République Algérienne Démocratique et Populaire
وزارة التعليم العالي والبحث العلمي
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique

جامعة محمد خيضر
بسكرة
Université Mohamed Khider de Biskra

OTRAINING OFFER
LMD

ACADEMIC LICENSE

(2thupdate)

NATIONAL PROGRAM
2021 – 2022

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

Domain	Sector	Speciality
Science and Technologies	***Hydraulic***	***Hydraulic***

Summary

I – License identity sheet

1 -Training location:

Faculty (or Institute):

Department:

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

2 -External partners:

Other partner establishments:

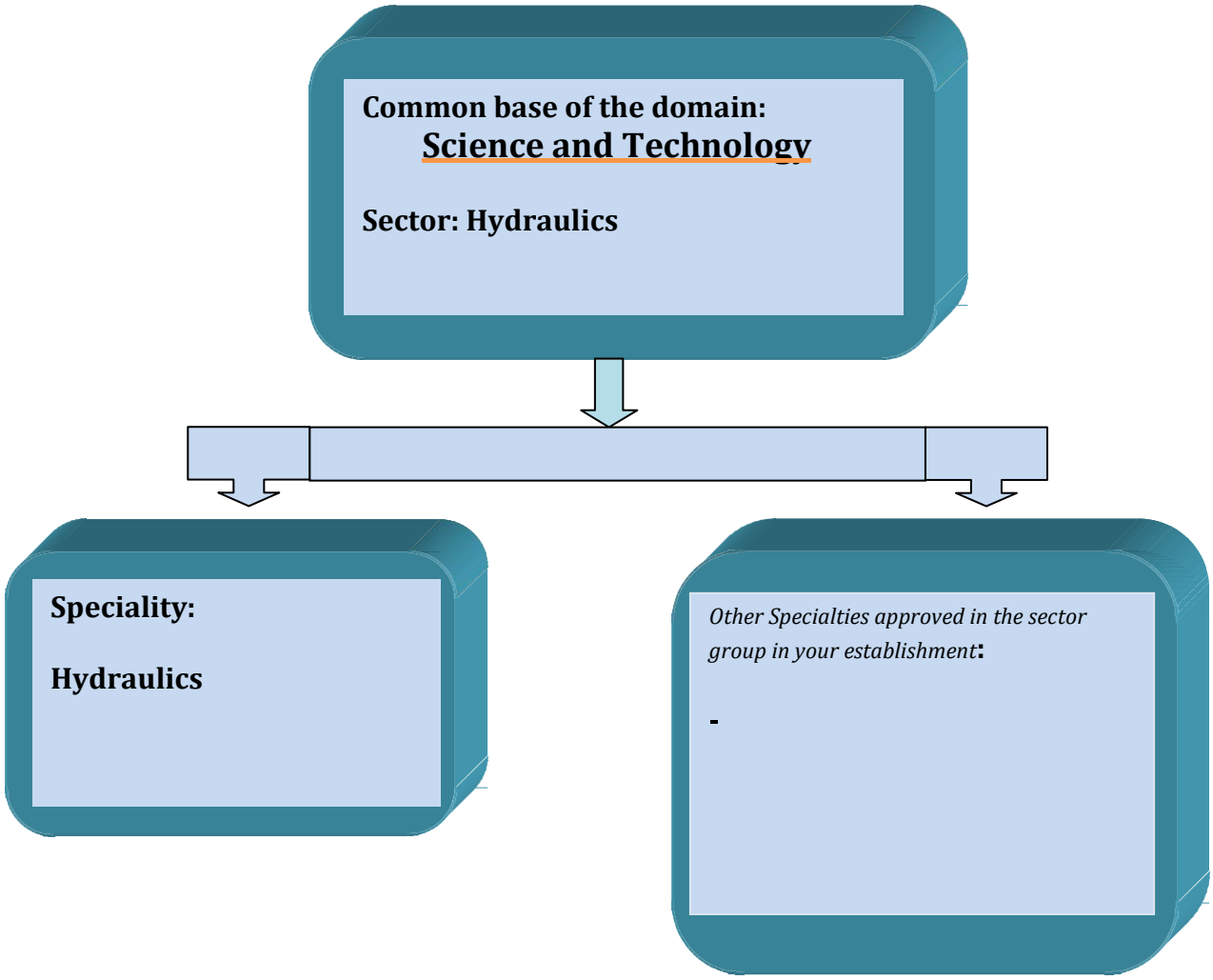
Businesses and other socio-economic partners:

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 framework 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:

Algeria is located in a region occasionally confronted with the scarcity and irregularity of water resources. In addition, the issues linked to these resources in both quantitative and qualitative aspects continue to grow in importance at the national level under the combined push of demographic growth (urban development) and the increase in water needs for agriculture. (which alone absorbs nearly 70% of water withdrawals). As a result, the sustainable development of agricultural activities and other industrial and urban sectors of our country finds itself under direct threat from chronic irregularity in the supply of this strategic resource.

As a result, public organizations and private companies operating in the field of water management, agriculture, development and town planning have ever-growing and increasingly pressing needs for skills. mastering the technical and scientific tools with a view to optimal management from both the qualitative and quantitative points of view of this strategic commodity. It is to meet the expectations of these partners that the university must offer this license and develop the horizons of this sector.

C – Targeted profiles and skills:

Due to the teaching provided in this degree, graduate students will be able to either follow their Master's studies or practice mainly in the following fields:

- water mobilization and management,
- water risk management,
- urban planning,
- rural development,
- the design and construction of various hydraulic works.

D – Regional and national employability potential:

This training is of interest to the public sector represented both by its economic enterprises and by its public administrations such as Ministries, Water Agencies, Dam Agencies, Agencies for the management and construction of infrastructure for irrigation and drainage, national and regional water resources agencies, wilaya hydraulics directorates, water distribution companies and the private sector through its design offices (soil, hydrology, hydraulics, environment).

The jobs for which graduates of this degree are destined are diverse:

- Technical Manager,
- Responsible for studies,
- Manager of irrigated areas,
- Advisor in agriculture-environment,
- Technical controller.

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	**Specialties**
Process Engineering	Process Engineering
Mining engineering	Mining Valorization of mineral resources
Hydrocarbons	Hydrocarbons
Industrial hygiene and safety	Industrial hygiene and safety
Petrochemical industries	Refining and petrochemicals

The sectors which present basic lessons common to each other (semester 3) have been grouped into 3 groups: A, B and C. These groups correspond schematically to the families of Electrical Engineering (Group A), Mechanical Engineering and Civil Engineering (Group B) and finally Process Engineering and Mining Engineering (Group C).
This degree offers multidisciplinary and transversal teaching programs:

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

Semester	**Sector group**	**Common lessons**
Semester 1	A - B - C	(30/30) Credits
Semester 2	A - B - C	(30/30) Credits
Semester 3	A-B	(18/30) Credits
	A-C	(18/30) Credits
	B - C	(24/30) Credits

In a transversal way, this License offers the student the choice of joining, if they express the desire and depending on the educational places available:

- All other specialties in the ST 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 – Expected training performance indicators:

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

3. Integration of graduates :

A coordination committee is created, made up of those responsible for training and members of the Administration, which is mainly responsible for monitoring the integration of graduates from the sector into professional life, and for establishing a graduate monitoring file. of the sector, to identify and/or update the existing economic and industrial potential at the regional and national level, to anticipate and encourage new professions in relation to the sector in association with the chamber of commerce, the various support agencies employment, public and private operators, etc., to participate in any action concerning the professional integration of graduates (organization of events with socio-economic operators).
To carry out these missions, this committee has complete freedom to carry out or commission any study or survey on the employment and post-employment of graduates. Below is a list 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 serious reflection on this subject on our part which, combined with the proposals coming from several establishments, resulted in the recommendations below.

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

1. Proposals relating to subjects with guided work:1.1.

Preparing 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).

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).

Student participation in tutorials:

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

Student Attendance:

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

2. Case of methodological units (Practical work) :

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

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

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

However, the teacher in charge of this subject can, if he wishes, let the students know that he can possibly evaluate them (ongoing) by offering to prepare presentations, make reports, look for additional information. of the course, use free software, ask students to watch at home a popular science film related to the subject (after having given them either the film on electronic media or having indicated to them the internet link to this film) and ask them to then submit a written report or make an oral presentation of the summary of this film, etc. The improvement of these activities is left to the discretion of the teacher and the training team 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 assess 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 seriesof these exercisework staff (duty to be A exposed,…) ndgive back,	30%	06 points
Written questions (minimumm 02 questions including one proposed by THE 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 course and/or impregnation :

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 training offered (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	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 1.1 Credits: 18 Coefficients: 9	Mathematics 1	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Physics 1	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Structure of matter	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
EU Methodological Code: UEM 1.1 Credits: 9 Coefficients: 5	TP Physics 1	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Chemistry 1	2	1			1h30	10:30 p.m.	27:30	100%	
	Computer science 1	4	2	1h30		1h30	45:00	55:00	40%	60%
	Methodology of the writing	1	1	1h00			3:00 p.m.	10:00 a.m.		100%
UE Discovery Code: UED 1.1 Credits: 1 Coefficients: 1	Careers in Science and Technologies 1	1	1	1h30			10:30 p.m.	02:30		100%
E Transversal Code: UET 1.1 Credits: 2 Coefficients: 2	Ethical dimension andethical (the foundations)	1	1	1h30			10:30 p.m.	02:30		100%

	Foreign language 1 (French or English)	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 1		**30**	**17**	**4:00 p.m.**	**4:30 a.m.**	**4:30 a.m.**	**375h00**	**375h00**		

Semester 2

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	T.D.	TP	Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode Continuous monitoring	Exam
Fundamental EU Code: UEF 1.2 Credits: 18 Coefficients: 9	Mathematics 2	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Physics 2	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Thermodynamics	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
EU Methodological Code: UEM 1.2 Credits: 9 Coefficients: 5	TP Physics 2	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Chemistry 2	2	1			1h30	10:30 p.m.	27:30	100%	
	Computer science 2	4	2	1h30		1h30	45:00	55:00	40%	60%
	Presentation methodology	1	1	1h00			3:00 p.m.	10:00 a.m.		100%
UE Discovery Code: UED 1.2 Credits: 1 Coefficients: 1	Careers in science and technology 2	1	1	1h30			10:30 p.m.	02:30		100%

Transversal EU Code: UET 1.2 Credits: 2 Coefficients: 2	Foreign language 2 (French and/or English)	2	2	3:00 a.m.			45:00	05:00		100%
Total semester 2		**30**	**17**	**4:00 p.m.**	**4:30 a.m.**	**4:30 a.m.**	**375h00**	**375h00**		

Semester 3

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 2.1.1 Credits: 10 Coefficients: 5	Mathematics 3	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Waves and vibrations	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF 2.1.2 Credits: 8 Coefficients: 4	Fluid mechanics	4	2	1h30	1h30		45:00	55:00	40%	60%
	Rational mechanics	4	2	1h30	1h30		45:00	55:00	40%	60%
EU Methodological Code: UEM 2.1 Credits: 9 Coefficients: 5	Probability and statistics	4	2	1h30	1h30		45:00	55:00	40%	60%
	Computer science 3	2	1			1h30	10:30 p.m.	27:30	100%	
	Technical drawing	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Waves and vibrations	1	1			1h00	3:00 p.m.	10:00 a.m.	100%	
UE Discovery Code: UED 2.1 Credits: 2 Coefficients: 2	Core Technology	1	1	1h30			10:30 p.m.	02:30		100%
	Metrology	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 2.1 Credits: 1 Coefficients: 1	Technical English	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 3		**30**	**17**	**1:30**	**7:30**	**4:00**	**375h00**	**375h00**		

Semester 3

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

Semester 4

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF 2.2.1 Credits: 6 Coefficients: 3	General hydraulics I	4	2	1h30	1h30		45:00	55:00	40%	60%
	Hydrology I	2	1	1h30			10:30 p.m.	27:30		100%
Fundamental EU Code: UEF 2.2.2 Credits: 8 Coefficients: 4	Mathematics 4	4	2	1h30	1h30		45:00	55:00	40%	60%
	Numerical methods	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF 2.2.3 Credits: 4 Coefficients: 2	Strength of materials	4	2	1h30	1h30		45:00	55:00	40%	60%
EU Methodological Code: UEM 2.2 Credits: 9 Coefficients: 5	Computer Assisted drawing	2	1			1h30	10:30 p.m.	27:30	100%	
	Fluid mechanics TP	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Numerical methods	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Resistance of materials	1	1			1h00	3:00 p.m.	10:00 a.m.	100%	
	Hydrology TP	2	1			1h30	10:30 p.m.	27:30	100%	
EU DiscoveryCode : UED 2.2 Credits: 2 Coefficients: 2	Geology	1	1	1h30			10:30 p.m.	02:30		100%
	Topography	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EUCode: UET 2.2 Credits: 1 Coefficients: 1	Expression, information and communication techniques	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 4		**30**	**17**	**12:00**	**6:00**	**7:00**	**375h00**	**375h00**		

Semester 4

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

Semester 5

Teaching unit	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF 3.1.1 Credits: 10 Coefficients: 5	General hydraulics II	4	2	1h30	1h30		45:00	55:00	40%	60%
	Hydrology II	4	2	1h30	1h30		45:00	55:00	40%	60%
	Hydrogeology	2	1	1h30			10:30 p.m.	27:30		100%
Fundamental EU Code: UEF 3.1.2 Credits: 8 Coefficients: 4	Hydraulic works	4	2	1h30	1h30		45:00	55:00	40%	60%
	Ground Mecanic	4	2	1h30	1h30		45:00	55:00	40%	60%
EU Methodological Code: UEM 3.1 Credits: 9 Coefficients: 5	TP Topography	2	1			1h30	10:30 p.m.	27:30	100%	
	Water treatment and purification	4	2	1h30	1h30		45:00	55:00	40%	60%
	TP Soil mechanics	2	1			1h30	10:30 p.m.	27:30	100%	
	Hydraulic TP	1	1			1h00	3:00 p.m.	10:00 a.m.	100%	
UE Discovery Code: UED 3.1 Credits: 2 Coefficients: 2	Irrigation	1	1	1h30			10:30 p.m.	02:30		100%
	Information system concepts geographical	1	1	1h30			10:30 p.m.	02:30		100%

Semester 5

Transversal EU Code: UET 3.1 Credits: 1 Coefficients: 1	Water legislation	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 5		**30**	**17**	**1:30 p.m.**	**7:30 a.m.**	**4:00 a.m.**	**375h00**	**375h00**		

Semester 6

Unit teaching	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	Half-yearly Hourly Volume (15 weeks)	Additional work in Consultation (15 weeks)	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF 3.2.1 Credits: 10 Coefficients: 5	Hydraulic Facilities	4	2	1h30	1h30		45:00	55:00	40%	60%
	Water supply drinkable	4	2	1h30	1h30		45:00	55:00	40%	60%
	Construction materials	2	1	1h30			10:30 p.m.	27:30		100%
Fundamental EU Code: UEF 3.2.2 Credits: 8 Coefficients: 4	Sanitation	4	2	1h30	1h30		45:00	55:00	40%	60%
	Pumps and pumping stations	4	2	1h30	1h30		45:00	55:00	40%	60%
EU Methodological Code: UEM 3.2 Credits: 9 Coefficients: 5	End of Cycle Project	4	2			3:00 a.m.	45:00	55:00	100%	
	Hydro-informatics	1	1			1h00	3:00 p.m.	10:00 a.m.	100%	
	Reinforced concrete concepts	4	2	1h30	1h30		45:00	55:00	40%	60%
UE Discovery Code: UED 3.2 Credits: 2 Coefficients: 2	Water resources management.	1	1	1h30			10:30 p.m.	02:30		100%
	Pipe technology and network equipment	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 3.2 Credits: 1 Coefficients: 1	Entrepreneurship and business management	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 6		**30**	**17**	**1:30**	**7:30**	**4:00**	**375h00**	**375h00**		

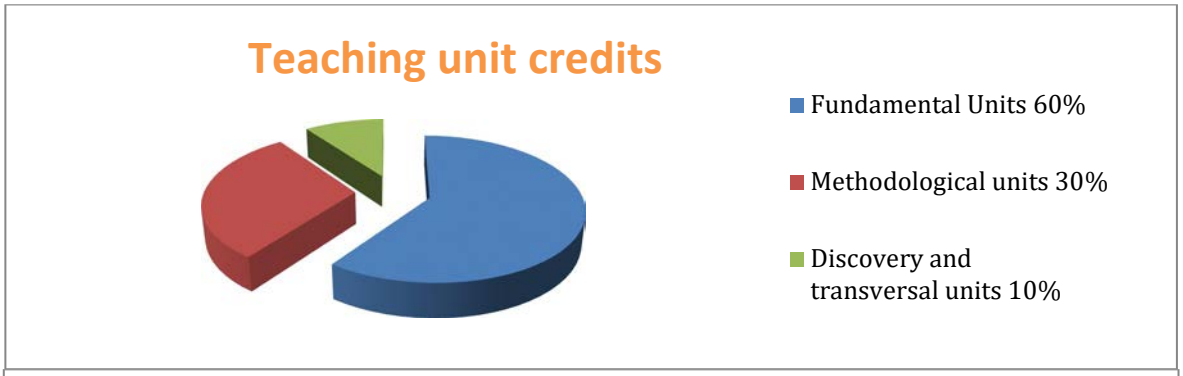
Semester 6

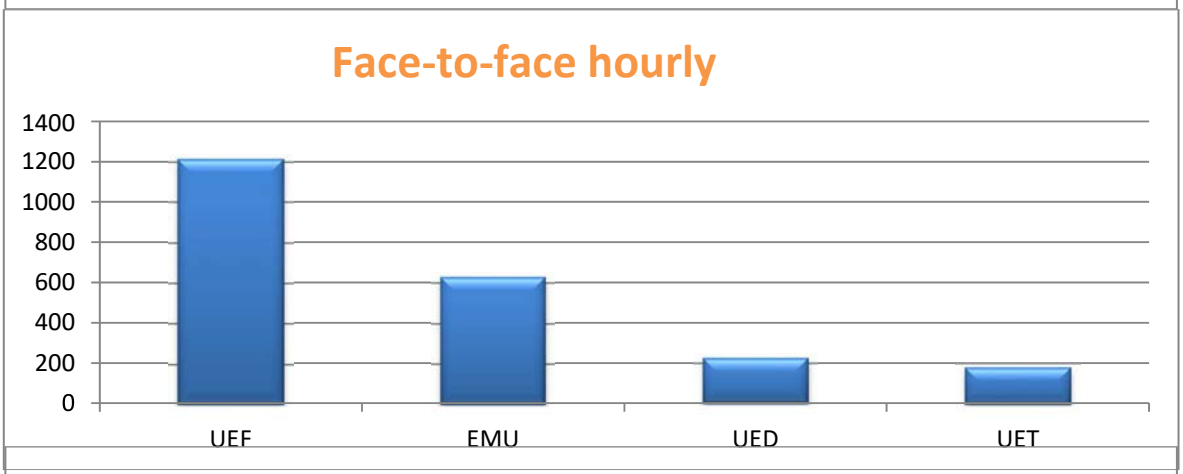
				p.m.	**a.m.**	**a.m.**				

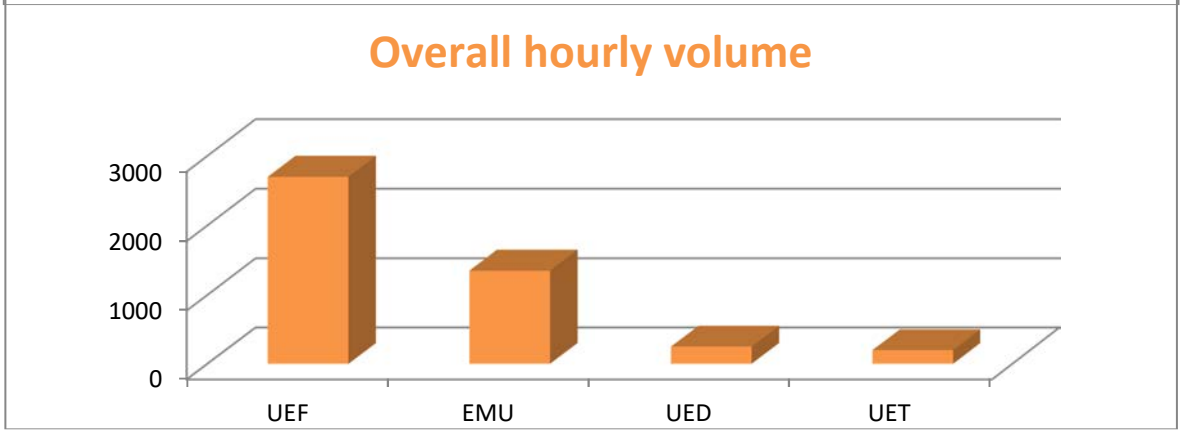
The evaluation methods presented in these tables are given for information purposes only; the establishment's training team may suggest other weightings.

Overall training summary :

EU V.H.	UEF	EMU	UED	UET	Total
Course	720h00	2:30 p.m.	225h00	180h00	1267h30
T.D.	495h00	67h30	---	---	562h30
TP	---	420h00	---	---	420h00
Personal work	1485h00	720h00	25:00	8:00 p.m.	2250h00
other (explain, list,)	---	---	---	---	---
Total	2700h00	1350h00	250h00	200h00	~~4500h00~~
Credits	108	54	10	8	180
% in credits for each EU	60%	30 %	10%		~~100%~~







III - Detailed program by subject

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

Teaching objectives

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

Recommended prior knowledge

Concepts of mathematics and physics.

Material content:

Math reminders (2 weeks)

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

Chapter 1. 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: UEF 1.1 Subject 3:
Structure of the VHS subject: 67h30
(Class: 3h00, TD: 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: UEM 1.1 Subject 1: TP Physics 1
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

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

Recommended prior knowledge
Concepts of mathematics and physics.

Material content:

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

- Methodology for presenting practical work 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: UEM 1.1 Subject 2: Chemistry TP 1
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives

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

Recommended prior knowledge

Basic concepts of Chemistry.

Material content:

1. Safety in the laboratory

2. Preparing solutions

3. Notions on uncertainty calculations applied to chemistry.

4. Acid-base dosage by colorimetry and pH 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: UEM 1.1 Subject 3: Computer science 1
VHS: 45h00 (Class: 1h30, TP: 1h30)
Credits: 4
Coefficient: 2

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

Recommended prior knowledge
Basic notions of web technology.

Material content:

Part 1. Introduction to Computer Science (5 weeks)

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

Part 2. Algorithm and program concepts (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: UEM 1.1
Subject 4: VHS writing methodology:
3:00 p.m. (Course: 1:00 a.m.)
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, Magazines)
-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:
10:30 p.m. (Class: 1:30 a.m.)
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: UET 3.1
Subject: Ethical and deontological dimension (the foundations)
VHS: 10:30 p.m. (Course: 1:30 a.m.)
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 – مهافم ةيساسأ (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 – تايعجرملا (2 weeks)

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

III. The University Franchise – مرحلا يعماجلا (3 weeks)

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

IV. University Values – ميقلا ةيعماجلا (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: UET 1.1 Subject 1: French language1 VHS: 10:30 p.m. (Course: 1:30 a.m.)
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 to develop their linguistic skills: listening, comprehension, oral and written expression. In addition, he must use this text to identify the grammatical structures that he will develop during the same class session. We recall here, by way of illustration, a set of grammatical structures which can be developed as examples. Of course, it is not a question of developing them all or in the same way. Some can be recalled and others can be detailed.

Examples of themes	Grammatical structures
Climate change 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,...'' 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 time of the indicator, Here, Future, passcompound, simple pass, 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: UET 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 somereadings:	**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: UEF 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: UEF 1.2 Subject
2: Physics 2
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

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

Recommended prior knowledge
Mathematics 1, Physics 1.

Material content:
Mathematical reminders: (1 week)
1- Elements of length, surface, volume in Cartesian, cylindrical, spherical coordinate systems. Solid angle, 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: UEF 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: UEM 1.2 Subject 1: Physics TP 2
VHS: 45h00 (TP: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives

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

Recommended prior knowledge

Mathematics 1, Physics 1.

Material content:

5 manipulations at least (3h00 / 15 days)

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

Evaluation method:

Continuous control: 100%

Semester: 2
Teaching unit: UEM 1.2 Subject 2: Chemistry TP 2
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives

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

Recommended prior knowledge

Thermodynamics.

Material content:

1. Ideal gas laws.
2. 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: UEM 1.2 Subject
3: Computer science 2
VHS: 45h00 (Class: 1h30, TP: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives

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

Recommended prior knowledge

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

Material content:

Chapter 1: Indexed variables **(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 modes
6- Reading and writing to a file

Computer science lab 2:

Plan a certain number of practical exercises to concretize the programming techniques seen during the course.
- 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: UEM 1.2
Subject 4: VHS presentation methodology:
3:00 p.m. (Course: 1:00 a.m.)
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: UED 1.2
Subject 1: Careers in Science and Technology 2 VHS:
10:30 p.m. (Class: 1:30 a.m.)
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: UET 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 to develop their linguistic skills: listening, comprehension, oral and written expression. In addition, he must use this text to identify the grammatical structures that he will develop during the same class session. We recall here, by way of illustration, a set of grammatical structures which can be developed as examples. Of course, it is not a question of developing them all or in the same way. Some can be recalled and others can be detailed.

Examples of themes	Grammatical structures
The pharmaceutical industry The food industry The agency national of employmentANEM 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 There China, a powereconomical Superconductivity	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. …

Cryptocurrency Advertising Autism	

Evaluation method:

Review: 100%.

Bibliographic references:

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

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

Fashion rating:
Review: 100%.

References:

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

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

Semester: 3
Teaching unit: UEF 2.1.1 Subject 1: Mathematics 3
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives:

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

Recommended prior knowledge

Mathematics 1 and Mathematics 2

Content of the material:

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

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

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

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

Chapter 5: Fourier Transform **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: UEF 2.1.1 Subject 2: Waves and Vibrations
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives

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

Recommended prior knowledge

Mathematics 2, Physics 1 and Physics 2

Content of the subject :

***Preamble**: This subject is split into two parts, the Waves part and the Vibrations part, which can be approached independently of the other. In this regard and due to the consistency of this subject in terms of content, it is advisable to approach this subject in this order: Waves and then Vibrations for students in the Electrical Engineering sectors (Group A). While for students of Groups B and C (Civil Engineering, Mechanical Engineering and Process Engineering), it is wise to start with Vibrations. In any case, the teacher is called upon, to do his best, to cover both parts. We remind you that this subject is intended for engineering professions in the Science and Technology Field. Also, the teacher is asked to go over all the parts of the course which require demonstrations or theoretical developments and to focus only on the application aspects. Furthermore, demonstrations can be the subject of auxiliary work to be asked of students as activities within the framework of the student's personal work. On this subject, consult the paragraph ''G- Student evaluation through continuous assessment and personal work'' present in this training offer.*

Part A: Vibration

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

Lagrange equations for a particle
- Lagrange equations
- Case of conservative systems
- Case of speed-dependent friction forces
- Case of an external force depending on time

System with several degrees of freedom.

Chapter 2: Free oscillations of systems with one degree of freedom **2 weeks**

Undamped oscillations
Free oscillations of damped systems

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

Differential equation
Mass-spring-damper system
Solution of the differential equation
- Harmonic excitation
- Periodic excitement

Mechanical impedance

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

Introduction
Systems with two degrees of freedom

Chapter 5: Forced oscillations of systems with two degrees of freedom **2 weeks**

Lagrange equations
Mass-spring-shock absorber system
Impedance
Applications
Generalization to systems with n degrees of freedom

Part B: Waves

Chapter 1: One-dimensional propagation phenomena **2 weeks**

Generalities and basic definitions
Propagation equation
Solution of the propagation equation
Sinusoidal traveling wave
Superposition of two progressive sinusoidal waves

Chapter 2: Vibrating strings **2 weeks**

Wave equation
Harmonic traveling waves
Free oscillations of a string of finite length
Reflection and transmission

Chapter 3: Acoustic waves in fluids **1 week**

Wave equation
Speed of sound
Sinusoidal traveling wave
Reflection-Transmission

Chapter 4: Electromagnetic waves **2 weeks**

Wave equation
Reflection-Transmission
Different types of electromagnetic waves

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: UEF 2.1.2 Subject 1:
Fluid mechanics VHS: 45h00
(Course: 1h30, TD: 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 material:

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

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

Chapter 2: Fluid Statics **4 weeks**

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

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

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

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

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

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

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

1- Fundamentals of fluid mechanics 6thEdition, 2009, BR Munson, DF Young TH Okiishi, WW Huebsch 6thPublished by John Wiley & Sons
2- Fluid mechanics, YA Cengel - 2010 - Tata McGraw-Hill Education
3- Fluid Mechanics Frank M. White Fourth Edition 2003 McGraw-Hill
4- Fluid mechanics and hydraulics 2nd edition, Ronald v. Giles, Jack B Evett, Cheng Liu, McGraw-Hill
5- S. Amiroudine, JL Battaglia, 'Fluid mechanics Course and corrected exercises'Ed. Dunod
6- R. Comolet, 'Experimental fluid mechanics', Volume 1, 2 and 3, Ed. Masson et Cie.
7- R. Ouziaux, 'Applied fluid mechanics', Ed. Dunod, 1978
8- BR Munson, DF Young, TH Okiishi, 'Fundamentals of fluid mechanics', Wiley & sons. RV Gilles, 'Fluid mechanics and hydraulics: Courses and problems', Schaum Series, Mc Graw Hill, 1975.

Semester: 3
Teaching unit: UEF 2.1.2 Subject 2:
Rational mechanics VHS: 45h00
(Course: 1h30, TD: 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

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

Content of the material:

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

Chapter 2: General and basic definitions **2 weeks**

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

Chapter 3: Static. **3 weeks**

Axioms of statics
Connections, supports and reactions
Axiom of connections
Equilibrium conditions:
Contributing forces
Parallel forces
Plane forces

Chapter 4: kinematics of the rigid solid. **3 weeks**

Brief reminders of kinematic quantities for a material point.
Solid body kinematics
Translational movement
Rotational movement around a fixed axis
Plane movement
Compound movement.

Chapter 5: Mass geometry. **3 weeks**

Mass of a hardware system
Continuous system
5.1.2. Discreet system
Integral formulation of the center of mass

5.2.1. Definitions (linear, surface and volume cases)
Discrete center of mass formulation
GULDIN's theorems
Moment and product of inertia of solids
Inertia tensor of a solid
Special cases
5.42 Main axes of inertia
Huyghens' theorem
Moment of inertia of solids relative to any axis.

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

Brief reminders about dynamic quantities for a material point.
Element of rigid body kinetics:
Amount of movement
Cinematic moment
Kinetic energy
Dynamics equation for a solid body
Angular momentum theorem
Kinetic energy theorem
Applications:
Pure translation case
Case of rotation around a fixed axis
Combined case of translation and rotation.

Evaluation mode :

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

Bibliographic references:

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

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

Semester: 3
Teaching unit: UEM 2.1 Subject 1:
Probability & Statistics VHS: 45h00
(Lecture: 1h30, TD: 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)**

Notions of population, sample, variables, modalities
Different types of statistical variables: qualitative, quantitative, discrete, continuous.

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

Number, Frequency, Percentage.
Cumulative headcount, Cumulative frequency.
Graphical representations: bar chart, circular chart, bar chart. Polygon of numbers (and frequencies). Histogram. Cumulative curves.
Positional characteristics
Dispersion characteristics: extent, variance and standard deviation, coefficient of variation.
Shape characteristics.

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

Data tables (contingency table). A cloud of dots.
Marginal and conditional distributions. Covariance.
Linear correlation coefficient. Regression line and Mayer line.
Regression curves, regression corridor and correlation ratio.
Functional fit.

Part B: Probabilities

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

Arrangements
Combinations
Permutations.

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

Algebra of events
Definitions
Probable spaces
General probability theorems

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

Conditioning,
Independence,

Bayes formula.

Chapter 4: Random variables **1 week**

Definitions and properties,
Distribution function,
Expectation,
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: UEM 2.1 Subject 2: Computer science 3
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Subject objectives

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

Recommended prior knowledge

The basics of programming acquired in computer science 1 and 2

Content of the subject :

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

Evaluation mode :

Continuous control: 100%.

Bibliographic references:

(Depending on the availability of documentation at the establishment level, websites...etc.)
1- Computer science: Programming and simulation in Scilab 2014 - Authors: Arnaud Bégyn, Jean-Pierre Grenier, Hervé Gras.

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

Semester: 3
Teaching unit: UEM 2.1 Subject
3: VHS technical drawing:
22h30 (TP: 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 knowledge (brief description of the knowledge required to be able to follow this course – Maximum 2 lines).

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

Content of the subject

Chapter 1: General. **2 weeks**

Usefulness of technical drawings and different types of drawings.
Drawing materials.
Standardization (Line types, Writing, Scale, Drawing and folding format, Cartridge, etc.).

Chapter 2: Elements of descriptive geometry **6 weeks**

Notions of descriptive geometry.
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.
Views: Choice and arrangement of views – Dimensions – Slope and conicity – Determination of the 3rd view from two given views.
Method of executing a drawing (layout, 45° straight line, etc.)
Application exercises and evaluation (TP)

Chapter 3: The outlook **2 weeks**

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

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

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

Chapter 5: Quotation **2 weeks**

General principles.

Rating, tolerance and adjustment.
Application exercises and evaluation (TP).

Chapter 6: Concepts on definition and overall drawings and parts lists.

1 week

Application exercises and evaluation (TP).

Evaluation mode :

Continuous control: 100%.

Bibliographic references:

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

1. Industrial designer's guide Chevalier A. Edition Hachette Technique;
2. Technical drawing 1erdescriptive geometry part Felliachi d. and Bensaada s. Edition OPU Algiers;
3. Technical drawing 2erpart industrial design Felliachi d. and bensaada s. Edition OPU Algiers;
4. First notions of technical drawing Andre Ricordeau Edition Andre Casteilla;
5. **المدخل إلى الرسم الصناعي** ماجد عبد الحميد ديوان المطبوعات الجامعية الجزائر
6. **مبادئ أساسية في الرسم الصناعي** عمر أبو حنيك المعهد الجزائري للتقييس والملكية الصناعية طبع الحميد ديوان المطبوعات الجامعية الجزائر

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

Semester: 3
Teaching unit: UEM 2.1 Subject 4:
TP Waves and Vibrations VHS:
3:00 p.m. (TP: 1:00)
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: UED 2.1 Subject 1: Basic VHS technology:
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 knowledge

Content of the subject

Chapter 1: Materials **3 weeks**

Metals and alloys and their designations
Plastic materials (polymers)
Composite materials
Other materials

Chapter 2: Processes for obtaining parts without material removal 4 Weeks

Casting, Forging, stamping, Rolling, Wire drawing, extrusion…. Etc
Cutting, folding and stamping, etc.
Sintering and powder metallurgy
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:

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

- Manual of mechanical technology, Guillaume SABATIER, et al Ed. Dunod.
- Memotech: materials production and machining BARLIER C. Ed. Casteilla
- Industrial sciences MILLET N. ed. Casteilla
- Memotech: Industrial technologies BAUR D. et al, Ed. Casteilla
- Dimensional metrology CHEVALIER A. Ed. Delagrave
- Drilling, milling JOLYS R and LABELL R. Ed. Delagrave
- Guide to mechanical manufacturing PADELLA P. Ed. Dunod
- Technology: first part, Bensaada S and FELIACHI d. Ed. OPU Algiers

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

Teaching objectives

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

Recommended prior knowledge

Trigonometry, optical and other.

Content of the subject

Chapter 1: General information on metrology **2 weeks**

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

Chapter 2: The international SI measurement system **3 weeks**

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

Chapter 3: Metrological characteristics of measuring devices **6 weeks**

Error and uncertainty (Accuracy, precision, fidelity, repeatability, reproducibility of a measuring device
Classification of measurement errors
Gross value;
Systematic error;
Corrected raw value.
Accidental errors
Random errors;
spurious errors;
Estimated systematic errors.
Confidence interval;
Technical uncertainty;
Total measurement uncertainty;
Complete measurement result;
Identification and interpretation of the specifications of a definition drawing for inspection;
Basics of calibers, gauges and simple measuring instruments.

Chapter 4: Measurement and control **4 weeks**

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

Evaluation mode :
Final exam: 100%.

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

- Manual of mechanical technology, Guillaume SABATIER, et al Ed. Dunod.
- Memotech: materials production and machining BARLIER C. Ed. Casteilla
- Industrial sciences MILLET N. ed. Casteilla
- Memotech: Industrial technologies BAUR D. et al, Ed. Casteilla
- Dimensional metrology CHEVALIER A. Ed. Delagrave
- Drilling, milling JOLYS R and LABELL R. Ed. Delagrave
- Guide to mechanical manufacturing PADELLA P. Ed. Dunod
- Technology: first part, Bensaada S and FELIACHI d. Ed. OPU Algiers

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Semester: 3
Teaching unit: UET 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, comparatives, following and giving instructions, identifying things.
- Use of numbers, symbols, equations.
- Measurements: Length, surface, volume, power...etc.
- Describe scientific experiments.
- Characteristics of scientific texts.

Evaluation mode :

Final exam: 100%.

Bibliographic references:

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

Semester: 4
Teaching unit: UEF 2.2.1 Subject 1:
General hydraulics VHS: 45h00
(Course: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives :
The objective of this subject is to provide the bases necessary for understanding and calculating the phenomena present in applied hydraulics, water and environmental engineering, in particular those encountered in drinking water, sanitation and rivers.

Recommended prior knowledge :
General notions of MDF

Content of the subject :

Chapter 1 HYDROSTATIC **(4 weeks)**

Fundamental equation of Hydrostatics
Absolute pressure and relative pressure
Equation of isobaric surfaces
Pascal's principle
Pressure measurement
Maximum vacuum value
Relative balance equations
Action of pressure forces on solid walls
Balance of floaters

Chapter 2 FLUID KINEMATICS **(4 weeks)**

Methods for studying the motion of a fluid
2-2 Acceleration of a fluid particle

2-3 Classification of flows 2-4
Continuity equation
2-5 Analysis of movement of a fluid particle 2-6
Vortex flows

Chapter 3 PERFECT FLUIDS DYNAMICS **(4 weeks)**

3-1 General equation of motion of a perfect fluid 3-2
Integration of equations of motion
Bernoulli equation
Pressure measurement (static pressure, total pressure, dynamic pressure)* 3-5
Flow and speed measurement

Chapter 4 REAL FLUID DYNAMICS **(3 weeks)**

Reynolds experiment
Characteristics of laminar flows* 4-3
Characteristics of turbulent flows 4-4 Equation of motion of a real fluid

Bernoulli equation for real fluid flow
Integration of Navier Stokes (NS) equations in the case of one-dimensional flow
Bernoulli equation applied to a current tube 4-8 General
expression of pressure losses

Evaluation mode :
Continuous monitoring: 40%; Exam: 60%.

References:

1- Carlier, M., (1980). General and applied hydraulics, Collection of the Department of Electricity Studies and Research of France, Volume 14, 2nd edition, Eyrolles, Paris, France
2- Graf Walter H., Altinakar M. (1998). Hydrodynamics an introduction, Collection: Civil engineering treatise, Presses Polytechniques et Universitaires Romandes
3- Hug M. (1975). Applied fluid mechanics, Edition Masson, Paris
4- Kremenetski N., Schterrenliht D., Alychev V., Yakovleva L. (1984). Hydraulics, MIR-MOSCOW edition
5- Laborde JP (2007). Elements of general hydraulics Edition polytechnic school of the University of Nice - Sophia Antipolis
6- Lencastre, A. (1999). General hydraulics, Editions Eyrolles, first edition, Paris. 7-

Ouragh Y. (1994). Forced flow in hydraulics, Volume 1, Edition OPU, Algiers

8- Ouragh Y. (1994). Forced flow in hydraulics, Volume 2, OPU Edition, Algiers

Semester: 4
Teaching unit: UEF 2.2.1 Subject 2: Hydrology I
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives :
The student will be able to understand the components of the hydrological cycle, their measurement, their interactions and their importance, as well as understand the functioning and hydrological behavior of various systems (watersheds).

Recommended prior knowledge :
Knowledge of mathematics, topography and probability and statistics

Content of the subject :

Chapter 1. Introduction to hydrology (2 weeks)
- The water cycle
- The hydrological balance

Chapter 2. The watershed (4 weeks)
- Definition of watershed
- Shape characteristics
- The characteristics of the hydrographic network
- Physiographic factors of a watershed

Chapter 3. Evaporation and infiltration (3 weeks)
- Definition,
- Measurement and calculation,

Chapter 4. Precipitation (3 weeks)
- Precipitation classification
- Precipitation measurement

Chapter 5. Hydrometry (3 weeks)
- Flow measurement
  - Gauging station
  - Station calibration

Evaluation mode :
Review: 100%.

References:

- Audenet M.: hydrometry applied to watercourses, Eyrolles, 454p.
- Réménièras G.: The hydrology of the engineer, Eyrolles, 465p.
- Dubreuil P. (1974): Introduction to Hydrological Analysis, Masson et Cie Edition Paris
- Gilman, CS (1964: Rainfall, section 9 in Handbook of Hydrology, VT Chow Editor, Mc Braw Hill Book Company New York
- Grisoni, M., Decrous, J. (1972): Course in Surface Hydrology, Introduction to Hydrology, SES, State Secretariat for Hydraulics, Algiers.
- Roche M. (1963): Surface hydrology, Gauther-Villars Edition Paris.
- Sari Ahmed: Introduction to surface hydrology, University of Bab Ezzouar, Algiers. Edition Distribution Houma

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

Teaching objectives :

This course covers the differential and integral calculus of complex functions of a complex variable. The student 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: 4
Teaching unit: UEF 2.2.2 Subject 2:
Digital methods VHS: 45h00 (Course:
1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

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

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

Content of the subject :

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

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

Chapter 2: Polynomial interpolation (2 weeks)

1. General Introduction,
2. Lagrange polynomial,
3. Newton polynomials.

Chapter 3 Function Approximation: (2 weeks)

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

Chapter 4: Digital integration (2 weeks)

1. General Introduction,
2. Trapezoid method,
3. Simpson method,
4. Quadrature formulas.

Chapter 5: Solving Ordinary Differential Equations (2 weeks)
(problem of the initial condition or of Cauchy).

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

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

1. Introduction and definitions,
2. Gauss method and rotation,

3. LU factorization method,
4. ChoeleskiMM factorization methodt,
5. Thomas algorithm (TDMA) for tri-diagonal systems.

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

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

Evaluation mode :
Continuous monitoring: 40%; Exam: 60%.

References:

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

Semester: 4
Teaching unit: UEF 2.2.3 Subject 1:
Resistance of VHS materials: 45h00
(Lecture: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives :
Know the methods for calculating the resistance of construction elements and determine the variations in the shape and dimensions (deformations) of the elements under the action of loads.

Recommended prior knowledge :
Analysis of functions; rational mechanics.

Content of the subject :

Chapter 1: INTRODUCTIONS AND GENERAL (2 weeks)
- Goals and Assumptions of Material Strength
- Classification of solids (beam, plate, shell)
- Different types of loads
- Connections (supports, fittings, ball joints)
- General principle of balance – Balance equations
- Principles of Cutting – Elements of Reduction
  - Definitions and sign conventions of: Normal force N, Shear force T, Bending moment M

Chapter 2: TRACTION AND COMPRESSION (3 weeks)
- Definitions
- Normal tensile and compressive stress
- Elastic deformation in traction/compression
- Tensile/compressive strength condition

Chapter 3: SHEAR (2 weeks)
- Definitions
- Simple shear – pure shear
- Shear stress
- Elastic deformation in shear
- Shear strength condition

Chapter 4: GEOMETRIC CHARACTERISTICS (3 weeks)
STRAIGHT SECTIONS
- Static moments of a straight section
- Moments of inertia of a straight section
- Formulas for transforming moments of inertia

Chapter 5: TWIST (2 weeks)
- Definitions
- Tangential or sliding stress
- Elastic torsional deformation

Torsion resistance condition

Chapter 6: SIMPLE PLANE FLEXION (3 weeks)

Definitions and assumptions
Cutting force, bending moments
Diagram of shear forces and bending moments
Relationship between bending moment and shear force
Deformation of a beam subjected to simple bending (arrow)
Calculation of constraints and sizing

Evaluation mode :

Continuous monitoring: 40%; Exam: 60%.

References:

- Mechanics for engineers – statics. Ferdinand P. Beer and Russell Johnston, Jr., McGraw-Hill, 1981.
- Resistance of materials, P. STEPINE, Editions MIR; Moscow, 1986.
- Strength of Materials 1, William A. Nash, McGraw-Hill, 1974.
- Resistance of materials, S. Timoshenko, Dunod, 1986

Semester: 4
Teaching unit: UEM 2.2 Subject 1:
Computer-assisted drawing VHS: 22h30
(TP: 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.)
Introduction and history of the DAO;
Configuration of the chosen software (interface, shortcut bar, options, etc.);
Software reference elements (software help, tutorials, etc.);
Backup of files (part file, assembly file, drawing file, backup procedure for delivery to the teacher);
Communication and interdependence between files.

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

3. 3D MODELING **(3 weeks)**
Concepts of planes (front plane, right plane and top plane);
Basic functions (extrusion, material removal, revolution):
Display functions (zoom, multiple views, multiple windows etc.):
The modification tools (Delete, Shift, Copy, Mirror, Adjust, Extend, Move):
Creating a sectional view of the model.

4. LAYOUT OF THE 3D MODEL **(3 weeks)**
Editing the plan and the title block:
Choice of views and drawing:
Object skins and properties (hatching, dimensioning, text, tables, etc.)

5. ASSEMBLIES **(2 weeks)**
Assembly constraints (parallel, coincidence, coaxial, fixed, etc.):
Creation of assembly drawings:
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: 4
Teaching unit: UEM 2.2 Subject 2:
Fluid Mechanics TP VHS: 22h30
(TP: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives :
The student puts into practice the knowledge in the fluid mechanics subject taught in S3

Recommended prior knowledge :
Subjects: fluid mechanics and physics 1.

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

Evaluation mode :
Continuous control: 100%.

Semester: 4
Teaching unit: UEM 2.2 Subject 3:
TP Digital methods VHS: 10:30 p.m.
(TP: 1:30 hrs)
Credits: 2
Coefficient: 1

Teaching objectives :
Programming of different numerical methods with a view to their applications in the field of mathematical calculations using a scientific programming language (matlab, scilab, etc.).

Recommended prior knowledge :
Numerical method, Computer science 2 and computer science 3.

Content of the subject :

1. Solving nonlinear equations **(3 weeks)**
   - Bisection method
   - Fixed point method
   - Newton–Raphson method
2. Interpolation and approximation **(3 weeks)**
   - Newton interpolation
   - Chebyshev approximation
3. Digital integrations **(3 weeks)**
   - Rectangle Method
   - Trapeze method
   - Simpson method
4. Differential equations **(2 weeks)**
   - Euler's method
   - Runge-Kutta methods
5. Systems of linear equations **(4 weeks)**
   - Gauss-Jordon method
   - Crout decomposition and LU factorization
   - Jacobi method
   - Gauss-Seidel method

Evaluation mode :
Continuous control: 100%.

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: UEM 2.2 Subject 4: TP
Resistance of VHS materials: 15h00
(TP: 1h00)
Credits: 1
Coefficient: 1

Teaching objectives :
Apply the different stresses studied in the materials resistance module and determination of material characteristics based on simple mechanical tests.

Recommended prior knowledge :
Resistance of materials, materials sciences.

Content of the subject :

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

Evaluation mode :
Continuous control: 100%.

Semester: 4
Teaching unit: UEM 2.2 Subject 5: TP Hydrology
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives :

The aim will be to present to students the hyro-climatological instruments that hydrologists can use to analyze and evaluate hyro-climatological factors: air temperature, absolute and relative air pressure, precipitation, humidity, evaporation, evapotranspiration, infiltration and runoff.

Recommended prior knowledge :

Hydrology course.

Content of the subject :

- Hydro-climatic measurements in a meteorological station
- Precipitation measurement
- Flow measurement
- Evapotranspiration
- Infiltration
- Sediment measurement

Evaluation method:

Continuous control: 100%.

Semester: 4
Teaching unit: UED 2.2 Subject 1: Geology
VHS: 10:30 p.m. (lesson: 1:30 a.m.) 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)
- Definition of Geology
- Paleontology
- Origin of the earth
- Geology Division

Chapter 2: Minerals and rocks (4 weeks)
- Concept of mineralogy
- Loose rocks
- Eruptive rocks
- Sedimentary rocks
- Metamorphic rocks

Chapter 3: Action of different elements on rocks (3 weeks)
- Action of air on rocks
- Action of water on rocks
- Action of glaciers on rocks

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

Chapter 5: Adaptation of geological techniques to the needs of civil engineering (3 weeks)
- Geological cartography
- The use of graphic constructions
- Geological survey of discontinuity surfaces
- 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: 4
Teaching unit: UED 2.2 Subject 2: Topography1
VHS: 10:30 p.m. (lesson: 1:30 a.m.) Credits: 1
Coefficient: 1

Teaching objectives :

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

Recommended prior knowledge :

Subjects: 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
- Mistakes and errors

Chapter 2: Measuring distances **(3 weeks)**
- Direct measurement of distances
- Alignment methods and precisions
- Measuring practice
- Indirect distance measurements

Chapter 3: Measuring Angles **(3 weeks)**
- Principle of operation of a theodolite
- Setting up a theodolite: Adjustment; Reading
- Reading horizontal angles
- Reading vertical angles.

Chapter 4: Determination of surfaces **(3 weeks)**
- Calculating the area of a polygon
- Determination of the surfaces of the contours represented on the plan
- Planimeter and surface measurement

Chapter 5: Direct and Indirect Leveling **(3 weeks)**
- Direct Leveling
- Indirect Leveling

Evaluation mode :

Review: 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 Bep Tech.geo T1, 2006
3 Dubois, F. and Dupont, G. (1998) precise topography, Principles and methods, Editions Eyrolles
4 Herman, T. (1997a) Parameters for the ellipsoid. Edition Hermès, Paris
5 Herman, T. (1997b) Parameters for the sphere. Edition Dujardin, Toulouse 55 pages
6 Meica (1997), Digital levels, Mieca Geosystems, Paris
7 Tchin, M. (1976) Applied topography, Course at the National School of Arts and Industries of Strasbourg, Specialty Topography.

Semester:4
Teaching unit: UET2.2
Subject: Expression, information and communication techniques VHS: 10:30 p.m. (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: UEF 3.1.1 Subject 1:
General hydraulics II VHS: 45h00
(Course: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The objective of this subject is to provide the bases necessary for understanding and calculating the phenomena present in applied hydraulics, water and environmental engineering, in particular those encountered in sanitation, canals and rivers.

Reminders on the main concepts of MDF and general hydraulics (2 weeks)
- CH 2: Flows through orifices and nozzles (3 weeks)
- CH 3: Flows through spillways (3 weeks)
- CH 4: Calculation of pipes under load (4 weeks)
- CH 5: Concepts on free surface flows (uniform and non-uniform permanent regimes) (3 weeks)

Recommended prior knowledge:

Basic knowledge, Fluid Mechanics and General Hydraulics.

Material content:

Reminders **(2 weeks)**
Laminar flow; Turbulent flow;

Chapter 1. Momentum equation **(4 weeks)**Momentum theorem; Integral equation of momentum; Momentum correction coefficient, Application of the momentum theorem; Reaction of a jet; Action of a jet on a plate; Action of a throw on an elbow.

Chapter 2. Flows through orifices and nozzles **(3 weeks)**
Flows through Orifices; Flows through nozzles.

Chapter 3. Flows in loaded pipes **(3 weeks)**
Pipe networks including a pump or turbine; Mesh networks; branched networks.

Chapter 4. Free surface flow. **(3 weeks)**Classification of free surface flows; Basic equation of free surface flow; Uniform flow conditions; Hydraulic parameters of channel cross section.

Evaluation mode:

Continuous control: 40%; Exam: 60%.

Bibliographic references :

1. Carlier, M.,"General and applied hydraulics", Collection of the direction of electricity studies and research in France, Volume 14, 2nd edition, Eyrolles, Paris, France.1980.
2. Graf Walter H., Altinakar M,"Hydrodynamics an introduction", 1998.
3. Hug M., “Applied fluid mechanics”, Edition Masson, Paris. 1975.
4. Kremenetski N., Schterrenliht D., Alychev V., Yakovleva L.,"Hydraulics", Edition MIR-Moscow, 1984.

5. Laborde JP,"Elements of general hydraulics", Edition polytechnic school of the University of Nice – SophiaAntipolis, 2007.
6. Lencastre, A, “General hydraulics”, Editions Eyrolles, first edition, Paris, 1999.

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

Teaching objectives:
Allows students to learn about hydrological phenomena and their genesis and the bases for the estimation and evaluation of parameters linked to these phenomena (precipitation, river flow, floods, etc.). Hydrology is of paramount importance in hydraulic studies.

Recommended prior knowledge:
Probability and statistics, hydrology I.

Material content:

Chapter 1. Concepts of probability and statistics **(4 weeks)**
Descriptive statistics ; frequency analysis

Chapter 2. Statistical and probabilistic study of precipitation
(4Weeks) Analysis and representation of rainfall data relating to a station; study of homogeneity of rainfall series

Chapter 3. Study of river flows
(3Weeks) Measurement of flow rates in rivers; Presentations of data relating to flow rates; Study of the flow regime

Chapter 4. Study of flood flows
(4Weeks) Basic data ; Probabilistic methods; So-called empirical methods; Hydrometeorological methods; analysis of flood hydrographs.

Evaluation mode:
Continuous control: 40%; Exam: 60%.

Bibliographic references:
1. Réméniéras G,"Engineering Hydrology", Ed. Eyrolles.
2. José Lamas,"General hydrology", Ed. Gaëtan Morin.
3. Dubreuil P,"Initiation to hydrological analysis", Ed. Masson and Cie, 1997.
4. Banton, Bangoy, "Multi-science environmental hydrogeology of groundwater", Presses de l'Université du Québec.

Semester: 5
Teaching unit: UEF 3.1.1 Subject 3: Hydrogeology
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

The teaching will aim to give students knowledge of the hydrogeological characteristics of aquifers and concepts on pumping tests.

Recommended prior knowledge:

General hydraulics, Topography, geology.

Material content:

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

Chapter 2. Hydrogeological characteristics of different types of aquifers **(3 weeks)**

Chapter 3. Concept of aquifers and different types of water tables **(3 weeks)**
Tablecloths in porous media; layers in cracked environments.

Chapter 4. Fundamental notions of hydrodynamics in porous media **(4 weeks)**
Hydrogeological applications of the notions of loads and Bernoulli's theorem; pressure losses in porous media Darcy experiment; application to reading hydrotype and transmissivity maps; permeability; generalization of Darcy's law; continuity equation; general equation of hydrodynamics in porous media.

Chapter 5. Groundwater flows towards catchment structures **(4 weeks)**
Pumping testing practice: introduction; steady-state or permanent regime; Dupuit formula; different graphics and settings; non-equilibrium or transitory regime; Theis formula; Jacob's formula.

Evaluation mode:

Review: 100%.

Bibliographic references:

1. Braillon, J –M,"Hydrogeology: practical work. Exercises". Algiers, National Agronomic Institute, 1981.
2. Castany, Gilbert, "Hydrogeology: principles and methods", Paris, Dunod, 1998.
3. Gilli, “Hydrogeology: objects, methods, applications”, E. Paris, Dunod, 2004.
4. Metreveli,"Hydrogeology and transport phenomena: collection of problems with corrections", Algiers: OPU, 1993.
5. G. De Marsily, “Quantitative hydrogeology”, Paris, Masson, 1981.
6. Fetter, CW, "Applied Hydrogeology", New Jersey, Prentice-Hall, 2001.
7. Fetter, CW, "Applied hydrogeology", USA: Pearson education, 2001.

Semester: 5
Teaching unit: UEF 3.1.2 Subject 1:
Hydraulic structures VHS: 45h00
(Course: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The student will be able to master the sizing calculations of hydraulic structures.

Recommended prior knowledge:

The student must have knowledge in the fundamental subjects namely mathematics, physics, fluid mechanics and water distribution.

Material content:

Part A: Dams

Chapter 1. Generalities, statistics, roles and ruptures **(2 weeks)**

Chapter 2. Different types of dams and choice of typical profile **(2 weeks)**

Chapter 3. Determination of the height of the dam and sizing of the reservoir **(2 weeks)**

Chapter 4. Sizing of dam components and definition of the template **(1 week)**

Chapter 5. Summary sizing of ancillary works and constructive measures **(2 weeks)**

Chapter 6. Flood spillways **(2 weeks)**

Intake tower and hydromechanical equipment; Bottom drain; Temporary diversion and inspection galleries.

Part B: Water intakes

Chapter 1. Collection methods **(1 week)**

Flows taken; Arrangement of socket points; Capture

Chapter 2. Diversion works **(2 weeks)**

Principle of derivation; Summary designs

Chapter 3. Channels and design principles - Stability of watercourses **(1 week)**

Evaluation method:

Continuous control: 40%; Exam: 60%.

Bibliographic references:

1. P. Gourdault Montagne,"Riverside rights, properties, uses, protection of watercourses", Édition tec et doc, 1994.
2. Marc Soutter, André Mermoud, André Musy," Water and soil engineering, Processes and management, Edition Presses Polytechniques et Universitaires Romandes (PPUR), 2007.
3. Richard McCuen, "Hydrologic Analysis and Design", Ed. Pearson Education, Prentice Hall, 2004.
4. R. Therond, “Research on the impermeability of reservoir lakes in karst countries”, Edition EDF, 1973.

Semester: 5
Teaching unit: UEF 3.1.2 Subject 2: 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 in-situ and laboratory identification tests and control their compaction.

Recommended prior knowledge :

Fundamental subjects of S1 and S2

Content of the subject :

Chapter 1. Introduction to soil mechanics (3 weeks) Purpose of soil mechanics (history and field of application), Definitions of soils, Origin and formation of soils, Structure of soils (grainy soils and fine soils).

Chapter 2. Soil identification and classification (3 weeks) Physical characteristics, Particle size characteristics, Consistency of fine soils (Atterberg limits), Geotechnical classification of soils.

Chapter 3. Soil compaction (3 weeks)
Compaction theory, Laboratory compaction tests (Proctor and CBR tests), Special in-situ compaction equipment and processes, Compaction requirements and control.

Chapter 4. Soil hydraulics (3 weeks)
Water flow in soils: speed, gradient, flow, Darcy's law, permeability; Flow networks: use for calculation of pore pressure and flow rate; Flow forces: principle of effective stresses, Boulance, Renard; Water table reduction by pumping: exploitation of the results in steady state.

Chapter 5: soil deformations: Settlement and Consolidation (3 weeks)
General information and recognition methods
Settlements (different settlements, causes, calculations of settlements, etc.) Compressibility
Consolidation theory

Evaluation mode :

Continuous control: 40%; Exam: 60%

Bibliographic references:

1. Sizing of foundations: superficial foundations, deep foundations, gravity retaining walls, Scientific and Technical Building Center, 2011.
2. Guy Sanglerat, "Course in soil mechanics and foundations" 1.2 Dunod edition, 1983.
3. Denis Tremblay and Vincent Robitaille, "Soil mechanics: Theory and practice", Edition, 2014.
4. François Schlosser, “Elements of soil mechanics”, Presse Ponts et Chaussées, 1997.
5. Roberto Nova,"Foundations of soil mechanics", Edition Hermès Lavoisier, 2004.

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

Teaching objectives:

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

Recommended prior knowledge:

Knowledge acquired in the subject Topography.

Material content:

TP 1: Measuring angles and distances.
Angles: horizontal and vertical.
Distances: Direct method, Indirect method.

TP 2: Polygonation
Recognition of locations, Choice of stations, Location sketches, Measurements (Angles and distances), Calculations and report.

TP 3: Tacheometry
Establishment of the field sketch, Survey of details by radiation, Calculations and report.

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

TP 5: Lateral oblique measurements
Establishment of the field sketch, Survey of details by radiation, Calculations and report.

TP6: Implementation
Implementation of alignments: Preliminary calculations (Office), Implementation on the ground, Implementation of a bend, Preliminary calculations (Office), Implementation on the ground, Implementation of a building.

Evaluation mode:

Continuous control: 100%.

Bibliographic references:

1. L. Lapointe, G. Meyer,"Topography applied to public works, buildings and urban surveys", Eyrolles, Paris, 1986.
2. R. D'Hollander, "General topographies, volumes 1 and 2", Eyrolles, Paris, 1970.

M. Brabant, "Mastering topography", Eyrolles, Paris, 2003.

Semester: 5
Teaching unit: UEM 3.1
Subject 2: VHS water treatment and purification: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4

Teaching objectives:

In this subject the student will learn the different modes and stages of treatment and purification of drinking water and wastewater.

Recommended prior knowledge :

Concepts of chemistry and biological sciences.

Material content:

Part 1: Water treatment

Chapter 1. General and standards (2 weeks)
Characteristics of natural waters; Water quality standards; Water uses and their requirements; Typical diagram of a treatment station.

Chapter 2. Clarifying treatment (1 week)
Coagulation – flocculation; decantation; filtration.

Chapter 3. Complementary treatments (2 weeks) Disinfection; Adsorption and ion exchange; Deironization – demanganization; Decarbonization; Defluoridation.

Part 2: Wastewater treatment

Chapter 1. Pollution parameters and discharge standards (2 weeks) Pollution parameters; Assessment of water pollution; Discharge standards; Concept of inhabitant equivalent

Chapter 2. Pretreatments (2 weeks)
Screening; Desanding; de-oiling; Fat separators.

Chapter 3. Primary treatments (2 weeks)
Decantation processes; Decantation with chemical reagents.

Chapter 4. Secondary treatments (2 weeks) Biological purification with suspended biomass (Activated sludge); Biological purification with fixed biomass; Biological purification with free biomass

Chapter 5. Complementary treatments (2 weeks) Nitrification and denitrification; Physico-chemical elimination of ammonia; Disinfection; Dephosphorization; Filtration; Adsorption on activated carbon.

Evaluation method:

Continuous control: 40%; Exam: 60%

Bibliographic references:

1. Olivier Atteia, “Chemistry and groundwater pollution”, Tec et Doc edition, 2005, 400 p.
2. Laura Sigg, Philippe Behra and Werner Stumm, "Chemistry of aquatic environments - Chemistry of natural waters and interfaces in the environment", Dunod edition, 2006,
3. Jean Rodier, "Water Analysis: Natural waters, waste water, sea water", Edition Dunod.
4. F. Edeline, "Biological water purification: Theory and technology of reactors", Ed. Cebedoc, Liège, 1993, 298 p.
5. A. Gaid, “Biological purification of urban wastewater”, Volume 1, Ed. OPU, Algiers, 1984, 261 p.
6. A. Gaid, “Biological purification of urban wastewater”, Volume 2, Ed. OPU, Algiers, 1984, 234 p.
7. C. Gomella and H. Guerree, "Wastewater in urban or rural areas, Volume 2: Treatment", Ed. Eyrolles, 1982, Paris, 260 p.
8. Anonymous, “Water technical guide (Volume 1 and 2)”, Ed. Degremont-Suez, 10th edition, 2005, 1904 p.

Semester: 5
Teaching unit: UEM 3.1 Subject 3:
Soil Mechanics TP VHS: 22h30
(TP: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives :

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

Recommended prior knowledge :

Soil mechanics course.

Content of the subject :

TP 1: Measurement of weight characteristics (density – water content).

TP 2: Measurement of consistency parameters (Atterberg limits).

TP 3: Particle size analysis (by sieving and sedimentometry).

TP 4: Measurement of compaction and bearing characteristics (Proctor and CBR tests).

TP 5: In-situ density measurement (membrane densitometer test).

TP 6: Soil permeability (Constant head and variable head permeameters).

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: 5
Teaching unit: UEM 3.1 Subject
4: VHS Hydraulics TP: 3:00
p.m. (TP: 1:00)
Credits: 1
Coefficient: 1

Teaching objectives:
This subject will allow the student to put theoretical knowledge into practice and visualize the various hydraulic phenomena as well as to master the methods of evaluation and measurement of hydraulic parameters. Several practical works will be carried out in the laboratory on general hydraulics.

Recommended prior knowledge:
Basics of mathematics.
Concepts in MDF.
Basic notions of Hydraulics.

Material content:

TP1: The free and forced vortex.

TP2: Study of jets.

TP3: Flow through the orifices.

TP4: Free surface flow.

TP5: Water hammer.

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. Carlier. M, "General and applied hydraulics", Edition Eyrolles, 1972.
2. Comolet. R, "Experimental fluid mechanics", Edition Dunod, 2002.
3. Violet. PL, Chabard. JP, Esposito. P. and Laurence. D,"Applied fluid mechanics", Press edition of the National School of Bridges and Roads.
4. Houpeurt, "Fluid mechanics in porous media, reviews and research", Technip editions, Paris 1974.

3.

Semester: 5
Teaching unit: UED 3.1 Subject 1: Irrigation
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

At the end of this semester, the student will have to acquire basic knowledge of the operation of an irrigation system.

Recommended prior knowledge:

Basic notions of hydraulics.

Content of the subject :

Chapter 1: General information on soil (3 weeks) Definition ; characteristics and physical properties of soils; soil water in relation to irrigation.

Chapter 2: principles of irrigation (3 weeks) Definition of irrigation; complement or supplement; water in the plant; side effects of irrigation; classification of irrigation; conditions of rational irrigation.

Chapter 3: Irrigation network (3 weeks)
Description ; Determination of channel scope; channel losses

Chapter 4: Irrigation techniques (3 weeks) Definition of an irrigation technique; Runoff irrigation; flood irrigation; infiltration irrigation; Sprinkler irrigation; Drip Irrigation.

Chapter 5: Study of a sprinkler and drip irrigation project (3 weeks)
Estimation of crop water needs (evapotranspiration; rainfall deficit; usable reserve; easily usable reserve; agricultural deficit; characteristic flow rates); equipment calculation

Evaluation mode:

Review: 100%

Bibliographic references:

1. CEMAGREF,"Practical guide to irrigation".
2. PHOCAIDES, A “Manual of pressure irrigation techniques”, (2nd Ed.).
3. DONEEN ID, "Irrigation techniques and water management. FAO Irrigation and Drainage Bulletin No. 1", Rome, 1972.

Semester: 5
Teaching unit: UED 3.1
Subject 2: Concepts of Geographic Information System VHS:
22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

This subject consists of teaching the student to build a GIS system on which he will have to put several layers of information and be able to manipulate them in order to bring out the state of the territory that he wishes to visualize.

Recommended prior knowledge:

Computer science.

Material content:

Chapter 1. Geographic Information System (GIS) **(2 weeks)**

Chapter 2. Data representation in GIS **(3 weeks)**

Chapter 3. Analysis in GIS and software **(3 weeks)**

Chapter 4. Remote sensing **(4 weeks)**

Chapter 5. Example of application of GIS and remote sensing in the water sector **(3 Weeks)**

Evaluation mode :

Review: 100%.

Bibliographic references:

1. Guy Lebègue, "From space to public works: virtual models", with the collaboration of Éric Lebègue, CSTB and Laurent Lebègue, CNES, Lettre AAAF Cannes, special March 2007, published on archive-host.com, reprinted in La Lettre AAAF n°6 of June 2007, (ISSN 1767-0675).
2. Jean Denègre and François Salgé, “Geographic information systems” 2e2004 edition PUF editions collection Que sais-je?

Semester: 5
Teaching unit: UET 3.1 Subject 1: Water legislation VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Give students the principles of legislation and water codes.

Recommended prior knowledge:

Knowledge of the principles and rules of legal and legislative aspects of water.

Material content:

Chapter 1. Water Code **(3 weeks)**

Hydraulic public domain; Right to use water; Easements; Useful effects of water; Harmful effects of water; Fight against pollution and protection of water resources; Planning of resource use; Unconventional water resources; Financial provisions sanctions.

Chapter 2. Legal and institutional aspects relating to the hydraulic sector (4 weeks)

Chapter 3. Skills and responsibilities of local authorities in the water sector (4 weeks)

Chapter 4. Water in developing countries **(4 weeks)**

Evaluation mode:

Review: 100%.

Bibliographic references:

1. M. Bouvard, "Economics and essential techniques of hydraulic developments", Eyrolles, 358p.
2. JR Vaillant, "Increase and management of water resources", Eyrolles, 246p. Official journal of RADP.

Semester: 6
Teaching unit: UEF 3.2.1 Subject 1:
Hydraulic arrangements VHS: 45h00
(Course: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

The teaching will aim to give students the knowledge necessary for the design and construction of hydraulic structures whose function is the development of watercourses.

Recommended prior knowledge:

General hydraulics I and II

Material content:

Chapter 1: Objectives of hydraulic developments **(3 weeks)**

Chapter 2: Hydrography
General information on watercourses, Characteristics of the bed and route

Chapter 3: Protection works against erosion **(3week)**
Erosion in watercourses,

Chapter 4: Flow through weirs **(3 weeks)**
Classification; general equation of weirs

Chapter 5: Flood protection works **(3weeks)**

Chapter 6: Case study: protection of an urban area against
Floods ***(3 weeks***

Evaluation mode:

Continuous control: 40%; Exam: 60%.

Bibliographic references:

1. M. Carlier,"Hydraulicsgeneral and applied", Eyrolles, Paris
2. WH Ggraf and MSAltinakar,"Fluvial hydraulics Volume 1: Permanent flow".
3. WH Ggraf and MS Altinakar,"Fluvial hydraulics Volume 2: Non-permanent flow and transport phenomenon", Presses polytechniques et universitaire romandes, Lausanne

Semester: 6
Teaching unit: UEF 3.2.1 Subject 2:
Drinking water supply VHS: 45h00
(Course: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:
The student will know the principles of sizing and design of drinking water distribution networks.
Recommended prior knowledge:
General hydraulics.

Material content:

Chapter 1. General (2 weeks)

Chapter 2. General water distribution scheme (2 weeks) Classification of AEP systems, Main diagrams of AEP systems (case of a surface source, Case of an underground source)

Chapter 3. Water needs (3 weeks)
Domestic water requirement, Localized water requirement (equipment), Water requirement for fire fighting, Calculation of total flow rate, Evolution of flow rate over time: histogram of hourly flow rate

Chapter 4. Water supply (3 weeks)
Sizing method), Load supply (Definition, Piping, Protection against corrosion, Accessories, Optimal diameter of the pipe (Bresse, Bonin, Vibert formula)

Chapter 5. Reservoirs (3 weeks)
Roles of reservoirs, Classification of reservoirs, Location of reservoirs, Calculation of reservoir characteristics, Calculation of the capacity, section and dimension of the reservoir invert, Equipment of reservoirs, Technical requirements to be met in the construction of a good reservoir

Chapter 6. AEP networks Water distribution systems (2 weeks) Description of the distribution system, Calculation of a branched network, Sizing of a mesh network

Evaluation mode:
Continuous assessment: 40%, Examination: 60%.

Bibliographic references:

1. Briere FG "Distribution and collection of water", Editions de l'Ecole Polytechnique de Montréal, 1994, 365 p.
2. Valiron F., "Lyonnaise des Eaux. Memorandum for the Water Supply and Sanitation Manager. Volume I Water in the City Water Supply". Paris, Technique and documentation Lavoisier, 1994.
3. Dupont A. "Urban hydraulics, Volume 2: Transport structures Elevation and distribution of water", Paris, Eyrolles, 1979, 4th ed.

Semester: 6
Teaching unit: UEF 3.2.1 Subject 3:
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 :

Soil mechanics, concrete.

Content of the subject :

Chapter 1. General **(3 weeks)**
History of construction materials, Classification of construction materials, Properties of construction materials.

Chapter 2. Aggregates **(3 weeks)**
Granularity, Classification of aggregates, Characteristics of aggregates, Different types of aggregates.

Chapter 3. Binders **(4 weeks)**
Classification, Aerial binders (aerial lime), Hydraulic binders (portland cements), Main constituents and additions.

Chapter 4. Mortars **(5 weeks)**
Composition, The different types of mortars (lime mortar, cement mortar), Main characteristics.

Evaluation mode:

Review: 100%.

Bibliographic references:

1. "Materials Volume 1, Properties, applications and design: courses and exercises: Bachelor's, master's, engineering schools", Edition Dunod, 2013.
2. Afnor, “Concrete admixtures”, 2012.
3. Casteilla, "Aggregates, soils, cements and concretes: characterization of civil engineering materials by laboratory tests: final STI civil engineering, BTS building, BTS public works, DUT civil engineering, master pro geosciences civil engineering, engineering schools" , 2009.
4. "Physico-chemical properties of construction materials: matter & materials, rheological & mechanical properties, safety & regulations".

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

Teaching objectives :

Allow the student to master the different stages of designing an urban sanitation system.

Recommended prior knowledge :

Hydrology, General hydraulics.

Material content:

Chapter 1. General characteristics of water to be evacuated (3 weeks) Introduction; wastewater classification; Domestic water; Runoff water; Industrial water; Characteristics of wastewater; Physico-chemical characteristics; Biological characters.

Chapter 2. Sanitation systems and schemes (3 weeks) Definition of the various sanitation systems; fundamental systems; Pseudo-separative systems; composite system; different wastewater disposal schemes.

Chapter 3. Evaluation of flow rates to be collected (3 weeks) Calculation of rainwater flows; Rational method; Superficial method; serial basins; Parallel basins; wastewater flow assessments.

Chapter 4. Hydraulic calculation of the water evacuation network (3 weeks) Introduction; Water transport condition (speed, slope, etc.); Methods for calculating a sanitation network.

Chapter 5. Additional works of the sanitation network (3 weeks) Introduction; Types of works; The gutters; Manholes; Fall looks; Hunting gaze; Storm spillway.

Evaluation mode:

Continuous control: 40%; Exam: 60%.

Bibliographic references:

1. Coste C. and Coudet M, “Guide to sanitation in urban and rural areas”, Eyrolles edition, ., 1988.
2. Valentin A, “Sanitation works”, Eyrolles edition, 1972.
3. Bourier. R," Sanitation networks", TEC and DOC edition, 1992.
4. Bennis Saad, “Hydraulics and hydrology”, Edition Multimondes, 2007.
5. Valiron F, "Lyonnaise des Eaux. Memorandum of the Water Supply and Sanitation Manager. Volume I Water in the City Water Supply. Paris", Technique and documentation Lavoisier, 1994. 435 p.

Semester: 6
Teaching unit: UEF 3.2.2
Subject 2: Pumps and Pumping Stations
VHS: 45h00 (Class: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Allow the student to acquire the basic notions necessary for sizing a water pumping station in hydraulic systems.

Recommended prior knowledge:

Fluid mechanics, General hydraulics.

Material content:

Chapter 1. Push-ups **(6 weeks)**
Fundamental equation of hydraulic machines; Flow inside the wheel; speed triangle; the similarity of hydraulic machines; Types of pumps and turbines; Characteristic curves; Cavitation.

Chapter 2. Pumping stations **(6 weeks)**
Installation under load; suction installation.

Chapter 3: Study of water hammer **(3 weeks)**
Introduction ; compressibility of pipes; Elasticity of pipes; Water hammer phenomenon; Wave propagation speed, Instantaneous maneuver; Progressive maneuver; The water hammer in the pumps.

Evaluation method:

Continuous control: 40%; Exam: 60%

Bibliographic references:

1. “Water pumping stations: IEP Collection, industry, production, environment”, Technique and documentation – 11 rue Lavoisier - Paris.
2. “Pump installations: AFEE, French Association for Water Studies” 21 rue de Madrid – Paris.
3. "Pumps. Selection manual, application to variable speed". (Technical Collection, ref. MD1 PUMPS). Author(s) Manon Jean - 01-2002 - 260p. 21x29.6 Paperback.

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

Teaching objectives

Assimilate the knowledge of 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 fit in 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: UEM 3.2 Subject 2: Hydroinformatics VHS: 3:00 p.m. (TP: 1:00 a.m.)
Credits: 1
Coefficient: 1

Teaching objectives:

Master the different techniques of numerical analysis in the field of modeling in hydraulics, hydrology, river hydraulics.

Recommended prior knowledge :

Mathematics, numerical methods.

Material content:

Chapter 1. Flowcharts and Algorithms **(3 weeks)**

Chapter 2. Digital Applications Program **(4 weeks)**

Chapter 3. Hydraulic programming in FORTRAN and MATLAB **(4 weeks)**

Chapter 4. Course Projects/Homework: **(4 weeks)**Numerical resolution by MATLAB and FORTRAN of a problem in hydraulics, (and/or) in hydrology.

Evaluation method:

Continuous control: 100%.

Bibliographic references:

1. R. Comolet, “Experimental fluid mechanics”, 2 volumes, Masson 1985.
2. JC. Lebreton, “Fluvial dynamics”, Eyrolles 1974.
3. Richard and Gakkgher: "Introduction to finite elements".
4. Smith "Programming finite element method".

Semester: 6
Teaching unit: UEM 3.2 Subject 3:
Concepts of reinforced concrete
VHS: 45h00 (Course: 1h30, TD: 1h30)
Credits: 4

Teaching objectives:

Teach the characteristics and mechanical properties of reinforced concrete. Learn the dimensioning of sections subjected to simple stresses (compression, traction and simple bending) according to the rules BAEL 91 modified 99, CBA93.

Recommended prior knowledge:

Resistance of materials (RDM) and Construction materials (MDC).

Material content:

Chapter 1. Formulation and mechanical properties of reinforced concrete (2 weeks) General information on reinforced concrete (properties of the constituents, advantages and disadvantages, applications, etc.), Mechanical properties (resistance, deformation moduli, stress-strain behavior)

Chapter 2. Regulatory requirements (2 weeks)

Rule of the three pivots, Limit states (ELU and ELS), Combinations of actions, Condition of non-fragility

Chapter 3. Calculation of sections subjected to simple compression (2 weeks)

Calculation of the reinforcement section A_{sc}, check of buckling, calculation of ultimate axial force

Chapter 4. Calculation of sections subjected to simple tension (2 weeks) Concrete cracking, Calculation of the reinforcement section A_{st}, checking the condition of non-fragility

Chapter 5. Calculation of sections subjected to simple bending (4 weeks)

Rectangular sections, T-sections, calculation by flowcharts, verification of reinforcement

Chapter 6. Steel-concrete adhesion and bar anchoring (3 weeks) Steel-concrete bond stress, Anchoring of a straight isolated bar, Anchoring by curvature, Covering of bars

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", BAEL 91 modified 99 and associated DTU", EYROLLES.
3. José Ouin, "Reinforced concrete in limit states" according to the BAEL91 addendum, EL educalivre.
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: 6
Teaching unit: UED 3.2
Subject 1: Water resources management
VHS: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Know and master the different management processes for hydraulic systems and the methods applied to preserve water resources.

Recommended prior knowledge:

General hydraulics, pumping station

Material content:

Chapter I: The world's water problem
water cycle ; The world's water inventory; Assessment of resources and needs in the world; Water problem in poor countries (3 weeks)

Chapter II. Water issues in Algeria (3 weeks)

Chapter III: Mobilization and strengthening of water resources
Water storage (reservoir dam, hill reservoir); Artificial recharge of groundwater; Seawater desalination; wastewater regeneration (3 weeks)

Chapter IV: Management of water resources from a scientific and technical aspect
Water and agriculture; Demand for drinking and industrial water (3 weeks)

Chapter V Water risk management
Floods; Droughts; pollution (3 weeks)

Evaluation mode:

Review: 100%.

Bibliographic references:

1. Rerau, “Restructuring of visitable collectors volumes 1 and 2” Lavoisier Paris 2002 and 2004.
2. M. Satin and B. Selmi, “Technical guide to sanitation”.
3. F. Valiron, “Water management: Water supply – sanitation”, 1989.
4. C. Maksimovic and JATejada-Cuibert,"The new frontiers of urban water management", 2001.

Semester: 6
Teaching unit: UED 3.2
Subject 2: VHS network pipe and equipment technology: 22h30
(Course: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

This course aims to give undergraduate students an overview of:

1. the different types of pipe materials marketed;
2. special parts used for connecting pipes;
3. water network protection equipment;
4. flow and pressure regulation equipment in water networks.

Recommended prior knowledge:

Drinking water supply, Pumps and Pumping stations.

Content of the subject:

Chapter 1. Nature of pipes (3 weeks) Characteristics, manufacturing, storage, transportation; Cast Iron Pipes; Steel pipes; HDPE pipes; PVC pipes; Concrete pipes; GRP pipes.

Chapter 2. Special parts and fittings (2 weeks)
Elbows, Tees, Reductions, Gate valves (gate and butterfly)

Chapter 3. Network protection equipment (3 weeks) Suction cups, traps, Van-air, Check valve; automatic shutter; overspeed valve; relief valve.

Chapter 4. Regulation equipment (4 weeks) Flow control valve; Upstream regulation valve; Control valve; swallow; Flow and pressure stabilizer; Flow and pressure reducer; Float valve; Altimeter valve.

Chapter 5. Measuring equipment (3 weeks)
Counters; Electromagnetic flow meters.

Evaluation mode:

Review:100%.

Bibliographic references:

1. A. Dupont, “Urban hydraulics (Volume 2 and 3)”, Eyrolles, 1978.
2. J. Bonvin, “Urban hydraulics 1”, Hes.so, 2005.
3. “Supplier catalogs” (Pont a Mousson, Chiali, Bayard, Ramus)

Semester: 6
Teaching unit: UET 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

License Title: Hydraulics

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

PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

Specifications Renewal of training for national recruitment with amendment

Licence in Hydraulics

SUMMARY

A – License identification sheet

Establishment: Mohamed Kheider Biskra University

Faculty or Institute: Faculty of Science and Technology

Department : Civil engineering and hydraulics

Domain: National sector

Branches/specialties: Hydraulics / Hydraulics

License Manager[1] : Name

:Bouziane
First name
:MohamedTewfik Rank:
Professor
E-

mail:bouziane@inbox.com

Mobile :+213550592810

[1] Attach CV

B - General Description of the License:

The main objective, expected of the planned training, is to transmit to students theoretical and practical knowledge in the field of hydraulics and the analytical methods related to it.

The multidisciplinary programs offered aim to train competent executives who know their mission precisely. Equipped with great autonomy, they will thus be able to identify and master the problems of handling and creating AEP and sanitation networks and the study of projects in the field of modeling and master plans applied to hydraulics.

C- Motivation for opening the License:

The planned training must lead to a Bachelor's degree, while ensuring sufficient qualitative and quantitative teaching. The immersion of the student in the area of interest of his training is already recommended through the discovery teaching units. This approach aims, on the one hand, to bring out early on the student's abilities to continue with serenity the training cycle proposed to them. As a result, convincing results are expected at the end of the training cycle, while minimizing or even eliminating the risks of loss or prolonged failure.

The areas of great interest to the planned training are, for the most part, linked to public or private activities whose mission is to develop water resources and make their use profitable. However, the training of assistant managers is expected, likely to help managers in decision-making and thus play the role of advisors and collaborators. Public and private design offices will also be able to benefit from such assistance.

The knowledge acquired will allow them to get involved in other fields such as: regional planning, earth sciences, process engineering.

The knowledge acquired, both theoretically and practically, will also allow students to move towards a Master's degree.

Employability is traditionally excellent, with 100% of students finding employment within the first 3 to 6 months after leaving training.

The sectors which traditionally employ these graduates are:

Service companies (ADE, AGID, etc.): 30%

Design offices: (BNEDER, SETEB, private design offices, etc.) 30%

Administration/public establishments: (ANB, OPIC, DHW, SHW, etc.)
Local authorities: (APC, Daïras, Wilayas) 40%

Companies: (CANAGHAZ, Hydro-Urbaine Est, Hydro-Drilling, Hydro-Equipment, Hydrotreatment, Hydro-Transfer, Hydro-Development, ENAGEO, STAH, Hydrotechnique, SOGERHYD, ENAFOR, ENTP, COSIDER, SONATRACH, private companies, etc....)

ADE: Algerian waters

AGID: Irrigation and Drainage Agency

CANAGHAZ: National Company for the Construction of Hydro-
Urban Pipelines East: Economic public company
Hydro-Drilling: National Hydraulic Drilling Company
Hydro-Equipment: National Hydraulic Equipment Company Hydro-
Treatment: Hydraulic Treatment Company
OPIC: Office of Irrigated Perimeters
Hydro-Transfert: National Water Supply and Transfer Company Hydro-
Development: National Hydraulic Development Company ENAGEO: National
Geophysics Company

STAH: Drilling and Hydraulic Development Company
GTH: National General Contractor for Major Hydraulic Works

Hydro-Technique: Economic Public Company
SOGERHYD: Rural Engineering and Hydraulic Works Company for the wilaya of Laghouat
COSIDER: Construction and works company.

SONATRACH: National company for the transport and marketing of hydrocarbons.

D - Objectives of opening the License:

The planned training should lead to an intermediate license diploma to the engineering diploma and the classic license obtained in a longer time than that planned at the end of this training, while ensuring sufficient qualitative and quantitative teaching. The immersion of the student in the area of interest of his training is already recommended during the common core, especially through the units

discovery teaching. This approach aims, on the one hand, to bring out early on the student's abilities to continue with serenity the training cycle proposed to them. As a result, convincing results are expected at the end of the training cycle, while minimizing or even eliminating the risks of loss or prolonged failure.

educational goals

To identify the motivating factors, it seems necessary to us to situate the city of Biskra and its region in order to better appreciate the multiple advantages it presents, in particular those linked to its strategic position, water and climatological resources. The town of Biskra is located 87 meters above the sea, making it one of the lowest towns. It is also served by an international airport and a railway line connects it to the town of Batna, capital of the Aurès, located 120 kilometers away. Biskra is the capital of Ziban or Mount Zab and is known as Queen of Ziban, meaning “The Oases” in Berber. It is located in the south-east of Algeria, some 450 kilometers from Algiers, and happens to be the gateway to the desert. The region is influenced by a semi-arid climate with a Mediterranean tendency which reigns over the high plains and the Saharan Atlas and the influences of the desert climate of the Sahara. Favored by its position at the foot of the Atlas reliefs, this region is an exception in the Lower Sahara because it uses surface water and groundwater. The Biskra region is part of the large hydrogeological basin of the Northern Sahara which presents several aquifer reservoirs of very great importance. The continental interlayer aquifer, which covers most of the territory of the Northern Sahara, has a capacity of no less than 50,000 billion cubic meters. Depending on the month of the year, wind speed varies between 4 m/s and 6 m/s. The duration of insolation reaches 3500 hours annually and the energy received over an area of 1 m2 is around 2200 KWh/m2/year. The continental intercalary formation constitutes a vast geothermal reservoir, commonly called the "Albian aquifer", which extends over several thousand square kilometers, the water being at a temperature of 57°C. If we combined the operating flow of the Albian aquifer with the total flow of the thermal springs, this would represent in terms of power, more than 700 MW. Note also that the Biskra region has two large dams, including that of “Fontaine des gazelles” which constitutes an exceptional water reservoir and which is, according to the opinion of all specialists, the future electricity supplier of the region. Water resources, thermal, solar and wind energy are therefore the energy and economic factors that characterize the region.

of Biskra, major natural assets making this region the ideal space for the training of qualified technical executives, for any study and for any research in the fields of water and energy sciences. Let us add to this favorable framework, the proven local skills of the University of Biskra which, without a doubt, will contribute to the development of scientific and technical human resources.

Research and Development Objectives

Scientific research within the University of Biskra occupies a preponderant place in the establishment's activities. Among the research laboratories approved by the Ministry of Higher Education and Scientific Research, 5 laboratories are involved in the fields of water resources and energy, in the context of climate change. The main objectives of these laboratories are both training, the dissemination of research results through national and international publications, and finally the execution of national research programs programmed by the government and conducted under the aegis of the general directorate of scientific research and technological development. In total, scientific research in the fields of water and energy is supported by 25 teacher-researchers, including 10 higher education professors, 6 lecturers and 9 assistant professors. Applied research projects, lasting an average of two years, are carried out by researchers under an agreement with the Ministry of Higher Education and Scientific Research. The results of these projects are evaluated by the national commission for the evaluation and programming of university research. During 2014, 8 projects were selected and are currently being implemented.

E - License Position

The license, which is prepared over 3 years, is a general training.
The minimum admission requirement for Baccalaureate candidates is selective and depends on the number of places available. The minimum scores required for admission may vary more or less depending on the number of applications received each year. The minimum average required is 11/20 for the baccalaureate.

A training course corresponds to progression over 6 semesters within a coherent set of courses (compulsory, open, optional, etc.), leading to the acquisition of 180 credits. The student is an actor in his journey. He can modify it or develop it. He benefits from educational support to advise him in his choices.

F - Targeted profiles and skills:

Quantitative aspect

Assessment of water resources.
Preservation of water resources. Sizing
of urban networks.
Optimization in the sizing of urban networks. Assessment of
water resources.
Sizing of hydraulic works. Development of
hydraulic works.
Establishment of economic planning and solutions.
Coordination between the different stakeholders in the field.

Qualitative aspect

Exploitation of water resources. Water
resources management.
Quality of water resources.
Protection of water resources.
Preservation of the environment.
Optimal management of urban spaces.
Improvement of the urban living
environment.
Optimization in network sizing

G - National employability potential

The areas of great interest to the planned training are, for the most part, linked to public or private activities whose mission is to develop water resources and make their use profitable. However, training of executives is expected

assistants, likely to help managers in decision-making and thus play the role of advisors and collaborators. Public and private design offices will also be able to benefit from such assistance.

The knowledge acquired will allow them to get involved in other fields such as: regional planning, earth sciences, process engineering.

The knowledge acquired, both theoretically and practically, will also allow students to move towards a Master's degree.

Employability is traditionally excellent, with 100% of students finding employment within the first 3 to 6 months after leaving training.

The sectors which traditionally employ these graduates are:

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Administration/public establishments: (ANB, OPIC, DHW, SHW, etc.) Local authorities: (APC, Daïras, Wilayas) 40%

Companies: (CANAGHAZ, Hydro-Urbaine Est, Hydro-Drilling, Hydro-Equipment, Hydrotreatment, Hydro-Transfer, Hydro-Development, ENAGEO, STAH, Hydrotechnique, SOGERHYD, ENAFOR, ENTP, COSIDER, SONATRACH, private companies, etc.…)

ADE: Algerian waters

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Development: National Hydraulic Development Company ENAGEO: National Geophysics Company

STAH: Drilling and Hydraulic Development Company
GTH: National General Contractor for Major Hydraulic Works

Hydro-Technique: Economic Public Company

SOGERHYD: Company of Rural Engineering and Hydraulic Works of the wilaya of Laghouat

COSIDER: Construction and works company.

SONATRACH: National company for the transport and marketing of hydrocarbons.

H - Educational supervision

List of speakers (specify specialty - grade - permanent - temporary - associates -) Recommended supervision rate (Teacher/student) in the specialty.

Last name First Name	Diploma	Grade	Quality*	Type of intervention **	Recommended support rate	Registration
ACHOUR BACHIR	DR	Pr	Permanent	Courses, TD, TP, Supervision		
ACHOUR SAMIA	DR	Pr	Permanent	Courses, TD, TP, Supervision		
GUERGAZI SAADIA	DR	Pr	Permanent	Courses, TD, TP, Supervision		
YOUCEF LEILA	DR	Pr	Permanent	Courses, TD, TP, Supervision		
DEBABECHE MAHMOUD	DR	Pr	Permanent	Courses, TD, TP, Supervision		
BENMEBAREK NAIMA	DR	Pr	Permanent	Courses, TD, TP, Supervision		
OUAMANE AHMED	DR	Pr	Permanent	Courses, TD, TP, Supervision		
BEN KHALED AEK	DR	Pr	Permanent	Courses, TD, TP, Supervision		
SEGHAIRI NORA	DR	MC	Permanent	Courses, TD, TP, Supervision		
BOUZIANE M TEWFIK	DR	Pr	Permanent	Courses, TD, TP, Supervision		
BENSAADA SAID	DR	Pr	partner	Courses, TD, TP, Supervision		
MASMOUDI RACHID	DR	MC	Permanent	Courses, TD, TP, Supervision		
MESSAMEH ABDELHAMID	DR	MCA	Permanent	Courses, TD, TP, Supervision		
LABADI IN SEDDIK	DR	MCB	Permanent	Courses, TD, TP, Supervision		
BEDJAOUI ALI	DR	MCB	Permanent	Courses, TD, TP, Supervision		
CHARHABIL SONIA	DR	MCB	Permanent	Courses, TD, TP, Supervision		

MIMECHE LEILA	**DR**	**MCB**	Permanent	Courses, TD, TP, Supervision		
DJEDRI TOUFIK	**MAG**	**MACC**	Permanent	Courses, TD, TP, Supervision		
BENNADJAI NASSIMA	**MAG**	**MACC**	Permanent	Courses, TD, TP, Supervision		
SOUISSI AHMED	**ING**	**MY**	Permanent	Courses, TD, TP, Supervision		
BOUCHAHM AISSA	**ING**	**ASS**	Permanent	Courses, TD, TP, Supervision		

*** Permanent, part-time, associate**
**** Courses, tutorials, practical work, internship supervision, dissertation supervision, other (to be specified)**

I- Educational supports and equipment

Water quality and treatment laboratory

No.	Equipment title	Number	observations
01	OVEN	03	
02	PORTABLE TURBIDIMETER	02	
03	CENTRIFUGE	01	
04	SPECTROPHOTOMETER (325-1000 NM)	01	
05	TWO-STAGE MEMBRANE PUMP	02	
06	ROTATIONAL VISCOSIMETER	03	
07	MICRO DOSING PUMP (Q3 – 120 ML/MN)	02	
08	BLENDER FOR FOUR CYLINDER (1000 ML)	01	
09	STANDARD DEPTH SAMPLER (02 L)	02	
10	12-STATION AUTOMATIC SAMPLER (1.8 L)	01	
11	AUTOMATIC SAMPLER WITH 24 STATIONS (01 L)	01	
12	CORROSION STUDY DEVICE WITH AMP/VOLT	01	
13	WATER DEMINERALIZER WITH CARTRIDGE	02	
14	BLOCK OXIDATION COMPLETE (COD) WITH SUPPORT TUBE HOLDER	01	
15	PH METER 96-A/SET-1	04	
16	PH METER OP-211/1	02	
17	pH meter 3010 (JENWAY)	05	
18	PORTABLE PH METER	01	
19	LF 90 conductivity meter (trunk)	02	
20	CONDUCTIVIMETER LF 96 A/SET-1 (TRUNK)	01	
21	CONDUCTIVIMETER LF 521	01	
22	CONDUCTIVIMETER TYPE OK-104 (TRUNK)	02	
23	OXIMETER/OXI 96-B/SET (TRUNK)	02	
24	OXIMETER/OXI 92 (TRUNK)	02	
25	CIRCULATION THERMOSTAT 750 WATTS	02	
26	LIGHT ABSORPTION MEASURING DEVICE IN WATER	01	
27	ROTARY EVAPORATOR WITH BATH HEATER 4.7 L Contact thermometer (0-250°)	03	
28	PYREX WATER DISTILLATOR	03	
29	X,Y,T RECORDER	03	
30	OIL PUMP	01	
31	LUXMETER	02	
32	TYPE OP 109 IONOMETER	01	
33	IONOMETER/PH – RISSELL MODEL RL 200	01	
34	COMBINED OXIMETER AND PH	01	
35	MAGNETIC STIRRERS	01	
36	AUTOMATIC BURETTE	02	
37	POCKET PH METER	01	
38	BAIN MARIE	01	
39	DRYING LAMP	30	
40	RAMP OF DIGESTION FOR THERE DETERMINATION OF NITROGEN (06 VIALS)	01	

41	SPECTROPHOTOMETER HAS ABSORPTION ATOMIC + PRINTER	01	
42	HOTPLATE	01	
43	HOT AIR BLOWER	01	
44	VIBRATING AGITATOR	02	
45	FLOWMETER STUDY SYSTEM	01	
46	LABORATORY TIMER	01	
47	CRUCIBLE TONGS	30	
48	BEAKER TONGS	01	
49	STOPWATCH	02	
50	FLOCCULATOR JAR TEST HAS 06 POSITIONS (SPEED INDIVIDUAL)	02	
51	PHOTOMETER IN CASE	01	
52	UV/VISIBLE SPECTROPHOTOMETER	01	
53	WTW LF 315 CONDUCTIMETER	01	
54	FILTRATION RAMP	01	
55	MULTI-PARAMETER PHOTOMETER C100	01	
56	COD TUBE MOUTH REACTOR WITH 16 STATIONS	01	
57	P 800 PH METER IN CASE	01	
58	FILTRATION UNIT	02	
59	HYDROMETER	01	
60	FALLING BALL VISCOSIMETER (SET OF 03 CYLINDERS)	03	
61	HYDRAULIC BENCHES	04	
62	PARSHALL CANAL	01	
63	WAVE GENERATOR (10 M CHANNEL)	01	
64	Hot wire anemometer study bench	01	
65	CALIBRATION BLOWER	01	
66	STUDY BENCH WITH LAZER-DOPLER FUNCTION	01	
67	DEVICE FOR STUDYING FREE AND FORCED VIRLS	01	
68	MEDIUM CORROSION PUMPS	04	
69	PUMP AND STATION OF PUMPING COMPLETELY EQUIPPED + FLOWMETRY TEST BENCH	01	
70	HYDROLOGY STUDY BENCH	01	
71	RAIN SIMULATOR	01	
72	LYSIMETER	02	
73	INFILTRATION AND DRAINAGE STUDY BENCH	01	
74	DEPTH HUMIDIMETER WITH NEUTRON PROBE	01	
75	RECORDER	02	
76	TENSIOMETER	17	
77	RHEOLOGICAL APPARATUS	01	
78	RECTANGULAR CHANNEL OF 10 AND 12 M LENGTH	02	
79	“U” PROFILE CHANNEL 07 M LENGTH	01	
80	TRIANGULAR CHANNEL OF 03 M LENGTH	01	
81	TRAPEZOIDAL CHANNEL 06 M LENGTH	01	
82	REELS AND MICRO REEL	05	
83	WEATHER STATION (SHELTER, RAIN GAUGE, BAC COLORADO, PLUVIOGRAPHER,…)	01	
84	MISCELLANEOUS TOPOGRAPHIC DEVICES		

85	**SUPPORT WORKSHOP FOR THE PRODUCTION OF MODELS AND**	**02**	

	CANALS (SAW CIRCULAR, SAW HAS RIBBON, TOURS, MILLING MACHINE, SHEET CUTTER, etc.)		

Hydrology Laboratory

No.	Equipment title	Number	observations
01	**HYDROLOGY STUDY BENCH**	**01**	
02	**RAIN SIMULATOR**	**01**	
03	**LYSIMETER**	**02**	
04	**INFILTRATION AND DRAINAGE STUDY BENCH**	**01**	
05	**DEPTH HUMIDIMETER WITH NEUTRON PROBE**	**01**	
06	**RECORDER**	**02**	
07	**TENSIOMETER**	**17**	
08	**RHEOLOGICAL APPARATUS**	**01**	
14	**REELS AND MICRO REEL**	**05**	
15	**WEATHER STATION (SHELTER, RAIN GAUGE, BAC COLORADO, PLUVIOGRAPHER,...)**	**01**	

Surface Hydraulics Laboratory

No.	Equipment title	Number	observations
01	**RECTANGULAR CHANNEL OF 10 AND 12 M LENGTH**	**01**	
02	**"U" PROFILE CHANNEL 07 M LENGTH**	**01**	
03	**TRIANGULAR CHANNEL OF 03 M LENGTH**	**01**	
04	**TRAPEZOIDAL CHANNEL 06 M LENGTH**	**01**	
05	**Numerical simulation of a viscoplastic flow**	**01**	
06	**High resolution acoustic Doppler profiler**	**01**	
07	**Rheometry plan-plan For the characterization rheological.**	**01**	
08	**Flow measurement test bench**	**01**	**Different flow meter types**

Pump and pump station laboratory

No.	Equipment title	Number	observations
01	**BENCH STUDY OF THE PUMPS CENTRIFUGAL AUTOMATED WITH FLOW REGULATION**	**01**	
02	**CENTRIFUGAL PUMP TEST BENCH**	**01**	
03	**CENTRIFUGAL PUMPS TEST BENCH, ASSEMBLIES SERIES AND PARALLEL**	**01**	
04	**PELTON TURBINE TEST BENCH**	**01**	
05	**PUMP DEMONSTRATION MODEL IN SECTION**	**08**	

06	**VARIOUS PUMPS TEST BENCH**	**01**	
07	**AXIAL PUMP EXPERIMENTAL MODULE**	**01**	
08	**PUMP CONTROL AND AUTOMATION BENCH**	**01**	
09	**PUMP CONTROL EQUIPMENT**	**01**	

Fluid mechanics laboratory

No.	Equipment title	Number	observations
01	Fluid hydrodynamic test bench	02	
02	Module of experimentation For networks of piping	02	
03	Hydrostatic test bench	04	
04	Determination of vertical descent speed	02	
05	Basic Fluid Dynamics Module	02	
06	Apparatus for studying hydrostatic pressure	03	
07	Bernoulli's law demonstration apparatus	02	
08	Device for analyzing flow through an orifice	03	
09	Ap.demonstration of losses in fittings and conduct	02	
10	Osborne Reynolds demonstration apparatus	02	
11	24-STATION AUTOMATIC SAMPLER (01 L)	01	
12	DEVICE STUDY OF THERE CORROSION WITH AMP/VOLT	01	
13	Water hammer demonstration device in conducts	01	
14	Sign of demonstration losses In THE conducts	01	
15	Sectional model of special parts	06	

Topography laboratory and workshop

No.	Equipment title	Number	observations
01	TOPOGRAPHIC DEVICES • THEODOLITES • LEVELS • STEREOSCOPE	30	
02	WORKSHOP FOR MODEL AND MODEL	01	

Soil mechanics laboratory

No.	Equipment title	Number	observations
01	Equipment For THE tests of weightspecific	05	
02	Atterberg limits	02	
03	Particle size and sedimentometry test bench	04	
04	Permeability determination bench	04	
05	Oedometer	02	
06	Strain Gauge Accessories	03	

07	**Materials for physical characteristics**	**01**	

	and the arrangement of particles		
08	**Bench for studying the hydraulic properties of soils**	**01**	**the gratitude soils and geotechnical applications**
09	**Microscopes**	**04**	
10	**Stand vertical For demonstration of mechanical**	**01**	

B- Internship sites and in-company training:

Training place	Number of students	Training period
DHW Biskra	05	15 days
DIRECTION OF THE ENVIRONMENTW.Biskra	05	15 days
ADE Biskra	05	15 days
NATIONAL HYDROGRAPHIC BASINS AGENCY	05	15 days
AGENCY NATIONAL OF THE WATER RESOURCES	05	15 days

J - Structures of research of support (internal and orexternal):

Research and support structure	Responsible	Approval date
LARHYSS laboratory	Achour Bachir	2001
LAHE laboratory	Ouamane Ahmed	2001
LARGHYDE laboratory	Debabeche Mahmoud	2011

K - Participation of the user sector in the License

Training place	Number of students	Training period
DHW Biskra	05	15 days
DIRECTION OF THE ENVIRONMENTW.Biskra	05	15 days
ADE Biskra	05	15 days

NATIONAL HYDROGRAPHIC BASINS AGENCY	05	15 days
AGENCY NATIONAL OF THE WATER RESOURCES	05	15 days

L - Organization of the License

L.1. Half-yearly organization sheet for national sector courses:

Semester 1:

Teaching units	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T. D.	 TP	VHS (14-16 weeks)	Other*	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF 1.1 Credits: 18 Coefficients: 9	Mathematics 1: Analysis	6	3	3h	1h30mn	-	67h30mn		40%	60%
	Physics 1: Mechanics of the point	6	3	3h	1h30mn	-	67h30mn		40%	60%
	Chemistry 1 Structure of matter	6	3	3h	1h30mn	-	67h30mn		40%	60%
EU Methodological Code: UEM 1.1 Credits: 6 Coefficients: 4	Physical practical work (2 hours/15 days)	2	1	-	-	1h30mn	10:30 p.m.		100%	
	Chemistry TP (2 hours/15 days)	2	1	-	-	1h30mn	10:30 p.m.		100%	
	Office automation and web technology	2	2	-	-	1h30mn	10:30 p.m.		100%	
UE Discovery Code: UED 1.1 Credits: 4 Coefficients: 2	Topography	2	1	1h30mn			10:30 p.m.			100%
	Environmental Protection	2	1	1h30mn			10:30 p.m.			100%
Transversal EU Code: UET 1.1 Credits: 2 Coefficients: 2	Foreign language I: (French)	2	2	3h			10:30 p.m.			100%
Total semester 1		**30**	**17**	**3:00 p.m.**	**4h.30mn**	**4h.30mn**	**360h**			

Semester 2:

Teaching units	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	VHS (14-16 weeks)	Other*	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF2.1 Credits: 18 Coefficients: 9	Mathematics 2: Algebra	6	3	03h	1h30mn	-	67h30mn		40%	60%
	Physics 2: Electricity and Magnetism	6	3	03h	1h30mn	-	67h30mn		40%	60%
	Chemistry 2: Thermodynamics and chemical kinetics	6	3	03h	1h30mn	-	67h30mn		40%	60%
EU Methodological Code: UEM 2.1 Credits: 6 Coefficients: 4	Physical practical work (2 hours/15 days)	2	1	-		1h30mn	10:30 p.m.		100%	
	Chemistry TP (2 hours/15 days)	2	1	-		1h30mn	10:30 p.m.		100%	
	Geology	2	2	1h30mn	-	-	10:30 p.m.			100%
UE Discovery Code: UED 2.1 Credits: 4 Coefficients: 3	Water mobilization works	1	1	1h30mn	-	-	10:30 p.m.			100%
	Water pollution	1	1	1h30mn	-	-	10:30 p.m.			100%
	Hydrometry	2	1	1h30mn			10:30 p.m.			100%
Transversal EU Code: UET 2.1 Credits: 2 Coefficients: 2	Foreign Language II: (French)	2	2	1h30mn	-	-	10:30 p.m.			100%
Total semester 2		**30**	**18**	**4:30 p.m.**	**4h30mn**	**3:00 a.m.**	**360h00**			

Semester 3:

Teaching units	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	VHS (14-16 weeks)	Other*	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF3.1 Credits: 18 Coefficients: 9	General Hydraulics I (Hydrostatics)	6	3	3h	1h30mn	-	67h30mn		40%	60%
	Probability and Statistics	6	3	3h	1h30mn	-	67h30mn		40%	60%
	Hydrology I (Morphology and morphometry of watersheds)	6	3	3h	1h30mn	-	67h30mn		40%	60%
EU Methodological Code: UEM 3.1 Credits: 6 Coefficients: 5	General hydraulic TP I	2	1	-	-	1h30mn	10:30 p.m.		100%	
	Technical drawing	2	2	-	-	3h	45h		100%	
	Computer Science: Programming Languages	2	2	1h30mn	-	-	10:30 p.m.			100%
UE Discovery Code: UED 3.1 Credits: 4 Coefficients:2	Urban Hydrology	2	1	1h30mn	-	-	10:30 p.m.			100%
	Underground hydraulics	2	1	1h30mn	-	-	10:30 p.m.			100%
Transversal EU Code: UET 3.1 Credits: 2 Coefficients:2	foreign III: (English)	2	2	1h30mn	-	-	10:30 p.m.			100%
Total semester 3		**30**	**18**	**3:00 p.m.**	**04:30**	**04:30**	**360h00**			

Semester 4:

Teaching units	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	VHS (14-16 weeks)	Other*	Evaluation mode Continuous monitoring	 Exam
Fundamental EU **Code: UEF4.1** **Credits: 18** **Coefficients: 9**	General Hydraulics II (Hydrodynamics)	6	3	3h	1h30mn	-	67h30mn		40%	60%
	Applied numerical methods	6	3	3h	1h30mn	-	67h30mn		40%	60%
	Hydrology II (Studies of precipitation and floods)	6	3	3h	1h30mn	-	67h30mn		40%	60%
EU Methodological **Code: UEM 4.1** **Credits: 6** **Coefficients: 4**	Hydrodynamics practical work	2	1	-	-	1h30mn	10:30 p.m.		100%	
	Methods practical work digital	2	1	-	-	1h30mn	10:30 p.m.		100%	
	Water chemistry	2	2	1h30mn	-	-	10:30 p.m.			100%
UE Discovery **Code: UED 4.1** **Credits: 4** **Coefficients: 3**	Water in the ground	2	2	1h30mn	-	-	10:30 p.m.			100%
	Unconventional waters	2	1	1h30mn	-	-	10:30 p.m.			100%
Transversal EU **Code: UET 4.1** **Credits: 2** **Coefficients: 2**	Foreign Language 4: (English)	2	2	3:00 a.m.	-	-	10:30 p.m.			100%
Total semester 4		**30**	**18**	**4:30 p.m.**	4h30mn	**3h**	**360h00**			

Semester 5:

Teaching units	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	 T.D.	 TP	VHS (14-16 weeks)	Other*	Evaluation mode Continuous monitoring	 Exam
Fundamental EU Code: UEF5.1 Credits: 10 Coefficients: 5	Free surface flows	4	2	1h30mn	1h30mn	-	45h		40%	60%
	Dam I (Gravity Dams)	4	2	1h30mn	1h30mn	-	45h		40%	60%
	Water treatment	2	1	1h30mn		-	10 p.m.			100%
Fundamental EU Code: UEF5.2 Credits: 8 Coefficients: 4	Hydrogeology	4	2	1h30mn	1h30mn	-	45h		40%	60%
	Drinking water supply networks	4	2	1h30mn	1h30mn	-	45h		40%	60%
EU Methodological Code: UEM 5.1 Credits: 6 Coefficients: 4	Water analysis practical work	4	2	-	-	1h30mn	10:30 p.m.		100%	
	Drilling	2	2	1h30mn	1h30		45h		40%	60%
UE Discovery Code: UED 5.1 Credits: 4 Coefficients: 4	Geographic Information Systems (GIS)	2	2	1h30mn	-	1h30	10:30 p.m.		40%	60%
	Estimation and protection of water resources	2	2	1h30mn	-	-	10:30 p.m.		-	100%
Transversal EU Code: UET 5.1 Credits: 2 Coefficients: 1	Expression and Communication Techniques	2	1	1h30mn	-	-	10:30 p.m.			100%
Total semester 5		**30**	**18**	**1:30 p.m.**	**7h30mn**	**03:00**	**360h**			

Semester 6:

Teaching units	Materials Titled	Credits	Coefficient	Weekly hourly volume Course	T.D.	TP	VHS (14-16 weeks)	Other*	Evaluation mode Continuous monitoring	Exam
Fundamental EU Code: UEF6.1 Credits: 10 Coefficients: 5 **Fundamental EU Code: UEF6.2 Credits: 8 Coefficients: 4**	Dam II (Earth dams)	4	2	1h30mn	1h30mn	-	45h		40%	60%
	Water purification	2	1	1h30mn		-	10:30 p.m.			100%
	Soil Mechanics (MDS)	4	2	1h30mn	1h30mn		45h		40%	60%
	Pumps and pumping stations	4	2	1h30mn	1h30mn	-	45h		40%	60%
	Sanitation networks	4	2	1h30mn	1h30mn	-	45h		40%	60%
EU Methodological Code: UEM 6.1 Credits: 6 Coefficients: 6	MDS practical work	2	2	-	-	1h30mn	10:30 p.m.		100%	
	PSP practical work	2	2	-	-	1h30mn	10:30 p.m.		100%	
	Computer science applied to hydraulics	2	2	-	-	1h30mn	10:30 p.m.		100%	
UE Discovery Code: UED 6.1 Credits: 4 Coefficients: 2	Irrigation	2	1	1h30mn	-	-	10:30 p.m.		-	100%
	Network management and diagnostics	2	1	1h30mn	-	-	10:30 p.m.		-	100%
Transversal EU Code: UET 6.1 Credits: 2 Coefficients: 1	Automation of hydraulic systems	2	1	1h30mn	-	1h30	45:00		40%	60%

Total semester 6		**30**	**18**	**12:00 p.m.**	**6:00 a.m.**	**6:00 am**	**360h**			

Overall training summary:

EU V.H.	UEF	EMU	UED	UET	Total
Course	816h 30 mins	135h	135h	67h30	1154
T.D.	472h30mn	-	-	-	472h30mn
TP	-	25h30mn		6am	472h30mn
Personal work					
other (explain, list,)					
Total	1289h	160h30mn	135h	37h30mn	945h
Credits	30	30	30	30	**180**
% in credits For eachEU	60%	20%	13%	7%	100%

- Organization sheets for teaching units

(Establish one file per EU)

EU wording:UEF 5.1
Typical course: License
Semester: S5

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 112.5 TD: 67.5 PT: 22.5 Personal work: 0 Others (internships, etc.): 0
Credits allocated to the EU (and its components)	UE = 20 credits Component 1: 4 credits Component 2: 4 credits Component 3: 4 credits Component 4: 4 credits Component 5: 4 credits
Description of the EU and its components	<u>Component 1:</u> Fundamentals Hydrostatic Hydrodynamic <u>Component 2:</u> Sizing Management and maintenance <u>Component 3:</u> Standards Analysis Classification Water treatment and purification methods <u>Component 4:</u> Base of underground hydraulics. Exploitation of resources Component 5: Population/needs Networks calculation

EU wording: UEM 5
Typical course: License
Semester: S5

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 67.5 TD: 22.5 PT: 22.5 Personal work: 0 Others (internships, etc.): 0
Credits allocated to the EU (and its components)	EU = 4 credits Component 1: 2 credits Component 2: 2 credits
Description of the EU and its components	<u>Component 1:</u> Basic notions of topography Measurement methods Topographic plans and maps <u>Component 2:</u> Fundamentals of hydrogeology Water balances Aquifers Flows towards structures Groundwater quality <u>Component 3:</u> Notions on Saharan hydraulics Planning methods

EU wording:UECG 5
Typical course: License
Semester: S5

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 22.5 TD: 0 TP: 0 Personal work: Others (internships, etc.): 0
Credits allocated to the EU (and its components)	EU = 1 credits Component 1: 1 credits
Description of the EU and its components	<u>Component 1:</u> Technical vocabulary Scientific texts

EU wording:UED 5
Typical course: License
Semester: S5

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 22.5 TD: 0 PT: 22.5 Personal work: 0 Others (internships, etc.): 0
Credits allocated to the EU (and its components)	EU = 2 credits Component 1: 2 credits
Description of the EU and its components	<u>Component 1:</u> Basic notions Measuring methods and equipment in watercourses Gauging stations

EU wording:UEF 6
Typical course: License
Semester: S6

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 157.5 TD: 90 PT: 22.5 Personal work: 0 Others (internships, etc.): 0
Credits allocated to the EU (and its components)	UE = 23 credits Component 1: 6 credits Component 2: 5 credits Component 3: 6 credits Component 4: 6 credits
Description of the EU and its components	<u>Component 1:</u> Basic definitions Dikes and dams <u>Component 2:</u> Notions on pumps Choice and sizing of pumping stations <u>Component 3:</u> Sizing of sanitation networks <u>Component 4:</u> Tanks Sizing networks

	Protection of pipes and structures

EU wording:UEM 6
Typical course: License
Semester: S6

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 22.5 TD: 0 TP: 45 Personal work: 0 Others (internships, etc.): 0
Credits allocated to the EU (and its components)	EU = 4 credits Component 1: 2 credits Component 2: 2 credits
Description of the EU and its components	<u>Component 1:</u> Chemical analyzes of water Laboratory work <u>Component 2:</u> Concepts on water economics (cost price, depreciation, etc.) Financial arrangements for projects

EU wording:UECG6
Typical course: License
Semester: S6

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 22.5 TD: 0 TP: 0 Personal work: Others (internships, etc.): 0
Credits allocated to the EU (and its components)	EU = 1 credits Component 1: 1 credits
Description of the EU and its components	<u>Component 1:</u> Report writing methods and memories.

EU wording: UED6
Typical course: License
Semester: S6

Distribution of the EU's Half-Yearly Hourly Volume and its components	Course: 22.5 TD: 0 TP: 0 Personal work: 0 Others (internships, etc.): 0
Credits allocated to the EU (and its components)	EU = 2 credits Component 1: 2 credits
Description of the EU and its components	<u>Component 1:</u> Concepts on resource vulnerability water Perimeter protection methods Legal and environmental aspects

- Detailed program by subject

(1 detailed sheet per subject)

Title of license : Hydraulic

Semester:5

Credit 6

Title of the subject: General Hydraulics

Teaching objectives:

The objective of this subject is to provide the necessary bases for understanding and calculation
phenomena present in applied hydraulics, water and environmental engineering,
particularly those encountered in drinking water, sanitation and rivers

Recommended prior knowledge:

General notions of MDF

Content of the material:

Chapter 1: Hydrostatic 4 weeks

Fundamental equation of Hydrostatics, Absolute pressure and relative pressure, Equation
isobaric surfaces, Pascal's principle, Pressure measurement, Maximum vacuum value,
Relative balance equations (uniform linear and horizontal acceleration, acceleration
uniform linear and vertical, uniform acceleration around a vertical axis), Action of
pressure forces on solid walls (flat wall, curved surface (left surface)), Equilibrium of floating bodies (Vertical equilibrium (Archimedes thrust), Rotational equilibrium)

Chapter 2: Fluid Kinematics 4 weeks

Methods for studying the movement of a fluid (Lagrange method, Euler method),
Acceleration of a fluid particle (Depending on the stationarity of the movement, depending on load, depending on
geometric characteristics), Classification of flows (Continuity equation, Analysis of movement of a fluid particle, Vortex flows)

Chapter 3: Perfect Fluid Dynamics 4 weeks

General equation of motion of a perfect fluid, Integration of the equations of movement, Bernoulli equation (Physical interpretation, Graphical interpretation,
Pressure Interpretation), Pressure Measurement (static pressure, total pressure, pressure
dynamic), Flow and speed measurement.

Chapter 4: Real Fluid Dynamics 3 weeks

Reynolds experiment, Characteristics of laminar flows,
Characteristics of
turbulent flows, Equation of motion of a real fluid, Bernoulli equation for the flow of a real fluid, Integration of the Navier Stokes (NS) equations in the case of a
one-dimensional flow, Bernoulli equation applied to a current tube,
General expression of pressure losses (General expression of linear pressure losses,
General expression of Singular pressure losses).

Evaluation method:

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

References:

1- Carlier, M, General and applied hydraulics, Collection of the direction of studies and
electricity research in France, Volume 14, 2nd edition, Eyrolles, Paris, France, 1980.
2- Graf Walter H., Altinakar M, Hydrodynamics an introduction, Collection: Treaty
of civil engineering, Presses Polytechniques et Universitaires Romandes, 1998. 3- Hug M. Applied fluid mechanics, Edition Masson, Paris, 1975 4- Kremenetski N., Schterrenliht D., Alychev V., Yakovleva L. Hydraulics, edition
MIR-MOSCOW, 1984.
5- Laborde JP Elements of general hydraulics Edition polytechnic school of the University of Nice - SophiaAntipolis, 2007.

6- Lencastre, A. General hydraulics, Editions Eyrolles, first edition, Paris, 1999
7-Ouragh Y. Forced flow in hydraulics, Volume 1, Edition OPU, Algiers 1994
8- Ouragh Y. Forced flow in hydraulics, Volume 2, Edition OPU, Algiers 1994

Title of license : Hydraulic

Semester:5

Credit 6

Title of the subject: General Hydraulics

Teaching objectives:

Knowledge of the principles of head and free surface flow.

Recommended prior knowledge:

Basic notions of hydrostatics and mathematics

Content of the material:

Chapter 1 - LOAD FLOWS. STEADY STATE

A - Linear pressure losses

B - Singular pressure losses

C - Load line and piezometric line D -

Special problems

Chapter 2 - FREE SURFACE FLOWS - UNIFORM REGIME

A - General

B - Load losses

C - Stability of uncoated channels

Chapter 3 - FREE SURFACE FLOWS. STEADY STATE

A - General equations

B - Gradually varied movement - Backwater curves C - Abruptly varied movement - Hydraulic jump D - Singularities in the channels

E - Flood spillways F - Energy dissipation

Chapter 4 - HYDRAULIC MEASURES. PORTS AND SPILLWAYS

A - Measurements of levels and pressures B - Measurement of speeds

C - Measurement of flow rates in charged pipes D - Orifices

E - Thin-walled weirs F - Wide threshold weirs

G - Short weir weirs

H - Venturi Channels. Parshall Measurer

Evaluation method: Continuous control, practical work, written questioning.

References

1- M. CARLIER 'General and applied hydraulics' Ed Eyrolles, Paris 1972
2- SINNIGER RO, HAGER WH 'Hydraulic construction: stationary flows, treatise on Civil Engineering, Federal Polytechnic School of Lausanne, Roman Polytechnic and University Press, 1989
3- A. LENCASTRE 'General Hydraulics' Ed Eyrolles 1968

http://www-engees.u-strasbg.fr/site/fileadmin/user_upload/pdf/shu/COURS_hydraulique_generale_MEPA.pdf

Semester:5

Title of the subject: **Urban Hydrology 2**

Credit 4

Teaching objectives:

Knowledge of the principles of flow in urban basins as well as the estimation of runoff flow rates

Recommended prior knowledge:

Basic notions of topography, general hydraulics, general hydrology.

Content of the material:

Chapter 1 general design

Chapter II calculation of rainwater flow

CHAPTER III wastewater

CHAPTER IV Calculation sections

CHAPTER V CONDITIONS for establishing networks

CHAPTER VI ANNEXED WORKS

CHAPTER VII rainwater reservoir basins appendices: sizing

chart for retention basins

Evaluation method: Continuous control, practical work, written questioning.

References

http://www.enpc.fr/cereve/HomePages/tassin/hydurb00/hydurb_projet_courant/enonces/HU_projet_exploitation_courant.doc

Semester:5

Title of the subject: **Quality and treatment of drinking water**

Credit 4

Teaching objectives:

Knowledge of the principles of water treatment, the different stages of purification

Recommended prior knowledge:

Notions elementary hydraulic general, hydrology urban,pollution

Content of the material:

I. Main constituents of natural waters

General information on water resources

Organoleptic characteristics of water

Physico-chemical characteristics of water

Biological characteristics

II. Objectives of treating water intended for consumption

Physico-chemical and bacteriological standards for potability

Origin of water to be treated

Classic diagram of a water purification station

III. Pretreatment processes

Screening

Sieving

Aeration

IV. Coagulation-flocculation

Characteristics of suspended solids and colloids

Ionic double layer theory

Definition of coagulation and flocculation

Practical aspects of coagulation-flocculation

Basics of sizing coagulation and flocculation basins

Effect of coagulation-flocculation on the constituents of the water

V. Solid-liquid separation processes

Decantation: theory of decantation, decanter technology

Filtration: type of filtration, parameters influencing filtration, filter sizing

VI. Disinfection processes

Physical and chemical disinfection processes

Chlorination of natural waters

Disinfectant and oxidizing effects of chlorine

Implementation of chlorination

Evaluation method: Continuous control, practical work, written questioning.

References

http://www.ensa-agadir.ac.ma/gpee/download/Pollution%20GPEE%205.pdf
http://staub.site.voila.fr/Pro/dnld/teubio.pdf
http://services.ville.montreal.qc.ca/station/fr/pdf/mem_intro.pdf
http://www2b.ac-lille.fr/biotechnologies/ME%20GPTE.pdf

Semester:5
Title of the subject:Dam 1
Credit 4

Teaching objectives

The teaching will aim to give students the knowledge necessary for the design, construction and operation of concrete dams.

Recommended prior knowledge

1.

Free surface hydraulics, geology, hydrology and MDS

Content of the material:

Chapter I The watershed
Chap II Introduction to the different types of dams Chap
III Earth dam

Evaluation method:continuous + exam

References*(Books and handouts, websites, etc.)*:

Ministry of Agriculture, Planning Directorate. Dam techniques in rural development, Paris.

G. Post and P. Londe. Compacted earth dams – American method, Editions Gauthier, Villars, Paris
DLVisheretW.H.Hager. Dam hydaulics, John Wiley & Sons New York
A Water Resources Technical Publication. Design of small dams.US Department of interior, Bureau of complaint.

Title of the subject: **WATER ANALYSIS METHODS**
Credit 2
Teaching objectives:
Knowledge of the principles and methods of water analysis in the laboratory and in situ.

Recommended prior knowledge:
Basic concepts of chemistry

Content of the material:

I. Reminders on the constituents of water

Physico-chemical constituents

Biological constituents

Organoleptic characteristics

II. Titrimetric methods

General information on chemical equilibria

Acid-base titrations

Precipitation titrations

Titrations by complexometry

III. Electrochemical methods

Reactions and redox potentials

Application to some selective oxidants

Application of potentiometry and specific electrodes

IV. Spectrometric methods

Molecular absorption spectroscopy in the ultraviolet and visible

Photometric methods

Atomic flame spectroscopy

V. Some analytical protocols

Titrations by complex formation with EDTA

Titration with KMnO4

Electrodes specific to fluorine and heavy metals

Flame emission photometry for sodium measurement

Evaluation method: Continuous monitoring

References*(Books and handouts, websites, etc.)*:

1. Book Lwater analysis - J. Rodier - Natural waters, Eyrolles Paris edition 1980

http://www.yopdf.com/jean-rodier-lanalyse-de-l'eau-pdf.html

Semester:5
Redit 4
Title of the subject: **HYDROGEOLOGY**

Teaching objectives:
Knowledge of the principles and rules of catchments, the development of forges, water tables and to understand the principles of hydrogeology and the flow of groundwater.

Recommended prior knowledge:
Basic notions of geology, soil mechanics, underground hydraulics

Content of the material:

1. Introduction
2. General
3. Hydrogeology?
4. The circulation of water in aquifers
5. Classic examples of groundwater
6. The diffusivity equation
7. The piezometry plot

Evaluation method: Continuous monitoring

References*(Books and handouts, websites, etc.)*:

http://step.ipgp.fr/images/e/e4/GE2008ch2.pdf
http://www.sisyphe.upmc.fr/~m2hh/hydr/marsily/gdm-hydrogeology.pdf
http://www.sisyphe.upmc.fr/~m2hh/docu.htm

journals

http://www.cig.ensmp.fr/~iahs
http://www.rse.uquebec.ca/
http://www.elsevier.com/wps/find/journaldescription.cws_home/503343/description#description

Semester:5
Title of the material: MDS
Redit 3

Teaching objectives:

The objective of this subject is to raise awareness and introduce the student to the resolution of geotechnical problems linked to hydrotechnical works.

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Recommended prior knowledge:

-RDM

2.

Content of the material:

1. Physical characteristics of soils
2. Water in the ground
3. Settlement, compressibility and consolidation
4. Soil compaction

Evaluation method:continuous + exam

References*(Books and handouts, websites, etc.)*:

MM. Costet and Sauglerat. Practical courses in soil mechanics. Dunod – Paris
MM. Caquot and Kerisel. Treatise on soil mechanics. Gauthier, Villars - Paris

Semester:5
Title of the subject: ARRANGEMENTSWATER COURSES
Credit 2
Teaching objectives

The teaching will aim to give students the knowledge necessary for the design and construction of hydraulic structures whose function is the development of watercourses.

Recommended prior knowledge

3.

Free surface hydraulics

Content of the material:

1- Purpose of watercourse developments
2- Characteristics of the bed and route
3- The different types of river development 4-
Development works
5- River maintenance
6- Case study: protection of an urban area against flooding

Evaluation method:continuous + exam

References*(Books and handouts, websites, etc.)*:

Mr. Carlier. General and applied hydraulics, Eyrolles, Paris
WHGgrafand MSAltinakar. River hydraulics Volume 1: Permanent flow
WHGgraf and MSAltinakar. River hydraulics Volume 2: Non-permanent flow and transport phenomenon, French-speaking polytechnic and university presses, Lausanne

Semester:5

Title of the subject: **Foreign language**

Credit 1

Teaching objectives:

- Improved language skills
- Promptness in writing reports

Recommended prior knowledge:

-Elementary basics in modern language

Content of the material:

Unit1: Civil Engineering

- Text reading
- Terminology explanation
- Checkup
- Elements of Grammar: 8 parts of speech
- Listening skill

Unit 2: Dam

- Text reading
- Terminology explanation
- Checkup
- Elements of Grammar: Sentence patterns
- Listening skills

Unit 3: Water resources

- Text reading
- Terminology explanation
- Checkup
- Elements of Grammar: Sentence patterns
- Listening skills

Evaluation method: Continuous monitoring

References*(Books and handouts, websites, etc.)*:

http://www.anglaisfacile.com/

http://www.e-anglais.com/

http://www.englishtown.com/

Title of license : Hydraulic

Semester:6

Credit 4

Title of the subject: Drinking Water Networks

Content of the material:

1. Drinking Water Supply Systems
2. Water resource capture
3. Water consumption in urban areas
4. Sizing a distribution network

a) Branched network
b) Mesh network
c) Mixed mesh network

5. Water supply
6. Storage works
7. Special parts in a distribution network

Evaluation method: Continuous control, TD, written questioning.

References

1- Water management: water supply, sanitation. François, Valiron. Paris: ENPC press, 1985.

2- Water management: cost and price of water supply and sanitation. Valiron, F. Paris: presses from the National School of Bridges and Roads, 1991.

3- Memento of administrator of food in water And ofsanitation .T. 1, Water in the city food in Water. Lyonnaise of the waters. Paris : Technical Anddocumentation - Lavoisier; New York, 1994.

4- Memento of administrator of food in water And ofsanitation. Volume 2, urban sanitation. Lyonnaise des Eaux. Paris: Technique and documentation - Lavoisier; New York, 1994.

5- Memento of administrator of food in water And ofsanitation. Volume 3, case administration Specific monographs. Lyonnaise des Eaux. London: Technique and documentation - Lavoisier; Paris,

New York, 1994.
6- Connections, drinking water & sanitation. Renaud, Henri. Paris: Eyrolles, 2002.
7- Help memory hydraulic urban. Bonnie, Jacques. Paris :Eyrolles, 1982.
8- Urban hydraulics: hydrology - water collection and treatment. Dupont, André. Paris: Eyrolles, 1981.
9- Urban hydraulics applied to small and medium-sized towns. Bounin, Jacques.
Paris: Eyrolles, 1977.
10- Hydraulic urban applied. 1, Principles fundamentals Andhydraulic supplements. Nonclercq, P.
Liège: CEBEDOC, 1982.
11- Applied urban hydraulics. 2, Hydraulic sizing of rainwater collectors.

Title of license : Hydraulic

Semester:6

Credit 4

Title of the subject: Sanitation Networks Content

of the subject:

1. General characteristics of the water to be evacuated
2. Sanitation systems and schemes
3. Evaluation of the flow rates to be collected
4. Hydraulic calculation of water evacuation networks
5. Additional works for sanitation networks

Evaluation method: Continuous control, TD, written questioning.

References

1- Water management: water supply, sanitation. François, Valiron. Paris: ENPC press, 1985.

3- Memento of administrator of L'food in water And ofsanitation .T. 1, Water in the city food in water.Lyonnaise of the waters. Paris : Technical Anddocumentation - Lavoisier; New York, 1994.

3- Memento of administrator of food in water And ofsanitation. Volume 2, urban sanitation. Lyonnaise des Eaux. Paris: Technique and documentation - Lavoisier; New York, 1994.

4- Memento of administrator of food in water And ofsanitation. Volume 3, case administration specific monographs. Lyonnaise des Eaux. London: Technique and documentation - Lavoisier; Paris, New York, 1994.

5- Guide to sanitation in urban and rural areas. 1, The Collection, Gomella, Cyril. Paris: Eyrolles.

6- Connections, drinking water & sanitation. Renaud, Henri. Paris: Eyrolles, 2002.

7- Urban sanitation course introducing wastewater and solid waste techniques. University of technical sciences. Algiers, OPU.

8- Guide to the design and management of unitary sanitation networks: state of the art. Michel, Affholder.
Paris: Tec. & Doc., 1996.
9- Guide technical of sanitation. Satin, Mark. Paris : "THEMonitor", DL 2006.
10- Wastewater sanitation. Badia-Gondard, Françoise. Voiron (Isère): Technicalities, 2003.
11- Cheat sheet hydraulic urban. Bonnie, Jacques. Paris :Eyrolles, 1982.

Title of license : Hydraulic

Semester:6

Credit 2

Subject title Pumps and Pumping Station

Content of the subject: (Program details: see Appendix)

1. General information about pumps
2. Theories of incompressible fluid turbomachines
3. Laws of similarities in incompressible fluid pumps
4. Coupling of pumps in series and parallel

Evaluation method: Continuous control, practical work, written questioning.

Reference :

1. History of hydraulic power: Mills, pumps, wheels and turbines from Antiquity to the 20th century. Author(s)
VIOLLET Pierre-Louis
2. Hydraulic one-dimensional Part 2: Blows of ram Andmass oscillation phenomenon. Pumps centrifugals. Author(s) PERNÈS Pierre
3. NF ISO 17559: hydraulic transmissions, electrically controlled hydraulic pumps .06-2004 - 28p.
Pin
4. The pumps. Manual selection, application to variable speed. (Technical Collection, ref. MD1 PUMPS).
Author(s) MANON Jean - 01-2002 - 260p. 21x29.6 Paperback
5. NF EN 23661: end suction centrifugal pumps, dimensions relating to bases and installation.
Author(s) NF EN 23661 - 12-1993 – Hardcover
6. NF EN ISO 5198: centrifugal, helico-centrifugal and propeller pumps. Functional test code

hydraulic class precision. Author(s) NF ISO 5198 - 12-1987 – Hardcover
7. Turbomachines Volume 1: pumps. Author(s) POMPES - 01-1987 - 4 volumes Approx. 502p. Pin
8. NF E 44 051: pumps, hydraulic test pressure. Author(s) NF E 44051

Title of license : Hydraulic

Semester:6

Credit 4

Subject title Wastewater Treatment

Content of the material:

1. Composition of wastewater
2. Pretreatment
3. Decantation
4. Biological purification
5. Phyto-purification

Evaluation method: Continuous control, TD, written questioning.

1- Bacteriology of the environments aquatic : aspects ecological Andsanitary facilities (Point on purification and water air effluent treatment 2-2): Tec. & Doc., 1985.

2- Biological purification of urban wastewater. Caid, Abdelkader. Algiers: OPU, 1984.

3- Biological water purification: theory, reactor technology. Edeline, F. Liège: éd.cebedoc, 1992.

4- Biological wastewater treatment: theory and technology. Edeline, F. Liége: éd.cebedoc, 1980.

5- Water purification using aquatic plants. Blake, G. Paris: afee, 1982.

6- Physico-chemical water purification: theory and technology. Edeline, F. Liège: éd.cebedoc.

Title of license : Hydraulic
Semester:6
Credit 4
Subject title Dam II: Special Annex Works
Content of the material:

1. Cofferdam and temporary diversion
2. Flood spillway
3. Bottom drain
4. Water intakes
5. Fight against infiltration
6. Monitoring and maintenance of dams
7. Energy dissipators

Evaluation method: Continuous control, TD, written questioning.

Reference :

1- Design and calculation of torrential correction dams. Deymier, Christian. Saint-Martin-d'Hères:
National Center for Agricultural Machinery, Rural Engineering, Water and Forests, Grenoble Group,
1995.
2- Mobile navigation barriers: project manager's guide: design, sizing, execution
Works, impact on the environment, operation, administrative procedures. Waterways of
France. Paris: Moniteur, 1998.
3- Dams: breaking floods and civil protection. Walk, Claude. Canada: Presses Internationales
Polytechnique, 2004.
4- Dams: engineering, design and environmental impacts:international conference, 10-13 September
1996, Cardiff, UK. Burt, Neville. Chichester: Wiley; New York, 1996.
5- Dams and sustainable development in France: proceedings of the technical conference, Paris, November 18, 2003.
French Committee on Large Dams. Antony (Hauts-de-Seine): CEMAGREF, 2003.

6- Geology of dams and small reservoirs. Lautrin, D. Strasbourg: CEMAGREF, 1990.
7- Monitoring and maintenance of small dams: practical guide. Paul, Royet. Paris: CEMAGREF, 1994.

Title of license : Hydraulic
Semester:6
Credit 4
Subject title Management and protection of Water Resources

Content of the material:

Chapter I –Water resources I-1- Surface water
I-2- Groundwater
Chapter II -Resource management
II-1- General management principlesII-2- Methods Management
II-3- Groundwater management II-4- Surface water management
Chapter III –Preservation of water resources
- General principles of resource preservation water
- Preservation methods III-3 – Preservation models
Chapter IV –Integrated resource management
IV-1 - Information system
IV-2 - Spatiotemporal mapping

Evaluation method: Continuous control, TD, written questioning.

Reference :

Title of license : Hydraulic

Semester:6

Credit 3

Subject title Applied Computing

1. Recent software(s) for drinking water supply
2. Recent software(s) for Sanitation
1. Autocad (CAD)
2. MapInfo (GIS)

Evaluation method: Continuous Control, TP

Title of license : Hydraulic
Semester:6
Credit 2
Subject titlewater saving

Content of the material:

1. **Rationalization of water in agriculture:**
2. **Water policy in Algeria**
3. **Integrated water resources management**
4. **Water rationalization**
    - **in industry**
    - **in domestic consumption:**
    - **in agriculture**
5. **Saving water and fighting pollution**

Evaluation method: Continuous monitoring

Reference :

Title of license : Hydraulic
Semester:6
Credit 2
Subject title Pollution and Impact on the Environment
Evaluation method: Continuous control, TD, written questioning.

Content of the subject

- General notions about the environment (definitions, nomenclature: ecosystems, ecological factors, etc.),
- Pollution and ecosystems (classification of pollution, water cycle, water cycle
- carbon, nitrogen cycle etc….),
- Impact of pollution on aquatic ecosystems (Effects of acid rain
- Eutrophication, self-purification, etc.),
- Global changes, greenhouse effect
- **Evaluation method:**Continuous monitoring

Reference

:

Title of license : Hydraulic
Semester:6
Credit 1
Subject title Foreign language
Content of the material:

Unit 1: Water supply

- Text reading
- Terminology explanation
- Checkup
- Elements of Grammar: Verb tenses
- Listening skills

Unit 2: pumps

- Text reading
- Terminology explanation
- Checkup
- Elements of Grammar: How to write a paragraph?
- Listening skills

Unit 3: Basic Equations of Hydraulics

- Text reading
- Terminology explanation
- Checkup
- Elements of Grammar: How to write an essay?
- Listening skills

Evaluation method: Continuous monitoring

References*(Books and handouts, websites, etc.)*:
http://www.anglaisfacile.com/
http://www.e-anglais.com/
http://www.englishtown.com/

M–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)

Object: Approval of co-sponsorship of there Licencetitled:..... .....

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.

SIGNATUREof 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:..... .....

By there present, the company..... .....declared her willingness to demonstrate 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

N - brief CV of the License manager

O-Opinions and Visas from administrative and consultative bodies

Title of the training for national recruitment:

Department Scientific Committee
Opinion and approval of the Date :

Scientific Council of the Faculty (or institute)
Opinion and approval of the Date :

Dean of the faculty (or Institute Director)
Opinion and visa from the Dean or Date :

Headmaster
Opinion and visa from the Head of Date :

P - Visa from the Regional Conference

(Only to be provided in the final version of the training offer)