{t}, Thomas algorithm (TDMA) for tri-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 mode :

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. University Presses of Grenoble, 1996.
8- E. Hairer, SP Norsett 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: FTU 2.2.3
Subject: Strength of materials
VHS: 45h00 (Lecture: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Learn the basics of material strength. The goal and hypotheses of the resistance of materials, the concept of internal forces, geometric characteristics of sections, the law of behavior of materials, concept of admissible stresses and dimensioning of parts under simple stresses.

Recommended prior knowledge:

Rational mechanics; analysis of functions.

Material content:

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, Equations of balance, Method of sections, Concept of internal forces: Normal force N, Shear force T , Bending moment M, Definitions, sign conventions and units.

Chapter 2: Geometric characteristics of straight sections (2 weeks) Center of gravity, Static moments, Moments of inertia of a straight section, Transformation of moments of inertia. Central principal axes, principal moments of inertia.

Chapter 3: Simple Tension and Simple Compression (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, the shear force and the bending moment. Diagram of shear forces and bending moments, Normal stress 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 in simple bending.

Chapter 5: Shearing (2 weeks)

Definitions, Simple shear – pure shear, Shear stress, Elastic deformation in shear, Shear resistance condition.

Chapter 6: Twist (2 weeks)

Definitions, Constraint tangential Or of sliding, deformation elastic in twist,Torsion 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: MTU 2.2
Subject 2: Soil Mechanics PW
VHS PW: 22h30, (PW: 1h30)
Credits: 2
Coefficient: 1

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 also determine the compaction and compressibility parameters of soils.

Recommended prior knowledge :

Soil mechanics course.

Content of the subject :

PW1: Measurement of weight characteristics (density – water content)
PW2: Measurement of consistency parameters (Atterberg limits)
PW3: Particle size analysis (by sieving and sedimentometry)
PW4: Measurement of compaction and bearing characteristics (Proctor and CBR tests)
PW5: Measurement of in-situ density (membrane densitometer test)
PW6: Measurement of compressibility parameters (oedometric test)

Evaluation mode :

Continuous control: 100%.

Bibliographic references:

1. Costet and Sanglerat,"Coursessoil mechanics practices", Dunod – Paris.
2. Caquot and Kerisel, “Treatise on soil mechanics”, Gauthier, Villars – Paris.

Semester: 4
Teaching unit: MTU 2.2
Subject 2: PW Construction materials
VHS: 22h30 (PW: 1h30 h)
Credits: 2
Coefficient: 1

Teaching objectives :

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

Recommended prior knowledge :

Construction materials course.

Content of the subject :

PW1: Densities of cement, sand and gravel

PW2: Particle size analysis of sand and gravel

PW3: Water content and expansion of sand
PW4: Porosity of sand and gravel
PW5: Volumetric coefficient of gravel
PW6: Equivalent of sand
PW7: Cement consistency and setting test

Evaluation mode :

Continuous control: 100%.

Semester: 4
Teaching unit: MTU 2.2
Subject 3: Computer-assisted drawing
VHS: 22h30 (PW: 1h30)
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.

Knowledgerecommended prerequisites: Technical drawing..

Content of the subject :

1. PRESENTATION OF THE CHOSEN SOFTWARE **(4 weeks)**
(SolidWorks, Autocad, Catia, Inventor, etc.)
1.1 Introduction and history of 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 Dimensioning 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 The 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 skins and properties (hatching, dimensioning, text, tables, etc.)

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

Evaluation mode :
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, Chevalier A, Edition Hachette Technique,

Semester: S4
Teaching unit: MTU 2.2
Subject 4: Numerical Methods PW
VHS: 22h30 (PW: 1h30 h)
Credits: 1
Coefficient: 1

Teaching objectives:

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

Recommended prior knowledge:

Numerical method, Computer science 2 and computer science 3.

Content of the subject :

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

Chapter 2: Interpolation and approximation **(3 weeks)**
1. Newton interpolation, 2. Chebyshev approximation

Chapter 3: 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 mode :

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; compliant with the new MPSI / Bouchaib Radi program; Abdelkhalak El Hami. - Paris: Ellipses, 2015. - 180 p.
3. Applied numerical methods: for scientists and engineers / Jean-Philippe Grivet, . - Paris: EDP sciences, 2009. - 371 p.

Semester: 4
Teaching unit: MTU 2.2
Subject 5: PW FM and SM
VHS: 15h00 (PW: 1 hr.)
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:
Resistance of materials.

Content of the subject :

Part I: Practical work: Fluid mechanics FM

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

Part II: Practical work: Strength of materials

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

Evaluation mode :

Continuous control: 100%.

Semester: S4
Teaching unit: DTU 2.2
Subject 1: Geology
VHS: 22h30 (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 Parriaux and Marcel Arnould, 2009
3. Engineering geology.. Bilingual French/English, Roger Cojean and Martine Audiguier, 2011
4. Hydrogeology, engineering geology, Éditions du BRGM, 1984.
Faucault A. Raoult JF (1995) – Dictionary of geology, 4 edition. Editions Masson, 325p
5. Pomerol C., Lagabrielle Y., Renard M. (2005) – Elements of Geology, 13eediting. Editions Dunod, 762p

Semester: S4
Teaching unit: TTU 2.2
Subject 2: Topography 1
VHS: 22h30 (Course: 1h30)
Credit: 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 subject :

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 mode :

Final exam: 100%.

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, Topography Specialty. Strasbourg

Semester:4
Teaching unit: TTU 2.2
Subject: Expression, information and communication techniques
VHS: 22h30 (Course: 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. It also allows the student to know the techniques, tools and methods used to facilitate communications.

Recommended prior knowledge:

Languages (Arabic; French; English)

Material content:

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

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

Chapter 3: Develop autonomy, organizational and communication skills within the framework of a project approach **(2 weeks)**
Position yourself in a project and communication approach, Anticipate action, Implement a project: Presentation of a report of practical work (homework).

Chapter 4: ICT – Definition and Evolution **(2 weeks)**Definition, Activities using ICT, Mastery of ICT skills, Evolution of ICT, Information and communication services

Chapter 5: Search, use and retrieval of information. **(2 weeks)**
Search directories (YAHOO, GOOGLE), Search engines, Query and search language, Retrieving and printing an HTML page, Retrieving an image, Downloading a file or software, Reading 'a local HTML file, Playback of a multimedia file saved on the Web.

Chapter 6: ICT Rights **(2 weeks)**
Computer crime, Media law, Electronic communications law, Electronic commerce law, Internet governance, …

Chapter 7: Securing sensitive information, Protection of confidential data and Preservation of nuisances. **(3 weeks)**
Backup of important data, “Informatics and freedoms” law, Internet dangers, Computer hacking, Machine protection, Protection against viruses, Protection against cyber threats or online threats (Phishing, spam emails, spyware, malware, ransomware,

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

Evaluation method:

Final exam: 100%.

Bibliographic references:

(Books and handouts, websites, etc.)

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. 3- Matthieu Dubost, Improving your written and oral expression all the keys, Edition Ellipses 2014.
4. Allegrezza Serge and Dubrocard Anne (edited by). Internet Econometrics. Palgrave Macmillan Ltd, 2011. ISBN-10: 0230362923; ISBN-13: 9780230362925
5. Anduiza Eva, Jensen J. Michael and Jorba Laja (edited by). Digital Media and Political Engagement Worldwide. Cambridge UniversityPress - MUA, 2012. ISBN-10: 1107668492; ISBN-13: 9781107668492
6. Baron GL, and Bruillard E. Computer science and its users in education. Paris, PUF, 1996. ISBN-10: 2130474926; ISBN-13: 978-2130474920
7. OnlineChantepie P. and Le Diberder A. Digital revolution and cultural industries. Landmarks. Paris, La Découverte, 2010. ISBN-10: 2707165050; ISBN-13: 978-2707165053
8. Dawn Medlin B. Integrations of Technology Utilization and Social Dynamics in Organizations. Information Science Reference (Isr), 2012. ISBN-10: 1-4666-1948-1; ISBN-13: 978-1-4666-1948-7
9. Devauchelle B. How digital technology is transforming places of knowledge. FYP Editions, 2012. ISBN-10: 2916571612; ISBN-13: 978-2916571614
10. GreenfieldDavid. “The Addictive Properties of Internet Usage.” In Internet Addiction, 133?153. John Wiley & Sounds, Inc., 2007. ISBN:9780470551165.http://dx.doi.org/10.1002/9781118013991.ch8.
11. Kurihara Yutaka and [Al.]. Information technology and economic development. Information Science Reference (Isr), 2007. ISBN 10: 1599045818; ISBN 13: 9781599045818
12. Paquelin D. The appropriation of digital training devices. From prescription to use. Paris, L'Harmattan, 2009. ISBN-10: 2296085563; ISBN-13: 978-2296085565
13. Tansey Stephen D. Business, information technology and society. Routledge Ltd, 2002. ISBN-10: 0415192137; ISBN-13: 978-0415192132

Semester: 5
Teaching unit: FTU 3.1.1
Subject 1: Beams and trellises
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. Learn the behavior of elements under the effects of compound stresses. Determine the elastic deformations and the internal energy. Begin hyperstatic calculation for one-dimensional elements and methods for evaluating forces in two-dimensional systems. Evaluate the forces in reticulated systems.

Recommended prior knowledge:

Resistance of materials 1.

Material content:

Chapter 1. Solicitations (4 weeks)

Compound Flexion, Deviated Flexion

Chapter 2. Deformations and internal potential (3 weeks) Calculation of deformations due to bending moments, Calculation of the internal deformation energy of a beam in bending, principle of virtual work. Calculation of deformations using internal potential theory

Chapter 3. Calculation of straight hyperstatic beams (4 weeks) Definition of a hyperstatic beam, Menabréa method, Continuous beams, Three moments method, Foci method.

Chapter 4. Reticulated systems (4 weeks)

General, Evaluation of forces in bars (node method, section method), Usual types of isostatic lattice beams, Deformation of a reticulated system, Externally hyperstatic lattice beam.

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: 5
Teaching unit: FTU 3.1.1
Subject 2: Reinforced concrete
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 (RDM1), Construction materials (MDC1).

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 (2 weeks)
Rule of pivots, Limit states, Combinations of actions, Condition of non-fragility

Chapter 3. Adhesion and anchoring (2 weeks)
Adhesion stress, Anchoring of a straight insulated bar, Anchoring by curvature, Covering

Chapter 4. Simple Compression (3 weeks)
Ultimate resistance limit state, service limit state

Chapter 5. Simple traction (2 weeks)
Ultimate resistance limit state, service limit state

Chapter 6. Calculation of reinforced concrete sections subjected to simple bending (4 weeks)
Rectangular section and T-section 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
Subject 3: Metal structures
VHS: 45h00 (Course: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The purpose of this course is to introduce the student to the dimensioning of metal parts and their assembly subjected to tensile, bending and shear forces according to the limit state calculation standards in force.

Recommended prior knowledge:

Rational mechanics, Resistance of materials 1.

Material content:

Chapter 1. General information on structural steel (2 weeks) Mechanical properties of steels, Safety concepts, Safety verification principle, Actions and combinations of actions, Regulatory requirements (calculations at ultimate and service limit states).

Chapter 2. Assemblies (3 weeks)
General information on connections, Types of assembly (rivets, bolts, welding), Technological aspects and Operating principle.

Chapter 3. Calculation of tensioned parts (5 weeks)Behavior of tensioned parts, Calculation of the net section area, Verification of tensioned parts, Taking into account the effects of assembly eccentricities in the calculation of tensioned parts.

Chapter 4. Calculation of deflected parts (5 weeks) Use of bent parts, Resistance to the bending moment, Resistance to the shear force, Justification at the ELU, Verification at the ELS.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

J. Morel. "Calculation of Metal Structures according to Eurocode 3". Eyrolles, 2005.
"CCM97: Design rules for steel structures". CGS Algiers, 1999.
MY. Hirt, R. Bez. "Metal Construction", Volumes 10 and 11, Presses Polytechniques et Universitaires Romandes.
J. Brozzetti, MA Bez. "Metal construction (Numerical examples adapted to Eurocodes)". Presses Polytechniques et Universitaires Romandes.
OPU collections, Algeria.

Semester: 5
Teaching unit: FTU 3.1.2
Subject 1: Roads 1
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The purpose of this course is to introduce students to the rules for designing and building roads, highways and urban roads in accordance with current standards.

Recommended prior knowledge:

Applied technical drawing, Applied topography, General notions of physics.

Material content:

Chapter 1. General characteristics of road traffic (2 weeks)
History and socio-economic importance of the road, Traffic analysis, Road classification.

Chapter 2. Vehicle movement (5 weeks) Traffic elements, Movement of the isolated vehicle (engine effort, grip and braking, stopping distance), Movement of grouped vehicles (safety distance, visibility distance), Determination of the level of service of a road.

Chapter 3. Geometric characteristics of roads (8 Weeks) Regulatory requirements, Plan layout (straight alignment, curves, curved and progressive connections, installation of the spiral), Long profile (vertical slope, longitudinal profile connection, coordination between plan layout and longitudinal profile), Profiles in across type and current (dimensioning, transverse slope, extra width on curves), Road capacity.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1. R. Coquand. "Roads". Volumes 1 and 2, Eyrolles.
2. Mr. Faure. "Road courses". Volumes 1 and 2. Hazards.
3. J. Sauterey. "Road courses: sizing of pavements". Presses des Ponts, France.
4. J. Sauterey. "Road courses: wearing layers". Presses des Ponts, France.
5. L. Gagnon. "Road techniques". Modulo.
6. "B40: technical standards for road development in Algeria".
7. SETRA-LCPC collections. France.

Semester: 5
Teaching unit: FTU 3.1.2
Subject 2: road materials
VHS: 22h30 (Course: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

The aim of this course is to introduce the student to the components of hydraulic concrete and bituminous coatings used in public works, their formulation and the processes of their development, as well as the physico-chemical and mechanical properties which characterize them.

Recommended prior knowledge:

Building materials 1.

Material content:

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

Classification of construction materials, Properties physicochemical and mechanical municipalities, Selection of aggregate sources.

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

Mineral binders, Hydraulic binders, Hydrocarbon binders.

Chapter 3. Hydraulic concrete **(4 weeks)**

Cements, Mortars, Concrete formulation, Implementation and control.

Chapter 4. Bituminous coatings **(4 weeks)**

Bitumens and emulsions, Composition, Implementation and control.

Evaluation mode

Review: 100%.

Bibliographic references

1. R. Dupain, R. Lanchon, J.-C. Saint-Roman. "Aggregates, soils, cements and concretes", Casteilla, 2009.
2. C. Lemaître. "The physicochemical properties of construction materials". Eyrolles, 2012.
3. C. Lemaître. "Implementation and use of construction materials". White BTP Collection, 2012.
4. G. Dreux. "New guide to concrete and its constituents". Eyrolles, 1998.
5. "Current cements and concretes (1987)". CIIC, Paris, 1980.
6. Mr. Venuat. "The practice of cements and concretes". The TPB Monitor, 1976.
7. OPU collections, Algeria.

Semester: 5
Teaching unit: MTU 3.1
Subject 1: Applied technical drawing
VHS: 37h30 (PW: 2h30)
Credits: 3
Coefficient: 2

Teaching objectives

The aim of this course is to introduce the student to drawing in accordance with customary standards and then to reading and interpreting a technical drawing applied to public works.

Recommended prior knowledge

Technical drawing.

Content of the subject

Chapter 1. General information on technical drawings (2 weeks)
General rules of presentation, General conventions of presentation.

Chapter 2. Special presentation rules and conventions (3 weeks) Land development and soil reconnaissance (conventional representation of the land, lithological legend of the soil, geological section, reconnaissance survey surveys), Masonry (principle of representation of the different categories of masonry, Reinforced and prestressed concrete (formwork and construction plans reinforcement), Metal framework (overall drawings, assemblies), Wooden framework (traditional framework, modern framework).

Chapter 3. Drawing of roads and structures (6 weeks) Roads (general plan, long profile, cross sections), Works of art (arrangement of figures, medium and large works of art, identification of sections and sections, designation of figures).

Chapter 4. Drawing of sanitation works (4 weeks)
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, 1980.
2. J.-P. Gousset. "Building drawing techniques - Technical drawing and plan reading Principles and exercises". White BTP Collection, 2011.
3. OPU collections, Algeria.

Semester: 5
Teaching unit: MTU 3.1
Subject 2: Road geotechnics
VHS: 22h30 (PW: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

The purpose of this laboratory course is to introduce the student to characterizing soils and rock materials used in road construction and to classifying them according to the road earthworks guide based on a few typical characterization tests.

Recommended prior knowledge:

Soil mechanics 1, Resistance of materials 1.

Material content:

Classification of soils and rock materials according to the road earthworks guide

Fine soils, Rocky materials, Organic soils.

Specific geotechnical aspects

Earthworks (rules for placing and compacting soil, drainage, treatment).

Characterization tests

PW 1: Methylene blue test
PW 2: Los Angeles Trial
PW 3: Micro-Deval test
PW 4: Fragmentation test
PW 5: Degradability test

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. LCPC-SETRA. “Guide to road earthworks: Creation of embankments and subgrade layers”. Technical guide, France, 2000.
2. LCPC-SETRA. “Treatment of soils with lime and/or hydraulic binders”. Technical guide, France, 2000.
3. J. Costet, G.Sanglerat. “Practical course in soil mechanics”. Dunod, 1981.
4. S. Amar, J.-P. Magnan. “Soil mechanics tests in the laboratory and on site: Cheat sheet”. LPC report, France, 1980.
5. F. Schlosser. “Elements of soil mechanics”. Presses des Ponts, France, 1988.

Semester: 5
Teaching unit: MTU 3.1
Subject 3: Applied topography
VHS: 45h (Lecture: 1h30, PW: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The purpose of this course is to introduce the student to carrying out topographical surveys and to carrying out or controlling the establishment of a road section or that of a work of art on land based on surveys drawn on plans.

Recommended prior knowledge:

Topography 1, Applied technical drawing.

Material content:

Chapter 1. Topographic Survey Systems (2 weeks) Surveys by alignment, Surveys by abscissa and ordinate, Surveys by radiation, Surveys by intersection, Surveys by intersection.

Chapter 2. Calculation of coordinates and areas (3 weeks)
Axes, Orientations and bearings, Conversion of coordinates, Calculation of surfaces.

Chapter 3. Canvas and detailed surveys (4 weeks) Polygonal network (path shapes, calculation of a framed path, calculation of a closed path, closure tolerance), Planimetric survey of details.

Chapter 4. Implementation of a road (3 weeks) Successive phases of the study of a road layout, Straight alignment, Long profiles, Cross profiles, Curves, Cubatures.

Chapter 5. Implementation of a work of art (3 weeks)
Retaining wall, Bridge.

Content of the PW:

PW No. 1: Measuring angles and distances, Angles: horizontal and vertical, Distances (direct method, indirect method).
PW No. 2: Polygonation: Recognition of locations, Choice of stations, Location sketches, Measurements of angles and distances, Calculations and reporting.
PW No. 3: Tacheometry
Establishment of the field sketch, Survey of details by radiation, Calculations and report.
PW No. 4: Survey by abscissa and ordinate and quasi-ordinate, Choice of lines of operation, Measurements, Calculations and report.
PW No. 5: Measurements by lateral obliques: Establishment of the field sketch, Survey of details by radiation, Calculations and report.

Evaluation method:

Continuous assessment: 40%, Examination: 60%.

Bibliographic references:

1. L. Lapointe, G. Meyer. "Topography applied to public works, building and urban surveys". Eyrolles, 1986.
2. R. D'Hollander. "General topography". Volumes 1 and 2, Eyrolles, 1970.
3. Mr. Brabant. "Mastering the topography". Eyrolles, 2003.
4. S. Milles, J. Lagofun. "Modern topography and topometry". Eyrolles, 1999.
5. OPU collections, Algeria.

Semester: 5
Teaching unit: DTU 3.1
Subject 1: Railway infrastructures
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

The purpose of this course is to introduce the student to familiarization with the rules for the design and construction of railway tracks and related works in accordance with current standards.

Recommended prior knowledge:

Resistance of materials 1, Soil mechanics, Reinforced concrete, Construction materials 1, Metal structures.

Material content:

Chapter 1. General information on rail transport (2 weeks)
Interest in rail transport (Train, Metro, Tramway).

Chapter 2. Geometric characteristics of railway tracks (6 weeks)
Rails and their metal structures, Evaluation of loads and overloads.

Chapter 3. Behavior and dimensioning of railway tracks (4 weeks)Chapter 4. Sanitation works for a railway line (3 weeks)

Evaluation method:

Review: 100%.

Bibliographic references:

1. P. Alias. “The railway courses taught at the Ecole des Ponts et Chaussées”. RHCP, 1996.

Semester: 5
Teaching unit: DTU 3.1
Subject 2: Underground infrastructures
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

The aim of this course is to introduce students to the rules for designing and building road and motorway tunnels, railway tunnels and underground car parks.

Recommended prior knowledge:

Resistance of materials, Soil mechanics, Reinforced concrete, Construction materials.

Material content:

Chapter 1. General information on underground work (2Weeks) Ma in categories of underground (road and motorway tunnels, railway tunnels, underground car parks, special structures), Natural data and constraints to be respected.

Chapter 2. Notions of rock mechanics (6 weeks) Definition, Discontinuity of the rock mass, Mechanical properties of the rock matrix, Modeling of the rock mass, Methods for calculating rock structures (stability of rock slopes, calculation of rock foundations, calculation of underground structures).

Chapter 3. Methods for constructing underground works (5 weeks) Classic phasing of tunnel construction by the conventional method (explosives, purging and pickling, installation of support, installation of waterproofing, installation of lining), The different types of support (the new Austrian NATM method, bending, support at the front of size), The different types of covering (formed concrete, prefabricated segments).

Chapter 4. Asset management and security (2 weeks)
The role of inspections, maintenance and safety of structures.

Evaluation method:

Review: 100%.

Bibliographic references:

1. A. Bouvard-Lecoanet, G. Colombet, F. Esteulle. “Underground works: Design, construction, maintenance”. Presses des Ponts, France, 1992.
2. B. Brady, E. Brown. “Rock Mechanics for underground mining.” Springer, 2004.
3. CFMR. “Handbook of Rock Mechanics: Fundamentals”. ENSMP Press, Paris, 2000.
4. CFMR. “Manual of rock mechanics: Applications”. ENSMP Press, 2004.
5. J.-L. Durville, H. Héraud. “Description of rocks and rock masses (c352”). Engineering techniques, construction treatise, 1995.
6. Mr. Panet. “The calculation of tunnels using the convergence – confinement method”, Presses des Ponts, France, 1995.
7. Z. -T. Bieniawski. “Engineering Rock Mass Classifications”. Wiley, 1989.
8. K. Szechy. “Treaty on the construction of tunnels”. Dunod, 1970.

Semester: 5
Teaching unit: TTU 3.1
Subject 1: Public works machinery
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

The purpose of this course is to introduce the student to familiarization with the machines used on public works sites.

Recommended prior knowledge:

None.

Material content:

Chapter 1. Introduction **(1 week)**

Presentation of public works and the need for the use of special machines.

Chapter 2. Drilling and survey equipment **(3 weeks)**

Vertical drilling rigs, Horizontal drilling rigs, Tunnel boring machines, Perforators.

Chapter 3. Extraction, loading and transport equipment **(3 weeks)**(Dozers or trax, Tracked or bull tractors, Dumpers, Dumpers, Loaders, Backhoe loaders, Scrapers.

Chapter 4. Lifting and handling equipment **(2 weeks)**

Forklifts, Cranes.

Chapter 5. Earth-moving machinery **(3 weeks)**

Graders, Compactors, Rollers, Pavers.

Chapter 6. Machines for implementing pavement materials **(3 weeks)**

Coating plants, Responders, Spreaders, Milling machines, Gravel mixers, Pulvimixers, Pavers.

Evaluation mode

Review: 100%.

Semester: 6
Teaching unit: FTU 3.2.1
Subject 2: Reinforced and prestressed concrete
VHS: 45h00 (Course: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The purpose of this course is to introduce the student to the dimensions of reinforced concrete parts subjected to stresses (Shear force, Compound bending and Torsion), according to the limit state calculation standards in force. It also provides general knowledge of prestressed concrete technology.

Recommended prior knowledge:

Resistance of materials, Construction materials, Concrete 1.

Subject program:

Chapter 1. Shear force (3 weeks)

Calculation of transverse reinforcement, Verifications in the areas of application of concentrated forces, Verification of punching resistance, Verifications in the junction zones with the web of the beams.

Chapter 2. Compound Flexion (6 weeks)

Calculation of sections at limit states of rectangular and circular sections, Buckling of compressed columns.

Chapter 3. Twist (2 weeks)

General overview of the torsion phenomenon and justification of concrete and reinforcement.

Chapter 4. General information on prestressed concrete (4 weeks) Prestressing technology, Action of prestressing, Foundations of calculation and justification rules, Regulatory requirements (BPEL).

Evaluation method:

Continuous Control: 40%; Exam: 60%.

Bibliographic references:

1. DTR-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.
6. A.Fuentès. “Prestressed concrete course”. Volumes 1 and 2, OPU, Algeria, 2006.
7. G. Dreux, J. Mazars, M. Rimboeuf. “Practical course on prestressed concrete: BPEL Rules”. Eyrolles, 1984.

Semester: 6
Teaching unit: FTU 3.2.1
Subject 2: Bridges
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives:

The purpose of this course is to introduce the student to familiarization with the rules of design and construction of road and railway bridges in accordance with current standards.

Recommended prior knowledge:

Resistance of materials, Construction materials, Reinforced and prestressed concrete, Soil mechanics, Metal structures.

Material content:

Chapter 1. General information on bridges (2 weeks)

Definition and classifications of bridges, Constituent elements of bridges.

Chapter 2. Bridge Design (4 weeks)

Reconnaissance of the site: Location and characteristics, Collection of natural data (topography, hydraulic data, scouring, geotechnical data), Functional data: relating to the track carried (plan layout, longitudinal profile and cross profile), relating to the supported track (templates, openings).

Chapter 3. Different types of Art works (3 weeks)

Hydraulic structures, I-girder bridges (reinforced concrete, prestressed concrete, steel and mixed), Slab bridges (reinforced concrete, prestressed concrete), Box girder bridges (prestressed concrete, steel and mixed), Cable bridges (cable-stayed bridges and suspension bridges).

Chapter 4. Actions and combinations of actions (3 weeks)

Actions on road bridges, Actions on rail bridges, Action combinations.

Chapter 5. Lines of influence (3 weeks)

Simply supported beams, Truss beams, Arches.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1. G. Grattesat, "Bridge design". Courses at the National School of Bridges and Roads. Eyrolles, 1984, 3rd edition.
2. B. Gely, J.-A. Calgaro. "Bridge design". Presse des Ponts, France, 1994.
3. JA Calgaro, "Project and construction of bridges: generalities, foundations, supports, current works". Presse des Ponts, France, 2000.
4. Specification of common requirements applicable to public works contracts relating to equipment services, Fascicle 61 Title II - Load programs and tests for bridges and roads, Special Fascicle No. 72-21 bis, Editions of the official journal, December 9, 1980 .
5. UIC (International Union of Railways) sheets: Load models to be taken into consideration in the calculation of structures under rails on international lines.
6. BAEL. 91-99., Technical rules for the design and calculation of reinforced concrete works and constructions using the limit states method. Eyrolles, 2000.
7. BPEL. 91-99., Technical rules for the design and calculation of prestressed concrete works and constructions using the limit states method. Eyrolles, 2000.
8. EN 1991-2: Eurocode 1: Actions on structures - Part 2: actions on bridges, due to traffic, September 2003.
9. R. Soltani, Lines of influence of isostatic beams and arcs, OPU, 2003.

Semester: 6
Teaching unit: FTU 3.2.2
Subject 1: Foundations and earthworks
VHS: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The aim of this course is to introduce the student to the rules for designing and calculating the stability of the foundations of engineering structures (bridges, retaining walls), earth structures (cuts, embankments) and retaining structures.

Recommended prior knowledge:

Resistance of materials 1, Soil mechanics 1.

Material content:

Chapter 1. Plasticity and shear resistance of soils (2 weeks)

Concept of Mohr's circle of stresses, Mohr-Coulomb plasticity criterion (intrinsic curve, case of powdery soils, case of coherent soils), Measurement of soil shear characteristics (direct shear, triaxial shear), Drained and undrained characteristics .

Chapter 2. Earth Thrusts and Thrusts (2 weeks)

Limit equilibrium states (ground at rest, thrust equilibrium, thrust equilibrium), Thrust and thrust coefficients (Rankine equilibrium, Boussinesq equilibrium, Prandtl equilibrium).

Chapter 3. Stability of slopes and embankments (4 Weeks)

Description and classification of land movements, Methods for calculating the stability of slopes (concepts of safety coefficient), Plane landslides, Rotational landslides (Fellenius and Bishop slice methods).

Chapter 4. Surface and deep foundations (4 weeks)

Definition and classification of foundations, Theory of bearing capacity, Calculation of shallow foundations, Calculation of deep foundations.

Chapter 5. Retaining structures (3 weeks)

Definition and classification of retaining structures, Stability of retaining walls, Stability of sheet pile curtains.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1. J. Costet, G.Sanglerat. “Practical course in soil mechanics”. Dunod, 1981.
2. G. Phillipponat, B. Hubert. “Foundations and earthworks Collection Blanche BTP”, 1997.
3. F. Schlosser. “Elements of soil mechanics”. Presse des Ponts, France, 1997.
4. F. Schlosser. “Soil mechanics exercises”. Presse des Ponts, France, 1995.
5. G. Olivari, G. Sanglerat, B. Cambou. “Practical problems of soil mechanics”. Dunod, 1987.
6. OPU collections, Algeria.

Semester: 6
Teaching unit: FTU 3.2.2
Subject 1: Roads 2
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The purpose of this course is to introduce students to the rules for designing and building roads, highways and urban roads in accordance with current standards.

Recommended prior knowledge:

Roads 1, Applied technical drawing, Applied topography, General notions of physics.

Material content:

Chapter 1. Dimensioning of pavement structures (3 weeks)
Flexible pavements, Rigid pavements, Semi-rigid pavements.

Chapter 2. Layout of intersections (3 weeks)
Flat intersections, roundabouts, interchanges.

Chapter 3. Urban roads (3 weeks)
General, Characteristics of the urban road network, Dimensioning of streets, sidewalks and parking lots, Pedestrian development.

Chapter 4. Road signs (3 weeks)
General, Safety concepts in signaling, Signals and protective devices, Horizontal and vertical signaling, Public lighting.

Chapter 5. Pathology and road maintenance (2 weeks) General, Roadway inspection methods, Survey of damage by type, Roadway maintenance, Roadway reinforcement.

Chapter 6. Road safety (1 week)
Definition of accidents (injury accidents, material accidents, statistics), Risks linked to road conditions, Risks linked to road users, Preventive measures.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1. R. Coquand. “Roads”. Volumes 1 and 2, Eyrolles.
2. Mr. Faure. “Road courses”. Volumes 1 and 2. Hazards.
3. J. Sauterey. “Road courses: sizing of pavements”. Presse des Ponts, France.
4. J. Sauterey. “Road courses: wearing layers”. Presse des Ponts, France.
5. L. Gagnon. “Road techniques”. Modulo.
6. “B40: technical standards for road development in Algeria”.
7. SETRA-LCPC collections. France.

Semester: 6
Teaching unit: MTU 3.2
Subject 1: End of Cycle Project
VHS: 45h00 (PW: 3h00)
Credits: 4
Coefficient: 2

Teaching objectives:

Assimilate knowledge from different subjects in a global and complementary manner. Concretely put into practice the concepts instilled during the training. Encourage a sense of autonomy and a spirit of initiative in students. Teach him to work in a collaborative setting by arousing intellectual curiosity in him.

Recommended prior knowledge:

The entire Bachelor's program.

Material content:

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

Noticed :

During the weeks during which the students are immersed in the purpose of their project and its feasibility (bibliographic research, search for software or hardware necessary for carrying out the project, revision and consolidation of teaching having a direct link with the subject, etc.), the subject manager must take advantage of this face-to-face time to remind students of the essential content of the two subjects "Writing Methodology" and "Presentation Methodology" addressed during the first two semesters of the common base.

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

- The detailed presentation of the study theme, emphasizing its interest in its socio-economic environment.
- The means implemented: methodological tools, bibliographical references, contacts with professionals, etc.
- Analysis of the results obtained and their comparison with the initial objectives.
- Criticism of the discrepancies observed and possible presentation of other additional details.
- Identification of the difficulties encountered by highlighting the limits of the work carried out and the follow-up to be given to the work carried out.

The student or group of students finally presents their work (in the form of a brief oral presentation or on a poster) in front of their tutor teacher and an examining teacher who can ask questions and thus evaluate the work accomplished on the plan. technical and that of the presentation.

Evaluation method:

Continuous control: 100%.

Semester: 6
Teaching unit: MTU 3.2
Subject 2: PW Road materials
VHS: 37h30 (PW: 2h30)
Credits: 3
Coefficient: 2

Teaching objectives:

The purpose of this practical work is to put into practice and deepen the student's theoretical knowledge acquired in the road materials course.

Recommended prior knowledge:

Building materials, Road materials, Roads 1, Roads 2.

Material content:

PW No. 1: Formulation of hydraulic concrete (Dreux-Gorisse method).

PW No. 2: Workability test with the Abrams cone
PW No. 3: Crush test on concrete
PW N°4: Measurement of the accelerated polishing coefficient (Le Roux Pendulum)
PW N°5: Bitumen penetrability test
PW No. 6: Bitumen ductility test
PW No. 7: Formulation of bituminous coatings

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. R. Dupain, R. Lanchon, J.-C. Saint-Roman. "Aggregates, soils, cements and concretes", Casteilla, 2009.
2. C. Lemaître. "The physicochemical properties of construction materials". Eyrolles, 2012.
3. C. Lemaître. "Implementation and use of construction materials". White BTP Collection, 2012.
4. G. Dreux. "New guide to concrete and its constituents". Eyrolles, 1998.
5. "Current cements and concretes (1987)". CIIC, Paris, 1980.
6. Mr. Venuat. "The practice of cements and concretes". The TPB Monitor, 1976.

Semester: 6
Teaching unit: MTU 3.2
Subject 3: Geographic information systems
VHS: 22h30 (Course: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

The purpose of this course is to introduce students to geographic information systems and their use in the public works sector.

Recommended prior knowledge:

Material content:

Chapter 1. GIS: towards a definition (3 weeks)

History (research of methods), Information systems, Classification of information systems, Geographic information systems technologies, Definitions (object-oriented definition, a definition highlighting the "decision support" aspect by relation to use, an organizational definition), Functionality of a GIS, Advantages of GIS / traditional cartography.

Chapter 2. Geographic information in GIS (4 weeks)

Definition of geographic information, The main acquisition methods, Main GIS modes (vector mode, raster mode), Importance of geocoding, advantages and disadvantages of each mode.

Chapter 3. Processing in GIS (5 weeks)

Geographic databases, DBMS database management systems, Crossing of layers (crossing in raster mode, crossing in vector mode), Digital processing of satellite images, Radiometric corrections, Geometric corrections, Colored composition, Dynamic enhancement, Spreading of dynamics, Synthesis of neo-channels, Concepts of spatial query.

Chapter 4. Use of GIS in the Public Works sector (3 weeks)

Evaluation method:

Review: 100%.

Bibliographic references:

Semester: 6
Teaching unit: DTU 3.2
Subject 1: Concepts on airport infrastructures
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

The purpose of this course is to introduce students to the rules for designing and building civil aerodromes in accordance with current standards.

Recommended prior knowledge:

Resistance of materials, Soil mechanics, Construction materials, Roads 1 & 2.

Material content:

Chapter 1. General information on aerodromes (2 weeks)
Interest in air transport, History, International Civil Aviation Organization (OAIC).

Chapter 2. Aerial equipment (3 weeks)
Classification of aircraft, Technical data sheet of aircraft, Determination of air traffic.

Chapter 3. General design of aerodromes (5 weeks) Movement areas (flight direction, runways, taxiways, parking areas), Dimensioning of flexible and rigid pavements, Determination of admissible loads, Clearance of the aerodrome.

Chapter 4. Aerodrome sanitation (3 weeks)
Sanitation network (surface sanitation, underground sanitation).

Chapter 5. Aerodrome marking and signaling (2 weeks)

Evaluation mode

Review: 100%.

Rbibliographic references

1. H.iSaadat, “Power system analysis”, Edition 2, 2004.
2. G. Meunier. “Design, construction and management of aerodromes”. Eyrolles, 1969.
3. A. Rouili. “Study and design of civil aerodromes in accordance with the recommendations of Annex 14 to the Chicago Convention”. Dar Raihana, Algiers.

Semester: 6
Teaching unit: DTU 3.2
Subject 2: Applied hydraulics
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Teach the fundamental bases of the hydraulics of surface flows, the influence of flows on public works, and to introduce the student to the rules for sizing and managing sanitation networks.

Recommended prior knowledge:

Fluid mechanics

Material content:

Chapter 1 Free Surface Flows (5 weeks)

Classification of flows, Geometric characteristics of free surface flows, Velocity and pressure in a flow section, uniform flow, flows varying gradually, flow varying suddenly.

Chapter 2 Solid transport in river hydraulics (3 weeks)

Carriage and suspension of non-coherent materials, bottom erosion and deposition, saturation with solid flow

Chapter 3 Road sanitation (5 weeks)

Roads and water, carriageways, sanitation works, shoulders, outlets

Chapter 4 Management of sanitation networks (2 weeks)

Operation and maintenance of sanitation, Rehabilitation of sanitation networks.

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: 6
Teaching unit: TTU 3.2
Subject: Entrepreneurship and business management
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

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

Recommended prior knowledge:

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

Targeted skills :

Ability to analyze, synthesize, work in a team, communicate well orally and in writing, be autonomous, plan and meet deadlines, be reactive and proactive. Be made aware of entrepreneurship by presenting an overview of management knowledge useful for creating activities.

Material content:

Chapter 1 – Operational preparation for employment: **(2 weeks)**

Writing the cover letter and developing the CV, Job interview, etc., Documentary research on professions in the sector, Conducting interviews with professionals in the profession and Simulation of job interviews.

Chapter 2 - Entrepreneurship and entrepreneurial spirit: **(2 weeks)**

Getting started, Businesses around you, Entrepreneurial motivation, Knowing how to set goals, Knowing how to take risks

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

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

Chapter 4 – Finding a Good Business Idea: **(2 weeks)**

Creativity and innovation, Recognizing and evaluating business opportunities

Chapter 5–Lancerand Running a Business: **(3 weeks)**

Choosing an appropriate market, Choosing the location of your business, Legal forms of business, Finding help and financing to start a business, Recruiting staff, Choosing your suppliers

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

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

Evaluation method: Review: 100%

References :

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

- LégerJarniou, Catherine, 2013, The entrepreneur's great book. Dunod, 2013.

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

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

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

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

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

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

IV- Agreements / Conventions

STANDARD LETTER OF INTENT

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

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

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

Hereby, the university (or university center) declares to co-sponsor the license mentioned above during the entire 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 educational programs,
- Participating in seminars organized for this purpose,
- By participating in the defense juries,
- By working to pool human and material resources.

SIGNATURE of the legally authorized person:

FUNCTION:

Date :

STANDARD LETTER OF INTENT

(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 License: Public works

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