Machine Translated by Google

ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ

Democratic and Popular Republic of Algeria

ÿÿÿÿÿ ÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ

Ministry of Higher Education and Scientific Research

Constantine University 1 - Mentouri Brothers

TRAINING OFFER
STATE ENGINEER

ST Course

Academic year: 2024-2025

Establishment	Faculty / Institute	Department
Constantine 1 - Brothers Mentouri	**Sciences of the Technology**	**Electrical engineering**

Domain	Sector	Speciality
Sciences and Technologies	***Electrical engineering***	***Electrical Systems Industrialists***

Machine Translated by Google

ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ
Democratic and Popular Republic of Algeria
ÿÿÿÿÿ ÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ
Ministry of Higher Education and Scientific Research

ÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ
ÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿÿÿÿ
Educational Committee National Domain
Science and Technology

The Lord
ÿÿÿÿÿÿ

Al-Qadr	Al-Qaeda/Al-Qaeda	Al-Qaeda
The Lord	ÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿ	ÿÿÿÿÿÿÿÿ 1 – ÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ

The	Allah	Al-Maghrib
ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ	The Lord	The Lord and the Lord

Machine Translated by Google

Summary

Machine Translated by Google

1- The weekly hourly volume VHH = 427H per semester,

2- The sum of the coefficients of the subjects must be equal to 19 and of the credits to 30 per semester,

3- The subject "Internship in an industrial environment 1 and 2 " must appear respectively in semesters 6 and 8 and in the methodological unit (UEM), the duration of these internships will be limited to 30 days/ internship (hourly volume outside the quota): credit 1 and coefficient 1 per internship. The subject **Professional Personal Project (credit 2, coefficient 1) must appear in S7 in the UEM.**

4- The following cross-curricular subjects are compulsory and must appear in online and face-to-face water education for exams:

S5: **Technical English related to the specialty,** ***S6:***
Entrepreneurship and business management (credit 1, coefficient 1)

S8: **Compliance with standards and rules of ethics and integrity (credit 1, coefficient 1)**

S9: Documentary research and **Dissertation design (credit 1, coefficient 1)**

5- The method of assessing subjects according to their teaching methods (Courses, tutorials, practical work) is already defined by the CPND

6- The elimination mark per subject must appear in the offer: 05/20

7- For S10: The PFE must be done in relation to a company or within the framework of decree 1275 (start-up).

Machine Translated by Google

I – Engineering Identity Card

Machine Translated by Google

1 - Location of the training :

1. 1. Location:

Establishment: Constantine 1 – Mentouri Brothers

Faculty: Science and Technology

Department: Electrotechnics

2. 2. Coordinators:

- Responsible for the training area (attach CV)

Name & surname: ZIANI Salim
Grade: MCA
ÿ:+213(0)31811130 Fax:+213(0)31811130 e-mail:ziani_salim@umc.edu.dz

- **Head of training program (Attach CV)**

Name & surname: NEMMOUR Ahmed Lokmane
Grade: Professor
ÿ:+213(0)31811130 Fax:+213(0)31811130 e-mail: ahmed-lokmane.nemmour@lec-umc.org

- Head of the specialty team (Attach CV)

Name & surname: BIDI MANEL
Grade: MCA
ÿ:+213(0)31701413 Fax:+213(0)31701413
Email: bidi.manel@umc.edu.dz

2- External partners:

Other partner establishments:

Businesses and other socio-economic partners:

ÿ The education sector

ÿ The industrial sector such as the various public companies and private

ÿ Research Laboratories

International partners:

Machine Translated by Google

3– Context and objectives of the training

A – Presentation of the project

Electrical engineering has an extremely broad scope of application, it concerns a large number of industrial companies, in the fields of production and transport of electrical energy, in electrical equipment, in transport using electric motors, in power electronics, etc.), and also in more unexpected fields such as aerospace. In this context, the training *"Industrial Electrical Systems* (SEI)" is offered and is intended for students registered for the "State Engineers" diploma in the field of Science and Technology, having validated two years of Preparatory Classes (first cycle of the common core of the graduation).

B - Training objectives:

Constantine 1 University - Mentouri Brothers (UMC1) aims to train engineers with a high scientific level and technical skills enabling them to assume various responsibilities within companies.

This training is based on three major pillars: knowledge of business and entrepreneurship, a broad scientific and technical culture, as well as expertise
in-depth study in a specific area of electrical engineering.

The UMC1 training program aims for a balance between scientific and technical aspects, between the mastery of specialized knowledge and skills, and between the development of abstraction, analysis, synthesis and practical application skills.

The importance given to business knowledge, communication and mastery of English, without neglecting science and technology, reflects this balanced approach.

An inductive teaching methodology, through the implementation of mini-projects, promotes a sense of concreteness, appreciation of practice, and innovation. Analytical, design, and implementation skills are systematically developed to achieve mastery of complex systems.

Finally, the training actively encourages creativity, entrepreneurial spirit, respect for ethics and professional conduct in the engineering profession, communication skills, and openness to international cultures. The ultimate goal is therefore to train professional state engineers.

C – Targeted profiles and skills:

At the end of the state engineer training program, students will develop the following skills:

- Application of knowledge in mathematics, physical sciences and computer science to solve scientific and technical problems.
- Design and implementation of scientific and technical experiments, analysis and interpretation of measurement results.
- Formulation and design of systems, processes or programs meeting specific needs.
- Effective collaboration within multidisciplinary groups.
- Identification and resolution of problems related to applied sciences.
- Understanding of ethical and professional responsibilities.

Machine Translated by Google

- Acute awareness of the impact of the engineering profession on society.
- Effective communication in Arabic, French and English.
- Competent use of modern technical and scientific tools in the practice of the engineering profession.
- Knowledge of contemporary developments and issues.
- Recognition of the need and ability to keep continuously informed of developments in the field.

D – Regional and national employability potential:

The job prospects for electrical engineers specializing in "Industrial Electrical Systems" who graduated from UMC1 are particularly promising. These opportunities extend in particular to national companies and industries such as (Sonatrach, Sonelgaz, Kahrakib, Sonacome, German, Seaco, Schlumberger, Schneider Algeria, Renault Algeria, Siemens Algeria, Condor, cement plants, naval industries, pharmaceutical industries, mechanical industries, etc.). In addition, opportunities are also available within multinationals operating in Algeria, design offices as expert consultants or design engineers, as well as in the academic and research fields as teacher-researchers within universities and research centers.

E – Expected performance indicators of the training:

ÿ Rate of professional integration. ÿ Rate of wish lists formulated by students for training proposed.
ÿ Feedback from companies that have hosted interns ÿ Feedback from companies that have recruited engineers from this training ÿ
Feedback from students at the end of the cycle ÿ
Feedback from students at the beginning of the cycle ÿ
Feedback from graduates

1. Evaluation of the training progress:

*

Before the training:

During training:

Downstream of the training:

2. Evaluation of the progress of the lessons:

3. Integration of graduates:

Machine Translated by Google

F- Student assessment through continuous assessment and personal work:

F1- Assessment by Continuous Assessment:

The importance of continuous assessment methods on student training in terms of educational outcomes is no longer in doubt. The calculation of continuous assessment averages (tutorials and practical work) is based on a weighting of all the elements that make up this assessment. These articles specify that this weighting is left to the discretion of the teaching team.

A survey conducted by the CPND-ST among all teachers in the various university establishments showed heterogeneity in the implementation of continuous assessment of students. Therefore, we are led to admit a real deficit in the effective management of this pedagogical activity, which required serious reflection on this subject on our part, which, combined with proposals from several establishments, resulted in the recommendations below.

1. Proposals relating to subjects with supervised work:

1.1. Preparation of exercise series: The teacher responsible for the subject must organize himself by proposing a series of exercises for each chapter of the course. This series must be exhaustive with exercises for understanding the course and standard exercises to be solved during the tutorial session.

These exercises must be prepared by the student before attending the tutorial. This preparation may be assessed. The assessment method is left to the discretion of the instructor in charge of the tutorial.

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

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

1.3. Student participation in tutorials:

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

1.4. Student Attendance: Student attendance is mandatory for tutorials and practical work. In class, it is difficult to monitor attendance for students with large numbers of students (lectures in lecture halls). For students with small numbers of students, attendance must be mandatory for both lectures and practical work.

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

Machine Translated by Google

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

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

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

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

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

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

4. Harmonization of continuous monitoring:

Using a common assessment grid would promote the harmonization of these practices from one teacher to another, from one department to another, and from one institution to another. It would also provide a structuring and reassuring benchmark for students.
To do this, we propose below an indicative assessment grid that presents the different continuous assessments allowing to evaluate the degree of acquisition of students' skills, whether in terms of knowledge, analytical skills or synthesis skills. 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" assessing the degree of assimilation of the different skills and knowledge taught to the student in all objectivity. In the same spirit, we would gain by promoting the contractualization of the assessment of learning by specifying, for example, the success criteria and good practices that would lead to correct and precise answers to the questions. Thus, the assessment would focus mainly on the skills acquired through training by giving exercises related to what was prepared in tutorials, without forgetting, however, to assess the students' ability to use their skills in more complex situations.

In accordance with the recommendations of the CPND-ST, the following evaluation grids will be adopted:

Machine Translated by Google

Nature of matter	Continuous assessment	Final exam
Subjects in the form of lectures only:	-	**100%**
For subjects in the form of lectures and tutorials or practical work:	**40%** (tutorials or practical work)	**60%**
For subjects in the form of lectures, tutorials and practical work :	**40%** (20% TD + 20% TP)	**60%**
For subjects in the form of tutorials or practical work	**100%**	**-**

Continuous assessment assessment (tutorials and practical work):

Practical work:

Preparation of series of exercises and personal work (homework to be submitted, presentations,	**20%**	04 points
etc.), Written tests (minimum 02 written tests including 01 test at least proposed by the subject manager to all sections)	**60%**	12 points
Student participation in tutorials (surprise quizzes, attendance, etc.)	**20%**	04 points
Total	**100%**	**20 points**

Practical work:

preparation of practical work, participation, attendance, preparation tests, etc.	**20%**	04 points
Report (to be submitted according to the decisions of the teaching team: at the end of the practical work session, the following week, following practical work, etc.)	**40%**	08 points
Practical work test at the end of the semester	**40%**	08 points
Total	**100%**	**20 points**

G2- Student's personal work:

The student's personal work has been allocated a very substantial amount of time per week: approximately 50% of the total training time (see the table "Overall training summary" in this training offer).

A survey conducted by the CPND-ST among training teams across all university establishments indicated that time spent on student personal work could be used wisely, under good teacher supervision, rationally and in various forms. The tasks that would then be completed by volunteer students would be evaluated and counted (as a bonus) in their overall continuous assessment grade. The rate of this bonus is left to the discretion of the teaching teams.

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

Machine Translated by Google

1. Homework :

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

2. Mini-course project:

The mini-course project (1 to 3 weeks) is an effective way to prepare students for the methodology of expression, writing and documentary research. It is a means that allows them 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 to the group, is awarded according to an evaluation grid (presentation of the document and use of bibliographic resources, oral presentation, respect for time, answers to questions, etc.) and will then be counted, as a bonus, in the continuous assessment mark.

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

Visits, educational outings, discovery and/or immersion courses are opportunities for students that can help them better understand the reality of the working world and help them achieve better professional integration later on.
Administrative managers and teachers must encourage, as much as possible, this very important aspect of training and ensure the organization of educational visits and outings throughout the training course.
They must also help/encourage students to prospect in economic institutions with the aim of finding discovery and/or immersion internships of one to two weeks in the industrial environment during the winter and spring holidays.
In this context, teachers must ensure that students take notes during these outings and require reports (reports of a few pages). This activity can be evaluated, graded, and recorded as a bonus for the student who completes it. Students can be offered templates *to* help them present their internship report effectively.

4. Participation in scientific events: In order to instill

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

Machine Translated by Google

5. Use of New Information and Communication Technologies:

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

6. Eliminatory note:

On the recommendation of the CPND-ST, the elimination mark to be taken into consideration is 05/20 for all subjects.

Conclusion :

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

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

Machine Translated by Google

Human resources available:

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

Number of students: 20

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

First and last name	Graduation Diploma	Specialty diploma (Master, doctorate)	Grade	Materials to teach	Signing in
KERDOUN DJALLEL	Master	Doctorate in Science	Prof.	SEI 6.1; SEI 9.1	
BENALLA HOCINE	State engineer	State Doctor	Prof.	SEI 5.3; SEI 6.2	
KHEZZAR ABDELMALEK	State engineer	Doctorate in Science	Prof.	SEI 5.7; SEI 9.4	
MEHASNI RABIA	License	Doctorate in Science	Prof.	SEI 5.2; SEI 6.9	
LABED DJAMEL	State engineer	State Doctorate	Prof.	SEI 6.3; SEI 7.3	
BOUCHERMA MOUHAMED	State Engineer	Doctorate in Science	Prof.	SEI 7.9; SEI 8.2	
NEMMOUR AHMED LOKMANE	State engineer	Doctorate in Science	Prof.	SEI 6.4; SEI 6.6	
BENSOUICI MOUMTEZ	State engineer	Doctorate in Science	Prof.	SEI 5.4; SEI 7.7	
ZAROUR LAID	State engineer	Doctorate in Science	Prof.	SEI 9.5	
ABED KHOUDIR	State engineer	Doctorate in Science	Prof.	SEI 6.5	
BENNECIB NEDJOUA	State engineer	Doctorate in Science	MCA	SEI 7.10	
HACIL MAHIEDDINE	State engineer	Doctorate in Science	MCA	SEI 5.1; SEI 5.11	
MAOUCHE YACINE	Master	3rd year doctorate Cycle	MCA	SEI 7.2	
BELAKEHAL SOLTANE	State engineer	Doctorate in Science	MCA	SEI 7.4	
BABAA FATIMA	State engineer	Doctorate in Science	MCA	SEI 8.9; SEI 9.3	
BIDI MANEL	State engineer	Doctorate in Science	MCA	SEI 8.5; SEI 9.8	
NEBTI KHALIL	State engineer	Doctorate in Science	MCA	SEI 7.1; SEI 8.3	
REZGUI SALAHEDDINE	License	Doctorate in Science	MCA	SEI 9.2	
LOUZE LAMRI	State engineer	Doctorate in Science	MCA	SEI 5.6; SEI 5.10	
BOURDIM SAMIA	State engineer	Doctorate in Science	MCA	SEI 5.5; SEI 8.8	
REBBAH REDJEM	State engineer	Doctorate in Science	MCA	SEI 8.6	

Machine Translated by Google

DJEGHLOUD HIND	State engineer	Doctorate in Science	MCA	SEI 6.7; SEI 8.4	
OUILI MEHDI	State engineer	Doctorate in Science	MCA	SEI 9.6	
AZIZI IDRIS	State engineer	3rd Cycle Doctorate	MCB	SEI 7.5	
BOUNECHBA HADJER	Master	3rd Cycle Doctorate	MCB	SEI 7.6	
AKKOUCHI KAMEL	License	Doctorate in Science	MCB	SEI 8.1	
BOUKEBBOUS Seif Eddine	State engineer	Doctorate in Science	MCB	SEI 9.7	

Departmental visa

Faculty or institute visa

Machine Translated by Google

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

Departmental visa

Faculty or institute visa

Machine Translated by Google

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

Grade	Internal Staff	Effective External	Total
Teachers	10		10
Lecturers (HAS)	13		13
Lecturers (B)	04		04
Assistant Professor (A)			
Assistant Professor (B)			
Other (*)			
Total	**27**		**27**

(*) Technical and support staff

Grade	Internal Staff
Laboratory engineer	5
Laboratory Technician	
Computer Engineer	

Machine Translated by Google

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: Electrical Measurements Laboratory

Student capacity: 12

No.	Equipment designation	Number	Observations
1	Oscilloscopes	06	
2	Ammeters	08	
	Voltmeters	08	
4	Wattmeters	08	
5	Galvanometer	04	
6	Stopwatch	04	
7	GBF	08	
8	Alim-AC	10	
9	DC power supply	10	
10	Three-phase power supply	16	
11	Multimeters	20	
12	Variable resistance box	30	
13	Rheostat	10	
14	Inductance coil	10	
15	Standard Batteries	02	
16	Diode Bridge	04	
17	Lots of Connection Wires	05	

Laboratory name: Power Electronics Laboratory

Student capacity: 12

No.	Equipment designation	Number	Observations
1	Single-phase non-controlled rectifiers	02	
2	Dual-bridge non-controlled rectifiers Greatz	02	
3	Dual-controlled non-rectifiers with center-tapped transformer	02	
4	Uncontrolled rectifiers S3 (diodes)	02	
5	Uncontrolled PD6 rectifiers (diodes)	02	
6	Single-phase controlled rectifiers (thyristors)	02	

Machine Translated by Google

7	Dual-control rectifiers - bridge Greatz	02	
8	Double-controlled rectifiers with center-tapped transformer	02	
9	S3 control rectifiers	02	
10	PD6 controlled rectifiers	02	
11	Single-control rectifiers	02	
12	Jones Choppers	01	
13	V/F CST Controlled Inverters	01	
14	Single-phase dimmers	02	
15	Three-phase dimmers	02	
16	Wattmeters	04	
17	Ammeters average values	04	
18	Effective Value Ammeters	04	
19	Ammeters true RMS values Voltmeters average	04	
values	Voltmeters RMS values	04	
		04	
22	voltmeters true RMS values	04	
23	Multimeters	04	
24	Current Probes	04	
25	Voltage probes	04	
26	Multi-caliber load resistors	04	
27	Load inductances	04	
28	Filter capacitors	04	
29	Lots of Power Transistors other	04	
accessories		05	
30	PCs with MATLAB/PSIM simulation software	04	

Laboratory title: Electronic Control Laboratory
Student capacity: 12

No.	Equipment designation	Number	Observations
1	Microcontroller Kit + accessories	02	
2	dSpace card + interface + microphone	02	
3	Hall Effect Sensors and CassyLab		
4	Lots of electronic logic components store		
5	Lots of analog electronic components store		

Machine Translated by Google

Laboratory name: 3 kW Electrical Machine Testing Laboratory
Student capacity: 12

No.	Equipment designation	Number	Observations
1	LANGLOIS 3kW machine	10	
2	DE LORENZO machines 3.5kW	02	
3	ECODIME machines 1.2kW	02	
4	VENETTA 1kW machines	06	
5	LEYBOLD 0.3kW machines	06	
6	LAB VOLT 0.175kW machines	04	

Laboratory title: Laboratory for the Assembly and Disassembly of 0.175kW Electrical Machines

Student capacity: 12

No.	Equipment designation	Number	Observations
1	Stator DC Machine	4	
2	Three-phase Stator AC Machine	4	
3	Stator, 2-speed motor	2	
4	Synchronous motor stator Rotating iron stator	2	
5	Multi-power motor stator Cond-start motor	2	
6	stator	2	
7	Repulsion/induction motor stator Different	2	
8	types of end shields Three-phase	8	
	wound rotor Two-phase	4	
wound	rotor Squirrel cage rotor	4	
Alternator	rotor Rotating iron syn.	4	
motor	rotor Universal motor	2	
armature	Repulsion/induction motor rotor	2	
Partially	wound 36-slot stator	2	
		2	
16		2	
17	Different tools	12	

Laboratory title: Automatic Laboratory
Student capacity: 08

No.	Equipment designation	Number D	Observations
1	Stabilized power supplies	10	
2	Combinatorial Logic Models	05	

Machine Translated by Google

3	Position control models	02	
4	Temperature control model	02	
	12V electric motor	05	
6 Ammeters		10	
	Voltmeters	10	
8 First order servo system		03	
	Oscilloscopes	10	
10 Second-order servo systems		03	

Laboratory title: Automation and Industrial Computing
Student capacity: 08

No.	Equipment designation	Number	Observations
1	Automated elevator model	01	
2	Automated traffic light model	01	
3	Asynchronous motor starting models	03	
4	Schneider Programmable Controller Kit	02	
5	Siemens programmable autumn kit	01	

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

In anticipation

Internship location	Number of students	Duration of the internship
SONATRACH	Average 20	30 days / 180 hours max
SONELGAZ	Average 20	30 days / 180 hours max
SATREX	Average 20	30 days / 180 hours max
SCHB Cement Company	Average 20	30 days / 180 hours max
SAMHA HOME APPLIANCES	Average 20	30 days / 180 hours max
ENAFOR	Average 20	30 days / 180 hours max
CITAL	Average 20	30 days / 180 hours max
CONDOR ELECTRONICS	Average 20	30 days / 180 hours max
BRICKLIST	Average 20	30 days / 180 hours max
SARL RAMY MILK	Average 20	30 days / 180 hours max
Algerian Interprofessional Office of Cereals OAIC	Average 20	30 days / 180 hours max
SETRAM	Average 20	30 days / 180 hours max
SNTF	Average 20	30 days / 180 hours max
Public economic enterprise EPE ETRAG	Average 20	30 days / 180 hours max

Machine Translated by Google

SONACOME	Average 20	30 days / 180 hours max
PMO	Average 20	30 days / 180 hours max
NUMEDIA AND SAFILAIT DAIRIES	Average 20	30 days / 180 hours max

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

Titles Available at

CENTRAL LIBRARY and at the
FACULTY LIBRARY

1. L. Lasne; Power electronics: Course, case studies and corrected exercises; Dunod, 2011.
2. P. Agati et al.; Aide-mémoire: Electricity-Control and power electronics–Electro-technology; Dunod, 2006.
3. J. Laroche; Power Electronics – Converters: Course and Corrected Exercises; Dunod, 2005.
4. G. Séguier et al.; Power Electronics: Course and Corrected Exercises, 8th edition; Dunod, 2004.
5. D. Jacob; Power electronics - Operating principle, dimensioning; Ellipses Marketing, 2008.
6. G. Seguier; Power electronics, basic functions and their main applications; Tech and Doc.
7. H. Buhler; Power electronics; Dunod
8. CW Lander; Power Electronics; McGraw-Hill, 1981
9. H. Buhler; Electronics for Regulation and Control; Treatise on Electricity.
10. F. Mazda; Power Electronics Handbook: Components, Circuits and Application; 3rd Edition, Newnes, 1997.
11. R. Chauprade; Controls of alternating current motors (Power electronics); 1987.
12. R. Chauprade; Controls of direct current motors (Power electronics); 1984.
13.
14. L. Lasne. Electrotechnics, Dunod, 2008
15. J. Edminister. Theory and Applications of Electric Circuits, McGraw Hill, 1972
16. D. Hong. Electrical Circuits and Measurements, Dunod, 2009
17. M. Kostenko. Electrical Machines - Volume 1, Volume 2, MIR Publishing House, Moscow, 1979.
18. M. Jufer, Electromechanics, Polytechnic and University Presses of Romandie-Lausanne, 2004.
19. A. Fitzgerald. Electric Machinery, McGraw-Hill Higher Education, 2003.
20. J. Lesenne. Introduction to Advanced Electrical Engineering. Technique et Documentation, 1981.
21. P. Maye. Industrial electric motors, Dunod, 2005.
22. S. Nassar. Electrical Circuits, Maxi Schaum.
23. Theodore Wildi. Electrotechniques, de Boeck, 2005
24. Electric drive, J.Fandino., Volume 1, ISBN: 2-7462-1305-2, 2006
25. Electrical machines; Francis Milsant, Ellipses, 1992 26.

M.Kostenko and L.piotrovski. Electrical machine: alternating current machine, Volume II, Mir edition 1979.

27. M. Kostenko and L. Piotrovsky. Electric machine: direct current machine, Volume I, Mir edition 1979.
Francis Milsant. Electrotechnical Course: Direct Current Machine, Volume II, Eyrolles, Paris 1981
28. JP Perez. Electromagnetism Foundations and Applications, 3rd Edition, 1997.
29. A. Fouillé. Electrotechnics for Engineers, 10th edition, Dunod, 1980.
30. René Basquin. Mechanics: Static-Dynamic Kinematics, Volume I, Paris Edition 1995.
31. G. Lenormand. Mechanical construction: elements of technology.2, the connection function, other functions elementary, Paris, Foucher, 1969.
32. Pierre Agati. Connections, mechanisms and assemblies: courses, exercises and applications, 2nd ed., Paris, Dunod, 1994.

Machine Translated by Google

33. Philippe Arquès. Mechanical power transmissions: application to automatic gearboxes, Paris, Ellipses, 2001.
34. I. Artobolevsky. Theory of Mechanisms and Machines, Moscow, Mir, 1977.
35. D. Feliachi Technical drawing.1, descriptive geometry, Algiers, Office of university publications, 1995.
36. D. Feliachi. Technical drawing.2, industrial drawing, Algiers, Office of university publications, 1995.
37. Michel Georges Technical drawing: understanding and mastering localization, Paris, Afnor, 1991.
38. Thomas Gmur Elements of structural mechanics, 1st ed., Lausanne, Presses Polytechniques et Universitaires Romandes, 2001.
39. René Basquin. Mechanics: Static-Dynamic Kinematics, Volume I, Paris Edition 1995.
40. G. Lenormand. Mechanical construction: elements of technology.2, the connection function, other functions elementary, Paris, Foucher, 1969.
41. Pierre Agati. Connections, mechanisms and assemblies: courses, exercises and applications, 2nd ed., Paris, Dunod, 1994.
42. Philippe Arquès. Mechanical power transmissions: application to automatic gearboxes, Paris, Ellipses, 2001.
43. I. Artobolevsky. Theory of Mechanisms and Machines, Moscow, Mir, 1977.
44. D. Feliachi Technical drawing.1, descriptive geometry, Algiers, Office of university publications, 1995.
45. D. Feliachi. Technical drawing.2, industrial drawing, Algiers, Office of University Publications, 1995.
46. Michel Georges Technical drawing: understanding and mastering localization, Paris, Afnor, 1991.
47. Thomas Gmur Elements of structural mechanics, 1st ed., Lausanne, Presses Polytechniques et Universitaires Romandes, 2001.
48. Lucien Borel. Thermodynamics and Energy, Diffusion, 1991.
49. Brebes. Thermodynamics, Hachette, 1999.
50. Yves Janniot. Heat transfers, course, 2002.
51. Arnold. Applied Thermodynamics, course, Sommerfeld, 2003.
52. George. G Thermodynamics, Edition Ellipse 2005.
53. Lucien Borel. Thermodynamics, PPUR, 2005.
54. K. Boukas, Servo-controlled systems, Editions of the Polytechnic School of Montreal, 1995.
55. P. Clerc. Continuous automatic, sampled: IUT Electrical Engineering-Industrial Computing, BTS Electronics-Mechanics-Computer Science, Editions Masson (198p), 1997.
56. Ph. de Larminat, Automatic, Editions Hermes 2000.
57. P. Codron and S. Leballois, Automatics: continuous linear systems, Dunod Editions 1998.
58. Y. Granjon, Automatics: Linear, non-linear, continuous-time, discrete-time systems, representation of state, Editions Dunod 2001.
59. K. Ogata, Modern control engineering, Fourth edition, Prentice Hall International Editions 2001.
60. B. Pradin, Automation Course. INSA Toulouse, 3rd year GII specialty.
61. M. Rivoire and J.-L. Ferrier, Course in Automation, volume 2: control, regulation, command analog, Editions Eyrolles 1996.
62. Y. Thomas, Signals and linear systems: corrected exercises, Editions Masson 1993
63. Christophe Prévé. Protection of electrical networks, Hermès, Paris, 1998.
64. S.-H. Horowitz & A.-G. Phadke, John Wiley & Sons. Power System Relaying, 2nd edition, 1995.
65. Féchant L., LV electrical equipment, Distribution devices, Engineering techniques, treatise, Engineering electric, D 4,865.
66. Sabonnadière Jean Claude. New Energy Technologies 1: Renewable Energies, Ed. Hermès.
67. Gide Paul. The Great Book of Wind Power, Ed. Moniteur.
68. A. Labouret. Photovoltaic Solar Energy, Ed. Dunod.
69. Viollet Pierre Louis. History of hydraulic energy, Ed. Press ENP Chaussée.
70. Peser Felix A. Solar thermal installations: design and implementation, Ed. Moniteur.
71. P. Robert. Materials of electrical engineering, Dunod
72. F. Piriou. Materials of electrical engineering, MGE 2000, Hermès
73. Breal. Treatise on materials 3: experimental characterization of materials II.
74. Gérald Roosen. Semiconductor materials and nitrides for optoelectronics, Hermès

Machine Translated by Google

75. P. Tixador. Superconducting materials, Hermès.
76. Treatise on Electricity, vol. II, "Electrotechnical Materials"
77. Michel Denis. Computer-aided design: CAD, Edition Hermès Sciences Publication.
78. Technical Drawing: Computer Aided Design, Axonometric Perspective, Perspective Isometric, Edition Books LLC.
79. Jean-Louis Berthéol, François Mendes. Exercises in drawing mechanical parts and assemblies with the SolidWorks software, Casteilla Edition.
80. Hervé Emery. SolidWorks: 3D Modeling Practicals, Eska Edition.
81. Claude Corbet, Laurent Huet. Solidworks CAD: For learning industrial design, Edition Casteilla.
82. Dieulesaint E, D Royer., Applied Automation, 2001.
83. De Larminat P. Automatics: Control of linear systems. Editions Hermes, 1993.
84. Astrom, KJ, and Hagglund. T. PID Controllers: Theory, Design and Tuning, Instrument Society of America, Research Triangle Park, NC, 1995.
85. Datta, A., Ho, MT, and Bhattacharyya, SP Structure and Synthesis of PID Controllers, Springer-Verlag, London, UK, 2000.
86. Jean-Marie Flaus. Industrial Regulation, Editions Hermes 1995.
87. P. Borne. Analysis and regulation of industrial processes volume 1: Continuous regulation. Technip Editions.
88. T. Hans, P. Guyenot. Regulation and enslavement Editions Eyrolles.
89. Roland Longchamp. Numerical control of dynamic systems, Presses Polytechniques et universitaires romandes, 2006.
90. http:/www.technologuepro.com/cours-genie-electrique/cours-6-regulation industrielle.
91. Jean Bonal, Guy Séguier. Variable Speed Electric Drives, 1998.
92. Michel Pinard. Electronic control of electric motors, Dunod, 2004.
93. Loron Luc. Control of electrical systems, Lavoisier, 2000
94. J.-P. Caron, JP Hautier. Modeling and control of the asynchronous machine, Technip, 1995.
95. G. Grellet, G. Clerc. Electric actuators, Principles, Models, Controls, Eyrolles, 1996.
96. J. Lesenne, F. Notelet, G. Séguier. Introduction to advanced electrical engineering, Technique and Documentation, 1981.
97. J. Caron, J. Hautier. Modeling and Control of the Asynchronous Machine, Technip Edition, Paris, France, 1995.
98. D. Jacob. Power electronics Operating principle, dimensioning, Ellipses Marketing, 2008.
99. G. Seguier. Power electronics, basic functions and their main applications. Tech and Doc.
100. H. Buhler. Power electronics, Dunod.
101. CW Lander. Power Electronics, McGraw-Hill, 1981.
102. H. Buhler. Electronics for Regulation and Control, Treatise on Electricity.
103. F. Mazda. Power Electronics Handbook: Components, Circuits and Application, 3rd Edition, Newnes, 1997.
104. R. Chauprade. Controls of alternating current motors (Power electronics), 1987.
105. R. Chauprade. Controls of direct current motors (Power electronics), 1984.
106. Georges Asch and Collaborators. Sensors in industrial instrumentation, (Dunod 1998)
107. Ian R. Sintclair. Sensors and transducers, Newnes, 2001.
108.J. G. Webster. Measurement, Instrumentation and Sensors Handbook, Taylor & Francis Ltd.
109. M. Grout. Industrial instrumentation: Specification and installation of sensors and control valves, Dunod, 2002.
110. R. Palas-Areny, JG Webster. Sensors and signal conditioning, Wiley and Sons, 1991.R. Sinclair. Sensors and Transducers, Newness, Oxford, 2001
111. Ronald J. Tocci, Reynald Goulet. Digital Circuits: Theory and Applications. 1996 Edition.
112. Mouloud Sbai. Combinatorial Logic and Digital Components, Course and Corrected Exercises, Edition Ellipses, 2013.
113. Jean-Yves Fabert. Automation and Automation: Course and Corrected Exercises. Ellipses Edition, 2003.
114. René David, Hassan Alla. From Grafcet to Petri Nets. Edition Hermès, 1992.
115. Simon Moreno, Edmond Peulot. Grafcet: Design-Implementation in Programmable Automation industrialists. Casteilla Edition, 2009.
116. G. Michel. APIs: Architecture and applications of industrial programmable logic controllers. Dunod Edition 1988.

Machine Translated by Google

117. William Bolton. Industrial Programmable Logic Controllers. Dunod Edition 2010.
118. Frederic P. Miller, Agnes F. Vandome, John McBrewster. Industrial Programmable Logic Controllers: Computer programming. Alphascript Publishing 2010.
119. Khushdeep Goyal and Deepak Bhandari. Industrial Automation and Robotics. Katson Books. 2008.
120. Gérard Boujat and Patrick Anaya. Industrial Automation in 20 Fact Sheets. Dunod. 2013.
121. Patrick H. Oosthuizen, William E. Carscallen. Compressible fluid flow, McGraw-Hill editions, 1997.
122. HW Liepmann, A. Roshko. Elements of Gasdynamics, John Wiley & Sons, 1957.
123. Roger Ouziaux. Applied Fluid Mechanics; 2004, Dunod.

124. Zwingelstein G, Failure diagnosis, Hermès, Paris 1997; 125. Jean Henq. Practice of preventive maintenance, Dunod, 2000.
126. Raymond Magnan. Practice of industrial maintenance, Dunod, 2003.
127. Yves Lavina. Industrial Maintenance, Company Function, 2005.
128. François M. Maintenance: method and organization, Dunod, Paris 2000.
129. Boulenger A & Pachaud C. Vibration diagnosis in preventive maintenance, Dunod. Paris 2000.
130. Jean Henq. Practice of preventive maintenance, Dunod, Paris 2002.
131. Cuigent R. Maintenance Management, Dunod, Paris 2002.
132. Robert S & Stéphane S. Maintenance: the Maxer method, Dunod, Paris 2008.
133.JFD Beaufort. Use of relays for the protection of installations, 1972.
134. Michel Pierre Villoz. Protection and environment,; Technology and engineering, 2006.
135. Nichon Margossian. Occupational Risks, Technical and Engineering, 2006.
136. . Van Basshuysen, F. Schäfer, Internal Combustion Engine Handbook. Basics, Components, Systems, and Perspectives, SAE International, 2002.
137. CR Ferguson, Internal Combustion Engines. Applied Thermosciences, John Wiley & Sounds, 1986.
138.J. B. Heywood, Internal Combustion Engine Fundamentals, McGraw-Hill Book Company, 1988.
139. R. Stone, Introduction to International Combustion Engines, 4th Edition, Palgrave Macmillan, 2012 140. Patrick Koenblit, Carole Nicolas, Hélène Lehongre, Building Your Career Project, ESF Publisher 2011 141. Rachid Chaib. Maintenance and Industrial Safety in the Company, Dar El Houda, Algiers, 2007.
142. Lucie Beauchesne, Anne Riberolles, Building your professional project, L'Etudiant 2002

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

- Personal work spaces:

Campus Library

- ICT available at department and faculty level :

Digital Campus Internet Room

Machine Translated by Google

II – Half-yearly organization sheets for the specialty courses

Machine Translated by Google

Half	Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
						Course	TD	TP		Continuous assessment	Exam final
1	Fundamental EU Code: UEF 1.1.1 Credits: 10 Coefficients: 5	Analysis 1	IST.1.1	6	3	1h30	3:00 a.m.		67h30	40%	60%
		Algebra 1	IST.1.2	4	2	1h30	1h30		45h00	40%	60%
	Fundamental EU Code: UEF 1.1.2 Credits: 14 Coefficients: 8	Elements of Chemistry (Structure of Matter)	IST.1.3	7	4	1h30	3:00 a.m.	1:30 a.m.	9:00 a.m.	40% (20% TD + 20% TP)	60%
		Elements of Mechanics (Physics 1)	IST.1.4	7	4	1h30	3:00 a.m.	1:30 a.m.	9:00 a.m.	40% (20% TD + 20% TP)	60%
	Methodological EU Code: UEM 1.1 Credits: 4 Coefficients: 4	Probability and statistics	IST.1.5	2	2	1h30	1h30		45h00	40%	60%
		Computer structure and applications	IST.1.6	2	2			3:00 a.m.	45:00 p.m.	100%	
	Transversal EU Code: UET 1.1 Credits: 2 Coefficients: 2	Ethics and deontology dimension (the foundations)	IST.1.7	1	1	1h30			10:30 p.m.		100%
		Foreign language 1 (French or English)	IST.1.8	1	1		1h30		10:30 p.m.	100%	
Total Hourly Volume				**30**	**19**	**9:00 a.m.**	**1:30 p.m.**	**6:00 a.m.**	**4:27 p.m.**		

Machine Translated by Google

Half	Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
						Course	TD	TP		Continuous assessment	Exam final
2	Fundamental EU Code: UEF 1.2.1 Credits: 10 Coefficients: 5	Analysis 2	IST.2.1	6	3	1h30	3:00 a.m.		67h30	40%	60%
		Algebra 2	IST.2.2	4 2		1h30	1h30		45h00	40%	60%
	Fundamental EU Code: UEF 1.2.2 Credits: 14 Coefficients: 8	Electricity and Magnetism (physics 2)	IST.2.3	7	4	1h30	3:00 a.m.	1:30 a.m.	9:00 a.m.	40% (20% TD + 20% TP) 40%	60%
		Thermodynamics	IST.2.4	7	4	1h30	3:00 a.m.	1:30 a.m.	9:00 a.m.	(20% TD + 20% TP)	60%
	Methodological EU Code: UEM 1.2 Credits: 4 Coefficients: 4	Technical drawing	IST.2.5	2 2				3:00 a.m.	- 45:00 p.m.	100%	
		Programming (computer science 2)	IST.2.6	2 2				3:00 a.m.	- 45:00 p.m.	100%	
	Transversal EU Code: UET 1.2 Credits: 1 Coefficients: 1	Foreign Language 2 (English)	IST.2.7	1	1		1h30		10:30 p.m.	100%	
	EU Discovery Code: UED 1.2 Credits: 1 Coefficients: 1	Engineering professions	IST.2.8	1	1	1h30			10:30 p.m.		100%
Total Hourly Volume				**30 19**	**7:30**	**12:00**	**9:00**	**42**	**7:30**		

Machine Translated by Google

Semester 3:

Teaching Units Module Titles					Hourly volume Weekly			Hourly Volume Biannual (15 weeks)	Assessment method	
					Course	TD	TP		Continuous assessment	Final exam
Fundamental EU Code: UEF 2.1.1 Credits: 11 Coefficients: 6	Analysis 3	IST 3.1	6	3	1h30	3h00		67h30	40%	60%
	Numerical analysis 1	IST 3.2	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
Fundamental EU Code: UEF 2.1.2 Credits: 14 Coefficients: 8	Waves and vibrations	IST 3.3	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
	Fluid mechanics	IST 3.4	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
	Rational mechanics	IST 3.5	4	2	1h30	1h30		45h00	40%	60%
Methodological EU Code: UEM 2.1 Credits: 3 Coefficients: 3	Computer Science 3 (Matlab)	IST 3.6	2	2	1h30		1h30	45h00	40%	60%
	Computer Aided Design IST 3.7		1	1			1h30	10:30 p.m.	100%	
Transversal EU Code: UET 2.1 Credits: 2 Coefficients: 2	Technical English	IST 3.8	2	2		3:00 a.m.		45h00	100%	
Total Hourly Volume for Semester 3			**30**	**19**	**9:00 a.m.**	**12:00 p.m.**	**7:30 a.m.**	**427h30**		

Machine Translated by Google

Semester 4:

Teaching Units	Module titles				Hourly volume Weekly			Hourly Volume Biannual (15 weeks)	Assessment method	
					Course	TD	TP		Continuous assessment	Final exam
Fundamental EU Code: UEF 2.2.1 Credits: 10 Coefficients: 6	Numerical analysis 2	IST 4.1	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
	Resistance of materials	IST 4.2	5	3	1h30	1h30	1h30	67h30	40% (20% TD + 20% TP)	60%
Fundamental EU Code: UEF 2.2.2 Credits: 12 Coefficients: 6	Fundamental Electronics IST 4.3		4	2	1h30	1h30		45h00	40%	60%
	Basic electricity	IST 4.4 4		2	1h30	1h30		45h00	40%	60%
	Signal theory	IST 4.5	4	2	1h30	1h30		45h00	40%	60%
metrology **Methodological EU Code: UEM 2.2 Credits: 7 Coefficients: 6**	Measurement and	IST 4.6 3		2	1h30		1h30	45h00	40%	60%
	Computer Science 4	IST 4.7	2	2	1h30		1h30	45h00	40%	60%
	Assisted Design Computer	IST 4.8	2	2			3:00 a.m.	45h00	100%	
Transversal EU Code: UET 2.2 Credits: 1 Coefficients: 1	Techniques of expression, information and communication	IST 4.9	1	1		1h30		10:00 p.m.	100%	
Total Hourly Volume for Semester 4			**30**	**19**	**10:30**	**9:00**	**9:00**		**427h30**	

Machine Translated by Google

Semester 5:

Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
					Course	TD	TP		Continuous assessment	Final exam
Fundamental EU Code: UEF.1 Credits: 9 Coefficients: 6	Fundamental electrical engineering	**SEI 5.1**	**3**	**2**	1h30	1h30		45H	40%	60%
	Field theory	**SEI 5.2**	**3**	**2**	1h30	1h30		45H	40%	60%
	Power electronics	**SEI 5.3**	**3**	**2**	1h30	1h30		45H	40%	60%
Fundamental EU Code: UEF.2 Credits: 9 Coefficients: 6	Heat transfer	**SEI 5.4**	**3**	**2**	1h30	1h30		45H	40%	60%
	Servitudes 1	**SEI 5.5**	**3**	**2**	1h30	1h30		45H	40%	60%
	SEI 5.6 Combinational and Sequential Logic		**3**	**2**	1h30	1h30		45H	40%	60%
EU Methodological Code: UEM Credits: 11 Coefficients: 6	Applied numerical methods- Python	**SEI 5.7**	**3**	**2**	1h30		1h30 45H		40%	60%
	TP Servo	**SEI 5.8**	**2**	**1**			1:30 a.m. to 10:30 p.m.		100%	
	Power Electronics TP	**SEI 5.9**	**2**	**1**			1:30 a.m. to 10:30 p.m.		100%	
	Practical work on combinatorial and sequential logic	**SEI 5.10**	**2**	**1**			1:30 a.m. to 10:30 p.m.		100%	
	Fundamental Electrotechnical Practical Work	**SEI 5.11**	**2**	**1**			1:30 a.m. to 10:30 p.m.		100%	
Transversal EU Code: UET Credits: 1 Coefficients: 1	Technical English related to the specialty	**SEI 5.12**	**1**	**1**		1h30	-	10:30 p.m.	100%	
Total Hourly Volume			**30**	**19**	10:30 a.m.	**10:30 7:30 427:30**				

Machine Translated by Google

Semester 6:

Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
					Course	TD	TP		Continuous assessment	Final exam
Fundamental EU Code: UEF1 Credits: 10 Coefficients: 6	Electrical Machines	**SEI 6.1**	**5**	3	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
	Power electronics.2	**SEI 6.2**	**5**	**3**	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
Fundamental EU Code: UEF2 Credits: 10 Coefficients 6	Electrical Networks	**SEI 6.3**	**5**	**3**	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
	Discrete servo systems	**SEI 6.4**	**5**	**3**	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
Methodological EU Code: UEM Credits: 8 Coefficients: 5	Diagrams and devices	**SEI 6.5**	**4**	**2**	1h30		1h30	45h00	40%	60%
	Signal processing	**SEI 6.6**	**3**	**2**	1h30		1h30	45h00	40%	60%
	Internship in a company 1	**SEI 6.7**	1	1	Hourly volume outside quota Tutoring: 1.5 hours of practical work per week				100%	
Transversal EU Code: UET Credits: 1 Coefficients: 1	Entrepreneurship and business management	**SEI 6.8**	**1**	**1**	1h30			10:30 p.m.		100%
EU Discovery Code: UED Credits: 1 Coefficients 1	Materials in electrical engineering and High Voltage Technology	**SEI 6.9**	**1**	**1**	1 hour 30 minutes			10:30 p.m.		100%
Total Hourly Volume			**30**	**19**	**12:00**	**6:00**	**9:00**	**405:00**		

Machine Translated by Google

Semester 7:

Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
					Course	TD	TP		Continuous assessment	Final exam
Fundamental EU Code: UEF.1 Credits: 10 Coefficients: 6	Industrial automation	**SEI 7.1**	**5**	3	1 hour 30 minutes	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
	Modeling of electrical machines	**SEI 7.2**	**5**	**3**	1 hour 30 minutes	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
Fundamental EU Code: UEF 2 Credits: 7 Coefficients 4	Electrical networks 2	**SEI 7.3**	**4**	**2**	1 hour 30 minutes		1:30	45h00	40%	60%
	Advanced power electronics	**SEI 7.4**	**3**	**2**	1 hour 30 minutes		1h30	45h00	40%	60%
Methodological EU Code: UEM Credits: 11 Coefficients: 7	Microcontrollers	**SEI 7.5**	**3**	**2**	1 hour 30 minutes		1h30	45h00	40%	60%
	Measuring technology and sensors	**SEI 7.6**	**3**	**2**	1 hour 30 minutes		1h30	45h00	40%	60%
	SEI 7.7 Pneumatic and Hydraulic Actuators		**3**	**2**	1 hour 30 minutes		1h30	45h00	40%	60%
	Professional Personal Project	**SEI 7.8**	2	1	Hourly volume hourly out of quota Tutoring: 1.5 hours of practical work per week				100%	
Transversal EU Code: UET Credits 1: Coefficients: 1	Standards in Electrotechnics	**SEI 7.9**	**1**	**1**	1 hour 30 minutes			10:30 p.m.		100%
Discovery Code: UED Credits 1: Coefficients: 1	Production of electrical energy	**SEI 7.10**	**1**	**1**	1h30			10:30 p.m.		100%
Total Hourly Volume			**30**	**19**	1:30 p.m.	3 hours	**10:30**	**405h00**		

Machine Translated by Google

Semester 8:

Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
					Course	TD	TP		Continuous assessment	Final exam
Fundamental EU Code: UEF1 Credits: 15 Coefficients: 9	Electrical Machine Controls	**SEI 8.1**	**5**	3	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
	Industrial electrical networks	**SEI 8.2**	**5**	**3**	1h30	1 hour 30 minutes	1h30	67h30	40% (20%TD+20%TP)	60%
	Industrial automation 2	**SEI 8.3**	**5**	**3**	1h30	1h30	1h30	67h30	240% (20%TD+20%TP)	60%
Fundamental EU Code: UEF 2 Credits: 9 Coefficients 5	Modeling and identification of electrical systems	**SEI 8.4**	**5**	**3**	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
	Energy quality and EMC	**SEI 8.5**	**4**	**2**	1h30	1h30		45 hours	40%	60%
Methodological EU Code: UEM Credits: 4 Coefficients: 3	Industrial computing	**SEI 8.6**	**3**	**2**	1h30		1h30	45 hours	40%	60%
	Internship in a company 2	**SEI 8.7**	1	1	Hourly volume hourly out of quota Tutoring: 1.5 hours of practical work per week				100%	
Transversal EU Code: UET Credits 1: Coefficients: 1	Compliance with standards and rules of ethics and integrity	**SEI 8.8**	**1**	**1**	1h30			10:30 p.m.		100%
EU Discovery Code: UED Credits 1: Coefficients: 1	Reliability and industrial maintenance	**SEI 8.9**	**1**	**1**	1h30			10:30 p.m.		100%
Total Hourly Volume			**30**	**19**	12:00 p.m.	7:30 a.m.	7:30 a.m.	**405h00**		

Machine Translated by Google

Semester 9:

Teaching unit	Subject headings				Hourly Volume Weekly			VHS	Assessment method	
					Tutorial course		TP		Continuous assessment	Final exam
Fundamental EU Code: UEF1 Credits: 15 Coefficients 9	Design of electric drive systems	**SEI 9.1**	5	3	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
	Intelligence Techniques Artificial	**SEI 9.2**	5	3	1h30		3:00 a.m.	67h30	40% (20%TD+20%TP)	60%
	Monitoring and diagnosis of electrical systems	**SEI 9.3**	5	3	1h30	1h30	1h30	67h30	40% (20%TD+20%TP)	60%
EU Methodology Code: UET1 Credits: 13 Coefficients 8	**SEI 9.4** Intelligent Electrical Systems		5	3	1h30		3:00 a.m.	67h30	40%	60%
	Power Electronics Design	**SEI 9.5**	5	3	1h30		3:00 a.m.	67h30	40%	60%
	Design of BT **SEI 9.6** installations		3	2			3:00 a.m.	45 hours	100%	
Transversal EU Code: UET Credits: 1 Coefficients: 1	Documentary research and memory design	**SEI 9.7**	1	1	1h30			10:30 p.m.		100%
EU Discovery Code: UED Credits: 1 Coefficients 1	Industrial hygiene and safety	**SEI 9.8**	1	1	1h30			10:30 p.m.		100%
Total Hourly Volume			30	19	10:30 a.m.	3:00 a.m.	3:00 p.m.	427h30		

Machine Translated by Google

Semester 10:

The internship, which must be related to the industrial sector or in a company, is validated by a dissertation and a defense

	VHS	Coefficient	Credits
Personal Work			
Internship in a company			
Seminars			
Other (Supervision)			
Total Semester 10			

This table is given for information purposes only.

Evaluation of the End of Engineering Cycle Project

- Scientific value (Jury assessment) /6
- Writing the Dissertation (Jury's Assessment) /4
- Presentation and answer to questions (Jury assessment) /4
- Assessment of the supervisor /3
- Presentation of the internship report (Jury assessment) /3

Machine Translated by Google

Detailed programs of the 1st semester subjects

Machine Translated by Google

HALF	Subject title		Coefficient	Credits	Code
S1	Analysis 1		3	6	IST1.1
VHH	**Course**	**Practical work**	**Practical work**		
67h30	1h30	3:00 a.m.	-		

Prerequisites:

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

Teaching objectives

This first subject of Analysis I is particularly dedicated to the homogenization of students' knowledge 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.

Content of the material:

Chapter 1: Properties of the set R

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

Chapter 2: Real Number Sequences

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

Chapter 3: Real functions with a single variable

1. Limits and continuity of functions
2. Derivative and differential of a function
3. Applications to elementary functions (power, exponential, hyperbolic, trigonometric and logarithmic)

Chapter 4: Limited Development

1. Limited development
2. Taylor's formula

Machine Translated by Google

3. Limited development of functions **Chapter**

5: Simple integrals

1 Reminders on the Riemann integral and on the calculation of primitives.

Assessment method:

Written test, supervised homework, final exam

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

Machine Translated by Google

HALF	Subject title		Coefficient	Credits	Code
S1	Algebra 1		2	4	IST1.2
VHH	**Course**	**Practical work**	**Practical work**		
45h00	1h30	1h30	-		

Prerequisites:

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

Teaching objectives

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

Content of the material:

Chapter 1. Sets, Relations and Applications **(5 weeks)**

1. Set theory.
2. Order relation, Equivalence relations.
3. Injective, surjective, bijective application and reciprocal function: definition of an application, direct image, reciprocal image, characteristic of an application.

Chapter 2: Complex Numbers

1. Definition of a complex number.
2. Representation of a complex number: Algebraic representation, trigonometric representation, geometric representation, exponential representation.

3. Roots of a complex number: square roots, solving the equation az2 + bz+ c = 0, nth roots of a complex number.

Chapter 3: Vector Space

1. Vector space, basis, dimension (definitions and elementary properties).
2. Linear application, kernel, image, rank.

Machine Translated by Google

Assessment method:

Written test, supervised homework, final exam

Bibliographic references:

1. J. Rivaud, Algebra: Preparatory Classes and University Volume 1, Exercises with Solutions, Vuibert.
2. N. Faddeev, I. Sominski, Collection of exercises in higher algebra, Edition of Moscow
3. M. Balabne, M. Duflo, M. Frish, D. Guegan, Geometry – 2e first year preparatory classes, Vuibert University.
4. B. Calvo, J. Doyen, A. Calvo, F. Boshet, Algebra exercises, 1st scientific cycle preparation for the grandes écoles 2nd year, Armand Colin – Collection U.

Machine Translated by Google

HALF	Subject title		Coefficient Credits Code		
S1	Elements of mechanics (Physics 1)		4	7	IST.1.4
VHH	**Course**	**Practical work**	**Practical WorkIst& ;'**		
90h00	1h30	3:00 a.m.	1h30		

Prerequisites:
It is recommended to have a good command of physical sciences and basic mathematics in secondary school

Goals :
The teaching of this subject allows the student to acquire the fundamental notions of classical mechanics linked to the material point through:
- kinematics
- the dynamics
- and the concepts of work and energy.

Subject content: Physics 1 (Mechanics)

Chapter I: Reminder
- Dimensional analysis
- Vector analysis

Chapter II: Kinematics
- Concept of Reference
- Study of movements in space (general case, circular, rectilinear, coordinates intrinsic)
- Coordinate systems (Cartesian, polar, cylindrical, spherical)
- Relative motion (laws of composition of speeds and accelerations)

Chapter III: Dynamics
- Principle of inertia, inertial mass and Galilean frame of reference
- Momentum – Principle of conservation of momentum
- Concept of Force,
- Newton's Laws
- Differential equation of motion
- Different types of force (gravitational, elastic, viscous, etc.)

Chapter IV: Rotational Movement
- Angular Momentum, Moment of a Force
- Angular Momentum Theorem and Moment of Inertia
- Applications: torsion, pendulum, etc.

Chapter V: Work, power, energy
- Work and power of a force
- Kinetic energy
- Potential energy (gravitational, elastic, etc.) and equilibrium states.

Machine Translated by Google

- Conservative and non-conservative forces.
- Conservation of energy.
- Impulse and shocks (elastic and inelastic)

Physics Practical Work 1:

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

Assessment method:

Written test, supervised homework, final exam, practical work report,

Bibliographic references:

— Physics, 1. Mechanics, Harris Benson, de Boeck editions. —

Physics, 1. Mechanics, Eugene Hecht, Boeck editions.

— General Physics, Mechanics and Thermodynamics, Douglas Giancoli, de Boeck editions.

Machine Translated by Google

HALF	Subject title		Coefficient	Credits	Code
S1	Elements of chemistry (Structure of matter)		4	7	IST.1.3
VHH	**Course**	**Practical work**	**Practical work**		
90h00	1h30	3:00 a.m.	1h30		

Prerequisites: **Nothing**

Goals :

Teaching this subject allows the student to acquire the 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. Making students better able to solve chemistry problems

Content of the material

Chapter 1: Basic Concepts

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

Chapter 2: Main constituents of matter

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

Chapter 3: Electronic structure of the atom

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

Chapter 4: Periodic Table of Elements

Periodic classification of D. Mendeleev, Modern periodic classification, Evolution and periodicity of physicochemical properties of elements, Calculation of radii (atomic and

Machine Translated by Google

ionic), successive ionization energies, electron affinity and electronegativity (Mulliken scale) by Slater's rules.

Chapter 5: Chemical Bonds

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

Chapter 6: Radioactivity – Nuclear Reactions

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

Assessment method:

Written test, supervised homework, final exam, practical work report,

Bibliographic references

1. Ouahes, Devallez, General Chemistry, OPU.
2. SS Zumdhal & coll., General Chemistry, De Boeck University.
3. Y. Jean, Electronic structure of molecules: 1 from the atom to simple molecules, 3rd edition, Dunod, 2003.
4. F. Vassaux, Chemistry in IUT and BTS.
5. A. Casalot & A. Durupthy, Inorganic Chemistry 2nd cycle course, Hachette.
6. P. Arnaud, Course in Physical Chemistry, Ed. Dunod.
7. M. Guymont, Structure of matter, Belin Coll., 2003.
8. G. Devore, General Chemistry: T1, study of structures, Coll. Vuibert, 1980.

Practical work "Structure of matter"

TP No. 1: Preliminary TP: Safety in the chemistry laboratory and description of the equipment and the glassware.

TP No. 2: Change of state of water: Transition from liquid state to solid state and from liquid in vapor state.

TP No. 3: Determining the quantity of material.

TP No. 4: Determination of molecular mass.

TP No. 5: Calculation of uncertainties - Determination of the ionic radius

TP No. 6: Determination of partial molar volumes in a binary solution.

TP No. 7: Qualitative analysis of Cations (1st, 2nd, 3rd and 4th group).

TP No. 8: Qualitative analysis of Anions.

TP No. 9: Identification of metal ions by the flame method

TP No. 10: Separation and recrystallization of benzoic acid.

TP No. 11: Construction and study of some compact structures.

TP No. 12: Study of ionic structures

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S1	Probability and statistics		2	2	IST1.5
VHH	**Course**	**Practical work**	**Practical work**		
45h00	1h30	1h30	-		

Prerequisites:

None

Objectives:

— To develop a complete study of a random character.
— Highlight a possible link between two random characters —

Introduction to elementary probability calculation.

Content of the subject:

I- Probabilities

1. Reminders (combinatorial analysis, permutation, etc.)
2. Random variables
3. Usual discrete and continuous probability laws

II- Statistics

1. Descriptive statistics

1.1 One-dimensional descriptive statistics

1.2 Two-dimensional descriptive statistics

2. **Estimate**

2.1 Sampling, fundamental theorems and principle

2.2 Point estimate

2.3 Interval estimation

2.4 Point and interval estimation of an average

2.5 Point and interval estimation of variance

2.6 Point and interval estimation of a proportion

2.7 Margin of error and required sample size

3. **Statistical tests (single sample)** 3.1 Principle of hypothesis tests 3.2 Comparison of a mean to a given value

3.3 Comparing a variance to a given value

3.4 Comparing a proportion to a given value

3.5 Descriptive threshold of the test

3.6 Risks and efficiency curve

3.7 Goodness-of-fit test – Chi-Square test

4. **Statistical tests (multiple samples)**

4.1 Principle of testing

Machine Translated by Google

4.2 Comparison of two variances
4.3 Comparison of two means
4.4 Other tests on averages
4.5 Comparison of two proportions
4.6 Test of independence – Chi-square test
4.7 Tests of homogeneity of several populations – Chi-Square test

Assessment method:

Written test, supervised homework, final exam,

Bibliographic references:

— A.HAMON, Descriptive statistics: corrected exercises, PUR, 2008
— A REBBOUH, Descriptive statistics and probability calculations, HOUMA, 2009
— A OUKACHA, Descriptive statistics and probability calculation, 2010
— DJ MERCIER, Higher Education Mathematics Notebooks, vol. 1, 2010
S CHAUM SERIES, Theory and applications of statistics, 1991

Machine Translated by Google

HALF	Subject title		Credit coefficient		Code
S1	Computer structure and applications		2	2	IST1.6
VHH	**Course**	**Practical work**	**Practical work**		
45h00	-	-	3:00 a.m.		

Prerequisites : None

Objectives:

- To have an overview of the architecture of a computer.
- Master the practice of the four operations in base 2, 8 and 16.
- Know the properties of the main encodings of integers, relative integers and decimal numbers.
- Know the theoretical and practical aspects of the analysis, synthesis and materialization of logic circuits found in computers.
- Develop an adequate analysis, to specify what is in data, what is in result.
- Define an algorithm to solve the problem

Content of the subject:

Representation and codification of numbers

- Number systems: decimal, binary, octal and hexadecimal.
- Decimal-binary and binary-decimal conversions.
- Binary arithmetic.

Boolean algebra

- Boolean expression.
- Truth tables.
- Logic gates.
- Logic circuit versus Boolean expression.
- Evaluation of the output of a logic circuit.
- Simplification of Boolean expressions.

Introduction to algorithms

- Algorithm and primitive action.
- Structure of an algorithm.
- Standard types and appropriate operations.
- Basic operations in algorithms: assignment, reading, writing.
- Control structures and different types of loops.
- Modularity of an algorithm: procedures and functions.
- Data structures (tables and records).
- The files

Machine Translated by Google

Assessment method:

Written test, supervised homework, final exam,

Bibliographic references:

— ZANELLA, P. and Ligier, Y. (1989). Computer Architecture and Technology.
DUNOD IT. DUNOD.
— BAJARD, J. (2004). Calculation and arithmetic of computers. IC2 Information Treatise -
Order - Communication: Computer Science and Information Systems. Hermes Science Publications.

— TOCCI, R. (1992). Digital circuits: theory and applications. DUNOD.
— BELAID, M. (2004). Computer Architecture: Course and Corrected Exercises. Student Manuals.
International Blue Pages.
— WACK, B. (2013). Computer science for all in preparatory classes for the grandes écoles.
Eyrolles.
— GAUDEL, M., Soria, M., and Froidevaux, C. (1987). Data types and algorithms.
Number vol. 1 in Educational Collection. National Institute for Research in Computer Science and
Automation.
— CORMEN, T., LEISERSON, C., RIVEST, R., and CAZIN, X. (1994). Introduction to algorithms.
Computer science. Dunod.
— CORMEN, T. (2013). Algorithms: Basic Notions. Computer Science. DUNOD Editions.

Machine Translated by Google

SEMESTER	Subject title	Credit coefficient		Code
S1	Ethical and deontological dimension (the foundations)	01	01	IST 1.7

VHS	Course	Practical work	Practical work
10:30 p.m.	1h30	-	-

Prerequisites: **Nothing**

Goals :

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

Content of the subject:

I. Fundamental Notions – (2 weeks) Definitions:

1. Moral:
2. Ethics:
3. Ethics “Theory of Duty”:
4. The right:
5. Distinction between the different concepts
    A. Distinction between ethics and morality
    B. Distinction between ethics and deontology

II. The References – The Philosophical

References The Religious Reference
The evolution of civilizations The
institutional reference

III. The University Franchise – The Concept of University Franchises

Regulatory texts
University franchise fees University campus stakeholders

IV. University Values – Social Values
Community Values
Professional Values

V. Rights and Duties

Machine Translated by Google

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

VI. University Relations

Definition of the concept of university relations
Student-teacher relations
Student-student relations
Student-Staff Relations
Student Relations – Association Members

VII. Practices

Best practices For the teacher Best practices For the student

Assessment method: Continuous assessment, final exam.

Bibliographic references:

1. Collection of ethics and professional conduct courses from Algerian universities.
2. BARBERI (J.-F.), ÿMorality and corporate law', *Les Petites Affiches,* no. 68, June 7, 1995.

3.J. Russ, *Contemporary Ethical Thought,* Paris, puf, *Que sais-je?,* 1995.
4.LEGAULT, GA, Professionalism and Ethical Deliberation, Quebec, Presses of the University of Quebec, 2003.
5.SIROUX, D., ÿDeontology', in M. Canto-Sperber (ed.), Dictionary of Ethics and Moral Philosophy, Paris, Quadrige, 2004.
6.Prairat, E. (2009). Teaching professions in the age of ethics. *Education and Societies, 23.*

https://elearning.univ-annaba.dz/pluginfile.php/39773/modresource/content/1/Cours%20Ethique%20et%20la%20d %C3%A9ontologie.pdf

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S1	Foreign language 1 (French or English)		1	1	IST 1.8
VHH	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	-	1h30	-		

Prerequisites:
English taught in secondary school, basic French

Objectives:
In addition to general language teaching, the teachers in charge of this technical subject will apply themselves to developing, in the learner, skills in language.
This technical English course focuses on the assimilation of the elements of speech, which are essential components of sentence formation. Their mastery will allow the learner to be able to use these components to communicate both in writing and orally.
The main objectives are:
-Be able to communicate in writing and orally in a professional setting, regardless of the learner's entry level

-Guide learners towards a good mastery of different characteristics of the language
- Deepening of grammar, learning of translation techniques, enrichment of written and oral expression, discovery of the culture of Anglo-Saxon countries.
-allow the student to have access to technical documentation, which will allow him to stay informed of the latest technological advances, as generally published in English.

Provide knowledge, know-how and interpersonal skills in both written and oral communication.

To encourage students to use a specific language by systematizing it (grammar, spelling, vocabulary) throughout university life, not only in the teaching of French, but also in that of other disciplines: human sciences, mathematics, physics, etc.

Machine Translated by Google

ENGLISH SUBJECT CONTENT Unit one : Diagrams and description of objects and devices

1. Topic one: Diagrams and description of objects
2. Topic two: Diagrams and description of devices

Discoveringlanguage (languageoutcomes) **a)**	Developing skills (skills and strategies outcomes)
Grammar ÿ Present simple ÿ Pronouns (Personal and possessive) ÿ Punctuation (full stop – comma) ÿ Adjectives ÿ Prepositions of place ÿ ÿTo' of purpose Pronunciation ÿ Final –s ÿ Weak and strong forms of ÿand' **b) Vocabulary** ÿ Strategies for using a monolingual dictionary ÿ Strategies for using a bilingual dictionary ÿ Study of a dictionary entry ÿ Vocabulary used to express relationship between a whole and its parts or between a set and its members.	**a) Functions:** ÿ Describing component shapes and features ÿ Describing the function of a device ÿ Making statements about diagrams ÿ Illustrating a text with diagrams ÿ Expressing measurement ÿ Expressing purpose **b) Listening & speaking** ÿ Listening to a presentation of a device ÿ Listening for specific information, general ideas ÿ Making inferences
•(including, making up) ÿ (excluding, not being part of) Language of measurements ÿ Basic metricunits ÿ Derivedmetricunits ÿ Compound metricunits Describing shapes and dimensions	ÿ Talking about a given device ÿ Making a presentation of a device ÿ **c) Reading & writing** ÿ Reading ÿ Reading for specific information, general ideas ÿ Identifying references of reference words ÿ Guessing the meaning of words through context ÿ Recognizing types of discourse ÿ Discussing the organizational pattern of the text ÿ Making logical links between sentences and paragraphs ÿ Summarizing ÿ Writing the description of a device

Machine Translated by Google

Unit two: Diagrams and description of processes

1. Topic one: How technology works
2. Topic two: How energy is produced

Discovering language (language outcomes)

a)Grammar – pronunciation

- ÿ Present simple vs. continuous
- ÿ Past simple
- ÿ Passive voice
- ÿ Sequencers (first, next...)
- ÿ Relative pronouns
- ÿ Short-form relative clauses
- ÿ Pronunciation
- ÿ Final –ed
- ÿ Strong and weak forms of ÿwas' and ÿwere'

b) Vocabulary

- ÿ Vocabulary related to processes
- ÿ Definitions
- ÿ Generalizations

Developing skills
(skills and strategies outcomes)

a)Functions:

- ÿ Drawing and labeling a diagram of a process, using drawings and terms provided.
- ÿ Providing descriptions for processes illustrated by diagrams
- ÿ Transformation of directions etc. into descriptions.
- ÿ Changing descriptions into sets of directions and statements of results.
- ÿ Describing a process (using sequencers) ÿ

b) Listening & speaking

- ÿ Listening to a presentation of a process
- ÿ Listening for specific information
- ÿ Listening for general ideas
- ÿ Recognizing and showing a sequence of events
- ÿ Predicting the sequencing of ideas
- ÿ Talking about a given process
- ÿ Managing through a long conversation by asking for clarifications, giving examples...
- ÿ Making an oral summary of a process

c) Reading & writing

- ÿ Reading
- ÿ Skimming
- ÿ Scanning
- ÿ Contextual reference
- ÿ Rephrasing
- ÿ Guessing the meaning of words through context
- ÿ Analysis of paragraph organization
- ÿ Making logical links between sentences and paragraphs
- ÿ Summarizing
- ÿ Writing a descriptive paragraph (process)

Teaching Activities and Tasks:

- ÿ Text-based activities
- ÿ Small and large group discussions
- ÿ Exploration of theme

Machine Translated by Google

ÿ Pre-review of vocabulary
ÿ Reading Project (Assessment Information Attached)
ÿ Writing Portfolio (Including product and process: assessment information attached)
ÿ Oral presentation
ÿ Quizzes
ÿ Debates
ÿ Other activities as assigned by instructor

Subject content in French: The targeted skills are summarized in terms of objectives in the table below:

Pragmatic objectives	Language objectives
1 · **Introduce yourself** — Introduce yourself and introduce someone, — Ask to give — The verbs to be / to be called in the information, — Talking about oneself (choices, hobbies, tastes, preferences), — Evoke perspectives, — Learn to use characters — Use informal and phonetics.	— The lexicon relating to presentation, — The presentative “it is”, — Qualifying adjectives, present tense of the indicative, — Simple questioning, — The auxiliaries être and avoir in the present, — The simple future, formal forms, — discrimination /i/ /y/ /u/ etc.
2 · **Understanding an oral course** Take notes, Prioritize ideas, Identify the essential from the — secondary, Identify what is possible or — hypothetical, Appropriate the language of mathematics. Understanding an audiovisual document	— Abbreviations, — The condition, — Homonyms: which, some, — Punctuation marks, — Equality, superiority, inferiority and equivalence, — The designation (that is, we give, we pose...) — Numbers, symbols and mathematical formulas, — Identify information in a record — Understand the points discussed, — Understand the speaker's reasoning, — Identify the theme and main information, — Identify specific vocabulary.

Machine Translated by Google

3 . Asking and giving information / Documentation Request — directions, — Express the need to understand, — Verb to be to have in the present tense — Asking for information about a — Possessive adjectives, object, of an action, — Perform a search requiring the — Interrogative pronouns. use of several documentary tools (books, internet, etc.) and identify the relevant elements, — Search and select elements in order to inform.	— It is, he/she is, — The interrogative sentence,
4 . Understanding instructions — Understanding various instructions, — Determining the meaning of the main instructions, — Respect the order of a series of instructions, — Nuance between instruction, advice and Order.	— The verbs of instructions, — The infinitive mood, — The imperative mood, — The negative form of an instruction: prohibition.

Assessment method:

Question, Supervised Assignment, Final Exam

Bibliographic references:

— Vassivière, Jacques, **Write well to succeed in your studies: spelling, vocabulary, syntax, 150 rules and reminders, 150 corrected exercises,** Armand Colin, Paris

— Grevisse, Maurice, The agreement of the past participle: rules, exercises and corrections, edition revised by Henri Brie,

— French pronunciation, practical language teaching notebooks, — TEEO Written and Oral Expression Techniques

— Simone EurinBalmet, Martine Henao de Legge , **Practices of scientific French: teaching French for the purposes of scientific communication,** Hachette

— Mangiante JM., Parpette C., 2004, **French for Specific Purposes,** Hachette

— Jacqueline Tolas, Océane Gewirtz and Catherine Carras, **Succeeding in your engineering studies in French,** PUG (Presses Universitaires de Grenoble)

A wide variety of materials, ranging from articles and exercises created for the course to literary works and English and French textbooks depending on the course chosen.

Machine Translated by Google

Detailed programs of the 2nd semester subjects

Machine Translated by Google

HALF	Subject title		Coefficient Credits Code		
S2	Analysis 2		3	6	IST 2.1
VHH	**Course**	**Practical work**	**Practical work**		
67h30	1h30	3:00 a.m.	-		

Prerequisites:
It is recommended to master the fundamental bases of the calculation of integrals and primitives and of mathematics taught in S1

Goals :
Of prime importance for a scientist, this subject allows the student to acquire:

- methods of solving differential equations necessary for problems encountered in engineering and physics
- methods of calculating differentiability and integrals of multi-function functions variables (surfaces volumes), the different forms of limited development

Content of the subject:

Chapter 1: Ordinary Differential Equations

1. First-order ordinary differential equations

1.1 Historical Note.
1.2 Physical model leading to a differential equation.
1.3 General definitions
1.4 General notions on first-order differential equations.
ÿÿGeneral solution. Particular solution.
1.5 Equations with separate and separable variables.
1.6 First-order homogeneous equations. Definitions and examples.
ÿÿSolving the homogeneous equation.
1.7 Equations reducing to homogeneous equations.
ÿÿSolving the linear equation.
1.8 Bernoulli equation.
ÿÿDefinition. Solving the Bernoulli equation.

2. Second-order differential equations

2.1 Historical Note.
2.2 Homogeneous linear equations. Definitions and general properties.
2.3 Second-order homogeneous linear equations with constant coefficients
The roots of the characteristic equation are real and distinct.
The roots of the characteristic equation are complex.
The characteristic equation admits a double real root.
2.4 Homogeneous linear differential equations of order n with constant coefficients.
Definition. General solution. General method for calculating n solutions linearly.
independent of the homogeneous equation.
2.5 Second-order non-homogeneous linear equations
Method of variation of arbitrary constants.

Machine Translated by Google

2.6 Non-homogeneous second-order linear equations with constant coefficients Case where the second member is of the form a. The number is

not a root of the characteristic equation: b. is a simple root of the characteristic

equation: c. is a double root of the characteristic equation: Case

where the second member is of the form a. if is not a root of the

characteristic equation: b. if is a root of the

characteristic equation:

Chapter 2: Functions of several variables. Notions of limit, continuity, partial derivatives, differentiability 2.1 Historical note

2.2 Domain of definition.

2.3 Notion of limit.

Introduction. Concept of neighborhood. Definition of the limit of a function of two variables. Do not confuse limit along a direction with limit.

2.4 Continuity of functions of two variables.

2.5 Partial derivatives of order one.

Definition of partial derivatives of order one of a function of 2 variables at a point (x0,y0)

The partial derivative function. Partial derivatives of order two. Continuity and existence of the partial derivatives ((ôf)/(ôx)) and ((ôf)/(ôy))

2.6 Differentiable functions.

Introduction. Definition of differentiable functions. Case of functions of a real variable f:ÿÿÿ.

Definition of differentiable functions. Case of functions of two variables f:ÿ 2ÿÿ

Relationship between differentiable function and existence of partial derivatives ((ôf)/(ôx)) and ((ôf)/(ôy)).

Relationship between differentiability and continuity.

2.7 Concept of differential of a function of two variables.

2.8 Partial derivatives of composite functions.

Partial derivatives of composite functions of type 1. Derivatives of composite functions of type 2.

2.9 Taylor formula for functions of 2 variables.

Partial derivatives of order n, n>2.

2.10 Differentiable optimization in ÿ ^{2}.

Definitions of local and global optimum. Necessary conditions for optimality. Sufficient conditions for optimality.

Chapter 3 1.

Double Integrals 1.1

Definition of the double integral 1.2

Examples 1.3

Properties of the double integral ÿÿLinearity ÿÿConservation of ,

order, ÿÿAdditivity .

1.4 Fubini's theorem in the case of a bounded domain ÿ .

1.5 Calculation of double integrals

ÿÿDirect calculation,

ÿÿChange of variables in a double integral (Change of variables formula).

Machine Translated by Google

1.6 Applications: Center of gravity, Moment of inertia.

2. Triple Integrals

2.1 Generalization of the notion of double integrals to triple integrals.

2.2 Calculation of a triple integral

ÿÿDirect calculation

ÿÿCalculation by change of variables (Formula for change of variables for a triple integral).

ÿÿVolume under the graph of a function of two variables.

ÿÿCalculation of the volume of certain solid bodies.

2.3 Applications: Center of gravity, Moment of inertia.

Assessment method:

Written test, supervised homework, final exam

Bibliographic references:

[1] KadaAllab, Elements of Analysis. Office of University Publications. Ben Aknoun. Algiers 1984

[2] N. Piskunov, Differential and Integral Calculus. Mir Publishing. Moscow 1978

[3] J. Dixmier, First cycle mathematics course. 1st year. Gauthiers-Villars. Paris 1976

[4] R. Murray Spiegel. Theory and Applications of Analysis. McGraw-Hill, Paris 1973

[5] G. Flory, Topology, Analysis. Exercises with solutions. Vuibert. Paris 1978

Machine Translated by Google

HALF	Subject title	Coefficient	Credits	Code
S2	**Algebra 2**	2	4	IST 2.2

VHS	Course	Practical work	Practical work
45h00	1h30	1h30	-

Prerequisites:
- Algebra 1

Goals :
- Consolidate the achievements of the first semester.
- Study new concepts: sum of several vector subspaces, stable subspaces, trace.
- Switch from geometric register to matrix register and vice versa.

Teaching content:

Chapter 1: Vector Spaces
— Definition (on — NoAnd ÿ).
Vector subspaces.
— Sum of subspaces.
— Additional subspaces.
— Free family. Linked family. Base (finite).

Chapter 2: Linear Applications
— Definition (operations).
— Core and image.
— Rank of a linear application.
— Rank theorem.
— Characterization of injection, surjection and bijection.

Chapter 3 : Matrices, associated matrices and determinants
— Definition (as a table of numbers). Particular matrices.
— Operations on matrices. The vector space of matrices.
— Determinants (definition (order 2, 3 and generalization) and properties).
— Invertible matrix.
— Matrix writing of a linear application.
— Correspondence between operations on linear applications and those on matrices.
— Base change matrix (passage matrix).
— Effect of a change of basis on the matrix of a linear application.

Chapter 4: Systems of Linear Equations —
Definitions and interpretations.

Machine Translated by Google

— Cramer systems (general case).

Chapter 5: Matrix Reduction.

— Eigenvalues.
— Eigenvectors.
— Characteristic polynomials. Cayley-Hamilton theorem.
— Characterization of diagonalizable matrices.
— Characterization of trigonalizable matrices.
— Applications of reduction.

Bibliographic references: —

A.KUROSH: Course in higher algebra. Edition MIR MOSCOW.

— D.FADEEV and I.SOMINSKY: Collection of exercises in higher algebra. MIR MOSCOW Edition.

— J.RIVAUD: Exercises with solutions volume 1 VUIBERT.
— J.RIVAUD: Exercises with solutions volume 2 VUIBERT.
— LEBSIR HABIB: General algebra tutorials. Dar el-houda Ain M'LILA.

— Jean-Pierre Escofier: All the algebra required for a bachelor's degree. Courses and corrected exercises. Dunod.

— J. Lelong-Ferrand, J. M. Arnaudiès: Mathematics Course. Volume 1 Algebra Edition.
eEdition. Preparatory Classes for the 1st University Cycle. Dunod.

3 — A.DONEDDU: ALGEBRA AND GEOMETRY 7 Special Mathematics First university cycle. VUIBERT.

— COLLET Valérie: MATHS All second year. ellipses

Assessment methods:

Question, Supervised Assignment, Final Exam

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S2	Electricity and magnetism		4	7	IST 2.3
VHH	Course	Practical work	Practical work		
90h00	1h30	1h30	1h30		

Prerequisites:

— Concepts of vector field and scalar field. —
Concepts of vector calculus.

— Electrical charges.

Objectives:

— Identify the sources of electric and magnetic fields.

— Calculate and differentiate vector and scalar fields.

— Calculate the electric field and potential produced by a charge distribution.

— Calculate the magnetic field produced by an electric current.

Content of the subject:

Chapter 1: Electrostatic Field and Potential

— The point charge.

— Electric force and Coulomb's law.

— Electric field and potential (discontinuous charge distribution).

— Electric dipole: electric field and potential.

— Action of the electric field on a dipole (orientation and equilibrium state).

— Electric field and potential (continuous charge distribution).

— Gauss's theorem.

Chapter 2: The Drivers

— Basic properties.

— Induced charge and influence phenomena

— Electrostatic pressure. — Capacitors, capacitance (different types), stored energy.

Chapter 3: Electric Current

— Notions of current intensity and density.

— Resistance and Ohm's law, Joule's law.

Chapter 4: Magnetostatics

- Introduction.

— Magnetic force and Lorentz's law.

— Action of a magnetic field on an electric current.

— Magnetic field produced by a stationary current: Biot-Savart law.

— Circulation of the magnetic field.

Machine Translated by Google

— Rotational magnetic field and Ampere's law.
— Magnetic field flux through a closed loop and induction. — Maxwell's equations.

Practical work in physics 2: — Assembly of an electrical circuit and measuring devices.
— Using the oscilloscope.
— Wheatstone Bridge.
— Charging and discharging a capacitor.
— Magnetic field outside a conductor.
— Single coil magnetic field: Biot and Savart law

Bibliographic references: —

Physics, 2. Electricity and magnetism, Harris Benson, de Boeck editions. —
Physics, 2. Electricity and Magnetism, Eugene Hecht, de Boeck editions.
— General Physics, Electricity and Magnetism, Douglas Giancoli, de Boeck editions

Assessment methods:

Questionnaire, Supervised Assignment, Practical Work Report, Final Exam.

Machine Translated by Google

HALF	Subject title	Coefficient	credits	Code
02	Thermodynamics	4	7	IST 2.4

VHS	Course	3-hour tutorials	Practical work
90h00	1h30		1h30

Prerequisites:

Nothing

Goals :

The knowledge acquired allows the characterization of the behavior of liquid, solid and gaseous substances and the evaluation of their thermodynamic properties for different conditions (temperature, pressure, simple pure bodies, ideal mixture and phase change)

Content of the material

Chapter I: **Basic concepts in thermodynamics**
I.1 Mathematical reminder on partial derivatives
I.2 Properties and states of a system
I.3 Process, equilibrium and thermodynamic cycle
I.4 Density, specific volume,
I.5 Pressure, temperature and energy

Chapter II: **Thermodynamic Properties of Pure Substances**
II.1 The ideal gas
II.2 Actual behavior of gases
II.3 Corresponding states and residual differences
II.4 Properties of liquids and solids

Chapter III: **Fundamental Concepts of Thermodynamics**
II.1 First principle and applications
II.2 Entropy and the second principle
II.3 Entropic balance and irreversibility
II.4 Properties of free energy and thermodynamic equilibrium
II.5 Chemical potential and fugacity

Chapter IV: **Equilibria of physical processes**
IV.1 Phase equilibria of a pure substance
IV.2 Thermodynamic properties of phase transitions
IV.3 Ideal behavior of gaseous, liquid and solid mixtures
IV.4 Phase equilibria of a compound in an ideal mixture
IV.5 Ideal solubility and partition coefficient

Machine Translated by Google

Bibliographic references:

Smith, E.B., Basic Chemical Thermodynamics, 2nd ed., Clarendon Press, Oxford, 1977.
Rossini, FD, Chemical Thermodynamics, Wiley, New York, 1950. Florence,
Stanley I. Sandler, Chemical and Engineering Thermodynamics, Wiley, New York, 1977.
Elliot, J, Lira CT, Introductory chemical engineering Thermodynamics, Prentice –Hall (1999)
Lewis GN, Randal M., Thermodynamics, Mac Graw Hill
Hougen OA, Watson KM, Chemical process principles, Vol II: thermodynamics John Wiley and sons

Practical work in Thermodynamics:

Practical work No. 1: Study of the equation of state of an ideal gas.
TP No. 2: Water value of the calorimeter.
TP No. 3: Specific heat: specific heat of liquid and solid bodies.
TP No. 4: Study of the solidification of pure water.
TP No. 5: Latent heat: Latent heat of fusion of ice.
TP No. 6: Determination of the latent heat of vaporization.
TP No. 7: Heat of reaction: Determination of the energy released by a chemical reaction (HCl/NaOH).
TP No. 8: Thermodynamic functions of an Acid-Base equilibrium.
TP No. 9: Study of the variation of pressure as a function of temperature at equilibrium (lg) for a pure system: water.
TP No. 10: Vapor pressure of a solution.
TP No. 11: Equilibrium diagram for a binary system.
TP No. 12: Equilibrium diagram for a ternary system.

Assessment methods:

Questionnaire, Supervised Assignment, Practical Work Report, Final Exam.

Machine Translated by Google

HALF	Subject title		Credit coefficient		Code
S2	Technical drawing		2	2	IST 2.5
VHH	Course	Practical work	Practical work		
45h00	-	-	3:00 a.m.		

Prerequisites:

— Basic geometric shapes

Goals:

— Acquisition of basic drawing concepts — Knowledge of technical terminology —

Read a plan

At the end of this content, the student is expected to be able to:

— Recognize the different presentation formats of drawings and their different elements

— Reading a plan

— Acquisition of basic drawing concepts

— Know the technical terminology

- Make corrections to a drawing

Content of the subject:

Chapter 01: Technical drawing (03h00)

1.1 General introduction
1.2 Scriptures
1.3 Presentation of drawings
1.4 Features
1.5 Scales

Chapter 02: Geometric Drawings (03h00)

2.1 Intersections
2.2 Connections

Chapter 03: Descriptive Geometry (03h00)

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

Machine Translated by Google

3.3.3 Surface perpendicular to the plane

Chapter 04: Orthogonal Projections (06h00)
4.1 Projection of prismatic parts **4.2** Projection of cylindrical parts **4.3** Projection of conical parts **4.4** Projection of mixed parts

Chapter 05: Perspective drawing (1h30)
5.1 Cavalier perspectives
5.2 Isometric Perspectives

Chapter 06: Quotation (1h30)
6.1 General Quotation Rules **6.2** Applications

Chapter 07: Sections and cuts (1h30)
7.1 Simple cuts **7.2** Extended sections **7.3** Folded sections

Chapter 08: Overall drawings (1h30)
8.1 Definition
8.2 Application
8.3 Definition drawings of component parts

Assessment methods:

Question, Supervised Assignment, Final Exam

Bibliographic references:

— A. Chevalier; “Industrial Designer’s Guide”; Hachette Technique; Paris, 2011.
— A. Ricordeau, C. Corbet; “Construction technology file”; Casteilla; Paris, 2001.
— A. Ricordeau; “Descriptive geometry applied to drawing”; Casteilla; Paris, 2009.
— C. Corbet, B. Duron; “Reading technical drawing”; Casteilla; Paris, 2005.

Machine Translated by Google

HALF	Subject title		Credit coefficient		Code
S2	Programming (computer science 2)		2	2	IST 2.6
VHH	Course	Practical work	Practical work		
45h00	-	-	3:00 a.m.		

Prerequisites: Computer Science 1

Objectives:

- Plan and design a program using structured techniques of development.
- Predict, design, create and use functions by decomposing a problem into subtasks.
- Passing arguments by reference or by value between functions. Different dimensions.
- Write valid programming instructions to declare, initialize, manipulate and pass pointers as arguments to functions.
- Use and explain the relationship between pointers and the values they indicate.
- Use and manipulate data structures.
- Use C language tools to implement algorithmic solutions.

Content of the material:

Introduction to the C language.
Variables and constants: declaration and manipulation
The IF THEN ELSE test structures
Loops: FOR loop and WHILE loop.
Procedures and functions.
Structure of a procedure / function
Calling a procedure/function
Recursive functions (Concept of recursive algorithm)
Transition from recursive algorithm to iterative algorithm.
Examples of recursive and iterative algorithms.
Pointers and dynamic memory allocation.
Complex data structures and files.
Linked lists: concepts and implementations.
Stacks and Queues: Concepts and Implementations.
Files: concepts and implementations.
Concept of library / module
Compound structures, arrays, sets

Practical work:

TP 1 : Assembling and disassembling a computer.
TP 2: Familiarization with the C development environment.
TP 3: Manipulating tables and records.

Machine Translated by Google

TP 4: Modularity: creation of a TP using functions with the different types of parameter passing.

TP 5: Recursion: carrying out a TP using the concept of recursion.

TP 6: Pointers and dynamic memory allocation.

TP 7: Manipulation of lists, stacks, queues and files: creation of tools for manipulating lists, stacks and queues such as creation, insertion, deletion.

Assessment method:

Written test, supervised homework, final exam, practical work report

Bibliographic references:

— ZANELLA, P. and Ligier, Y. (1989). Computer architecture and technology. DUNOD informatique. DUNOD.

— BAJARD, J. (2004). Calculation and arithmetic of computers. IC2 Information Treatise - Order - Communication: Computer Science and Information Systems. Hermes Science Publications.

— TOCCI, R. (1992). Digital circuits: theory and applications. DUNOD.

— BELAID, M. (2004). Computer Architecture: Course and Corrected Exercises. Student Manuals. International Blue Pages.

— WACK, B. (2013). Computer science for all in preparatory classes for the grandes écoles. Eyrolles.

— GAUDEL, M., Soria, M., and Froidevaux, C. (1987). Data types and algorithms. Number vol. 1 in Educational Collection. National Institute for Research in Computer Science and Automation.

— CORMEN, T., LEISERSON, C., RIVEST, R., and CAZIN, X. (1994). Introduction to algorithms. Computer science. Dunod.

— CORMEN, T. (2013). Algorithms: Basic Notions. Computer Science. DUNOD Editions.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S2	Engineering professions		1	1	IST 2.8
VHH	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	1h30	-	-		

Prerequisites: **Nothing**

Goals :

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

Content of the subject:

1. What are engineering sciences?

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

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

- Definitions, fields of application (Home automation, embedded applications for automobiles, Video surveillance, Mobile telephony, Optical fiber, Advanced scientific instrumentation, Imaging and medical instrumentation, Giant mirrors, Contact lenses, Transport and distribution of electrical energy, Power generation plants, Energy efficiency, Maintenance of industrial equipment, Elevators, Wind turbines, ...

- Role of the specialist in these areas.

3. Automation and Industrial Engineering sectors:

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

4. Process Engineering, Hydrocarbons and Petrochemical Industries:

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

- Role of the specialist in these areas.

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

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

Machine Translated by Google

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

- Role of the specialist in these areas.

3. Civil Engineering, Hydraulics and Public Works courses: (2 weeks)

- Definitions and areas of application (Construction materials, Major road and rail infrastructure, Bridges, Airports, Dams, Drinking water supply and sanitation, Hydraulic flows, Water resource 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:

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

- Role of the specialist in these areas.

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

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

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

Assessment method:

Continuous assessment, Final exam,

Bibliographic references:

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

2- J. Douënel and I. Sédès, Choosing a career according to your profile, Editions d'Organisation, Collection: Employment & career, 2010.

3- V. Bertereau and E. Ratière, What Job Are You Made For? Publisher: L'Étudiant, 6th edition, Collection: Métiers, 2015.

4- The great book of professions, Publisher: L'Étudiant, Collection: Métiers, 2017.

Machine Translated by Google

5- Careers in the aeronautics and space industry, Collection: Parcours, Edition: ONISEP, 2017.

6- Careers in electronics and robotics, Collection: Parcours, Edition: ONISEP, 2015.

7- Construction and public works professions, Collection: Parcours, Edition: ONISEP, 2016. 9- Transport and logistics professions, Collection: Parcours, Edition: ONISEP, 2016.

8- Energy professions, Collection: Parcours, Edition: ONISEP, 2016.

9- Mechanical professions, Collection: Parcours, Edition: ONISEP, 2014.

10- Careers in chemistry, Collection: Parcours, Edition: ONISEP, 2017.

11- Web professions, Collection: Parcours, Edition: ONISEP, 2015.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S2	**Foreign Language 2 (English)**		**1**	**1**	ISGC 2.7
VHH	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	-	1h30	-		

Prerequisites:
Technical **English** 1

Goals :
— To help students understand basic vocabulary of science and technology.
— To help students use essential vocabulary of science and technology.
— To consolidate/reinforce grammar rules.
— To write meaningful sentences.
— To write coherent paragraphs.
— To answer written examination questions correctly.
— To read to grasp the general idea of a text.
— To read in order to find the main ideas within a text.
— To listen and understand basic functional scientific English.
— To communicate using concepts and terminology taught in classroom

Content of the subject:

Unit one: Classifications and generalizations (11H15 min)

I. Topic one: Materials in Engineering
2. Topic two: Sources of energy
3. Topic three: Periodic table

Discoveringlanguage (languageoutcomes) **a) Grammar— pronunciation** Present simple vs. Continuous vs. perfect Active & passive voice Pronunciation of must, can, should in the passive Weak forms of was and were Pronunciation of final —ed and —ch Compound nouns Adjectives ending in '-ly' Adverbs Affixes (-ic, -ilY, -ness) b) **Vocabulary** Structures used to express classification	Developing skills (skills and strategies outcomes) **a) Functions:** Classifying items in the form of diagrams Diagrams, levels of generalization Classifying items according to their properties and characteristics **b) Listening & speaking** ÿ Listening to a lecture/talk (Classification) ÿ Listening for specific information ÿ Listening for general ideas Note taking ÿ Speaking from notes ÿ Making an oral summary

Machine Translated by Google

	c) Reading & writing ÿ Reading ÿ Reading for specific information ÿ Reading for general ideas ÿ Contextual reference ÿ Rephrasing ÿ Guessing the meaning of words through context ÿ Making logical links between sentences and paragraphsSummarizing ÿ Analyzing and making as synthesis

Unit two : Describing discoveries, inventions and experiments (11H15 min)

Discovering language (language outcomes)	Developing skills (skills and strategic outcomes)
a) Grammar —pronunciation ÿ Past simple vs. continuous ÿ Active & passive voice ÿ Pronunciation of must, can, should in the passive ÿ Weak forms of was and were ÿ Pronunciation of final ed and ch ÿ Sequencers (first, next...) ÿ Noun modification **b) Vocabulary** Vocabulary related to discoveries and inventions Expressing cause/effect	**a) Functions:** ÿ Making observations The use of the passive in the description of an experiment **b) Listening & speaking** ÿ Listening to a presentation of (an invention, a discovery, an experiment) ÿ Listening for specific information ÿ Listening for general ideas Recognizing and showing a sequence of events Note taking ÿ Speaking from notes ÿ Talking about a given experiment Making an oral presentation of (a discovery) **c) Reading & writing** ÿ Reading ÿ Reading for specific information ÿ Reading for general ideas ÿ Contextual reference ÿ Rephrasing ÿ Guessing the meaning of words through context ÿ Making logical links between sentences and paragraphs Writing the description of an experiment

Machine Translated by Google

Teaching Activities and Tasks:

- ÿ Text-based activities
- ÿ Small and large group discussions
- ÿ Exploration of theme
- ÿ Reading and exhibition
- ÿ Pre-review of vocabulary
- ÿ Reading Project (Assessment Information Attached)
- ÿ Writing Portfolio (Including product and process: assessment information attached)
- ÿ Oral presentation
- ÿ Quizzes, Debates, ... Other activities as assigned by instructor

Assessment method:

Continuous assessment + final exam

Bibliographic references:

A wide variety of materials, ranging from articles and exercises created for the course to literary works and English textbooks depending on the course chosen.

Machine Translated by Google

Detailed programs of subjects for the 3rd semester

Machine Translated by Google

HALF	Subject title	Coefficient	credits	Code
S3	Analysis 3	3	6	IST 3.1

VHS	Course	Practical work	Practical work
67h30	1h30	3:00 a.m.	-

Prerequisites:
It is recommended to master the fundamental bases of the calculation of integrals and primitives of functions with several variables and the mathematics taught in S1 and S2

Goals :

Of prime importance for a scientist, this subject allows the student to acquire:

- The use of vector analysis dedicated to the description of several phenomena physical and practical
- mastery of the Fourier transform for the most common applications
- mastery of the Laplace transform for solving equations and systems of differential equations

Content of the subject:

Chapter 1: Vector Analysis

1. Scalar fields and vector fields
- Definition of a scalar field
- Definition of a vector field
2. Circulation and gradient
- Definition (Circulation of a vector field)
- Definition (Gradient of a scalar field)
- Definition (Gradient fields)
3. Divergence and rotation
- Definition (Divergence of a vector field)
- Definition (Rotational of a vector field)
- Definition (Rotational fields)
- Definition (Laplacian of a scalar field)
4. Scalar potentials and vector potentials
5. Curvilinear integral
6. Calculation of the curvilinear integral
7. Green's formula
8. Conditions for a curvilinear integral not to depend on the path of integration
9. Surface integrals
10. Calculation of surface integrals
11. Stockes' formula
12. Ostrogradsky's formulas

Machine Translated by Google

Chapter 2: Numerical and integer series I-

Numerical series 1.
General: Partial

sum. Convergence, divergence, sum and remainder of a convergent series.

2. Necessary condition for convergence.

3. Properties of convergent numerical series 4. Numerical

series with positive terms 4.1 Convergence

criteria - Necessary and sufficient

condition for convergence.

4.2 Comparison Criterion -
Theorem -

Consequence (Equivalence Rule)

4.3 D'Alembert's rule - Theorem
4.4 Cauchy's

rule - Theorem 4.5
Cauchy's

integral criterion - Theorem 5. Series
with arbitrary

terms 5.1 Alternating series.

Definition of an alternating series

Leibnitz's theorem (Alternating series theorem)

5.2 Absolutely convergent series Definition

of an absolutely convergent series Theorem: CVAÿCVS
5.3 Semi-convergent series.

Definition of a semi-convergent series Examples

5.4 Abel's
Criterion Theorem

(Abel's first criterion for series)

II- Power series 1.

Definition of a power series, ABEL's

lemma, Radius of

convergence Determination

of the radius of convergence, HADAMARD's rule.

2. Properties of power series.

Linearity and product of two power series, Normal

convergence of an SE of a real variable under any segment included in the open interval of convergence,

Continuity of the sum on the open interval

of convergence, Term-by-term integration of an SE of a real variable on the

interval of convergence, Term-by-term derivation of an SE of a real variable on the interval of convergence.

3. Development in SEau near zero of a function of a real variable.

Function developable in SE on the open interval of convergence.

Taylor-Maclaurin series of a function of class ÿ Uniqueness of the

SE development

4. Applications.

Establish the developments in power series of the usual functions Search for the

solution of an ordinary differential equation of the first and second order

Machine Translated by Google

with variable coefficients in the form of SE

Chapter 3: Fourier Series

1. General definitions
2. Fourier coefficients.
3. Function developable in Fourier series.
4. Dirichlet's Theorem
5. Parseval equality.
6. Application: simple examples of Sturm-Liouville problems.

Chapter 4: Fourier and Laplace Transforms

1. The Fourier integral
2. Complex form of the Fourier integral.
3. Definitions and first properties

Definition of a Fourier transform and its inverse
Derivative of the Fourier transform

Laplace Transform 1-
Definition of the Laplace Transform 2 - Properties of the Laplace Transform (Uniqueness, Linearity, Scale Factor, Derivation, Integration, Theorems) 3 - Common Laplace transforms 4 - Solving differential equations using Laplace transforms

Assessment methods:

Question, Supervised Assignment, Final Exam

Bibliographic references:

1. Med El Amrani, Numerical suites and series, Ellipses.
2. François Liret; mathematics in practice, courses and exercises; Dunod. (fpv; Int. Mult. Series…)
3. Marc Louis, Maths MP-MP, Ellipses. (Int. Doubles)
4. Denis Leger, PSI. Corrected Math Exercises, Ellipses. (Function Series, Integers, Fourier, etc.)
5. Charles-Michel Marle, Philippe Pilibossian, Sylvie Guerre-Delabrière, Ellipse. (Sequences, Series, Integrals).
6. Fabrice Lembiez Nathan, All in one, Math exercises.
7. Valerie Collet, Maths throughout the second year, 361 exercises, course reminders, tips and tricks, ellipses.
8. A. Monsouri, MK Belbarki. Element of analysis. Course and solved exercises. 1st university cycle. Chiheb. (Double and triple integrals, Series, Fourier and Laplace transformations, Partial differential equations of the 2nd order).
9. B. DEMIDOVITCH. Collection of exercises and problems in mathematical analysis. 11th edition. Ellipses. (Functions of several variables, Series, Multiple integrals)

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S3	**Numerical analysis 1**	**3**	**5**	IST 3.2
VHS	**Course**	**Practical work**	**Practical work**	
67h30	1h30	1h30	1h30	

Prerequisites:

A good knowledge of the analysis of functions of a real variable and the basics matrix calculation.

Objectives:

This course provides an introduction to scientific computing. Its objective is to:

ÿ Present basic numerical methods for solving concrete engineering problems using a computer.

ÿ Identify the difficulties linked to the numerical resolution of a problem on a computer real.

ÿ Know how to develop and implement problem discretization methods continuous.

ÿ Master and know how to implement the basic techniques of numerical analysis matrix.

ÿ Know how to implement basic numerical calculation techniques.

Content of the subject:

Chap. 1 Introduction to Numerical Analysis 1.1.
Sources of errors: modeling errors, data errors, approximate value, error propagation, relative error and absolute error, floating-point arithmetic, IEEE-754 standard, rounding errors, truncation error, exact significant digits, risky operations.

1.2. Conditioning and stability: example of numerical instabilities, conditioning of a problem.

1.3. Methods and algorithms: exact methods, approximate methods, iterative methods.

Chapter 2 Solving nonlinear equations 2.1. Functions of a real variable: localization theorems and separation of roots.

2.2. Classical methods: dichotomy method, secant method, stopping criterion.

2.3. Iterative methods: fixed point method, Newton method, order of convergence, stopping criteria.

Chapter 3 Solving Linear Systems 3.1. Direct methods: upper (or lower) triangular matrix, symmetric matrices (definitions and properties), Gaussian elimination method, LU factorization (Crout, Doolittle), Cholesky factorization (positive definite symmetric matrix).

3.2. Numerical algebra vocabulary: vector norms, matrix norms,

Machine Translated by Google

conditioning of a matrix (definitions and properties), spectral radius, example of ill-conditioned linear system.

3.3. Iterative methods: Jacobi methods, Gauss-Seidel, relaxation, study of the convergence of iterative methods, stopping criteria.

Practical work:

- Getting started with Matlab

ÿ Resolution of non-linear equations

ÿ Resolution of linear systems: Direct methods

ÿ Resolution of linear systems: Iterative methods

Dironin This sbibliography EUs:

[1] I year - Pierre Of my ill y, year aly himself naked meriq EU And equations difirontiel

Machine Translated by Google

THE
,
E
D
P
Sc
good
This
s
(2
00
6).
[2]
Al
fio
What
art
er
we
i,
Ri
cc
ar
do
Its
cc
o,
Fa
just
o
Its
1st
i,
me
th
od
is
naked
me
riq
EU
s:
alg
origin
th

Machine Translated by Google

mes, year aly himself And ap fold cat io ns, Sp rinse ge r- Ve rla g (2 00 7). [3] Al fio What art er we i, Fa just o Its 1st i, Pa wave Ge rv asi o, cal ass sci ent

Machine Translated by Google

ifi
that
e :
co
bears
,
ex
erc
ice
s
co
rri
ge
s
And
ill
just
rat
io
ns
in
my
tla
b
And
oct
with
e,
Sp
rinse
ge
r-
Ve
rla
g
(2
01
0).
[4]
W
we
Yo
A
g
Yes

Machine Translated by Google

ng, W in wu That o, Your e- Its ng Ch A g, Ap fold ed naked me ric al me th od s factory ng my tla b, Jo hn Wi law in d So ns (2 00 5). [5] I year - Lo

Machine Translated by Google

uis
M
err
good
,
year
aly
himself
naked
me
riq
EU
with
ec
my
tla
b,
Of
no
d
(2
00
7).
[6]
Year
Dr.
e
Fo
roast
n,
year
aly
himself
naked
me
riq
EU
po
our
in
ge
deny
bears
,
Pr

Machine Translated by Google

ess is int er nat io final is Po lyt ec hn iq EU (2 01 1). [7] Wi lli am Fo rd, naked me ric al linen ear alg eb ra wi th ap fold cat io ns factory ng my tla b, The

Machine Translated by Google

himself
life
r
In
c
(2
01
5).
[8]
Cl
ev
e
B.
M
ole
r,
naked
me
ric
al
co
m
could
tin
g wi
th
my
tla
b,
If
am
(2
00
4).
[9]
Gr
eg
see
e
Al
lai
D,
If
di

Machine Translated by Google

M
ah
m
Or
d
Ka
be
r,
naked
me
ric
all
ine
macaw
age
br
has,
Sp
rinse
ge
r
(2
00
8).
[1
0]
Read
c
Jol
live
t,
Ra
ba
h
There
bb
ace,
year
aly
himself
And
year
aly
himself
naked

Machine Translated by Google

me
riq
EU
:
ra
pp
the
of
co
bears
And
ex
erc
ice
s
co
rri
ge
s,
There
you
isi
er
(2
00
5).
[1
1]
Yes
cq
EU
s
Ra
pp
az,
M
bow
o
Pi
That
ss
o,
int
ro
of

Machine Translated by Google

cti we has there final ys e naked me riq EU, Pr ess is po lyt ec hn iq EU s And A live rsi tai res ro my nd is (2 00 4). [1 2] Neither ch wave s J. Hi gh am ,

Machine Translated by Google

Ac
cu
rac
y
year
d
sta
bill

city of
naked
me
ric
al
alg
origin
th
ms
,if
am
(1
99
6).
[1
3]
Jo
hn
Hu
bb
ar
d,
Fl
gold
in
This
Hu
be
rt,
cal
ass
sci
ent
ifi
that
e

Machine Translated by Google

of there tea origin ea there pr ati that e : ill just rat io ns with ec my ple And my tla b, A live rsi you of Pr ov in This, M ars eye

the (2 00 5).

M od Ali your of

Machine Translated by Google

evaluation:

Integration, Devoir surveillé, Travaux

Machine Translated by Google

HALF	Subject title	Coefficient 3	credits	Code
S3	**Waves and Vibrations**		**5**	IST 3.3

VHS	1.5 hour	1.5-hour **tutorial**	**Practical work**
67h30	**course**		1h30

Prerequisites:

Have assimilated the subjects dealing with point mechanics and first-year analysis mathematics

Goals :

The acquisition of theoretical and practical knowledge of any vibration or wave system through:

-understanding and resolving vibratory movements and the different types of oscillations generated

-the study of the propagation of mechanical waves and the wave movements generated

Machine Translated by Google

HALF	Subject title	Credit coefficient		Code
S3	**Fluid mechanics**	**3**	**5**	IST 3.4

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:

- ÿ Mechanics of the material point
- ÿ Statics of a solid body
- ÿ Thermodynamics
- ÿ Mathematical analysis

Objectives:

- ÿ Provide basic knowledge of fluid statics
- ÿ Learn to describe a moving fluid using fields

Machine Translated by Google

ÿ Establish the theorems of fluid mechanics
ÿ Provide the basic elements necessary for solving ideal and real fluid flow problems

ÿ Know how to apply the fundamental relationship of hydrostatics (calculation of pressure at one point)
ÿ Learn to calculate the hydrostatic forces applied to a surface
ÿ Know how to apply Archimedes' principle ÿ Know how to apply Bernoulli's theorem ÿ Learn to manipulate the mathematical tools of vector analysis (differential, gradient, divergence, rotational, Laplacian operators)

Teaching content:

Chapter I: Fluid Statics 1.1. Definition of a fluid

1.2. Physical properties of Fluid:
density - specific weight - density - viscosity

1.3. Classification of fluids

1.3.1 By compressibility

ÿ Incompressible fluid ÿ

Compressible fluid **1.3.2.**
By viscosity effect

ÿ Perfect fluid ÿ

Real fluid (Newtonian and non-Newtonian fluid)

1.4. General principles and theorems

1.4.1. Concept of pressure and pressure scale:
-Atmospheric pressure; -Relative pressure; -Absolute pressure

1.4.2. Pressure forces at a point in a fluid **1.4.3.**
Fundamental principle of fluid statics **1.5. Hydrostatic thrust**

1.5.1. Definition

1.6. Hydrostatic thrust center 1.6.1.
Definition

1.6.2. Case of a flat wall

1.6.3.case of a curved wall

1.7. Relative balance

1.7.1. Pressure in a fluid subjected to horizontal acceleration

1.7.2. Pressure in a fluid subjected to uniform rotation

1.8. Archimedes' Principle

1.8.1. Body completely submerged

1.8.2. Partially submerged body

Chapter II: Fluid Kinematics 2.1. Description of the movement of a fluid ÿ Lagrangian description:
trajectory

ÿ Eulerian Description: Streamline, stream tube

2.2. Continuity equation

2.2.1 Concept of Flow

Machine Translated by Google

2.2.2 Development of the continuity equation

2.3. Current function

2.4. Type of flows:

2.4.1 Stationary Flow **2.4.2** Uniform Flow **2.4.3** Rotational Flow

2.4.4 Irrotational or velocity potential flow

Chapter III: Dynamics of perfect incompressible fluids (Lecture: 3 hours, Tutorial: 3 hours)

3.1. Euler's Equation and Bernoulli's Theorem

3.2. Applications of Bernoulli's theorem:

ÿ Venturi tube

ÿ Draining a tank ÿ Pitot tube

3.3. Steady-state momentum theorem

ÿ Reaction of a jet

ÿ Impact jet

Chapter IV: Dynamics of real incompressible fluids (Lecture: 6h00, Tutorial: 6h00)

4.1. Viscosity of a fluid

ÿ Dynamic viscosity

ÿ Kinematic viscosity

4.2. Fluid flow in a pipeline (Poiseuille flow)

4.3. Flow regimes - Reynolds number 4.4. Pressure losses

4.4.1 Linear pressure losses

4.4.2 Singular pressure losses **4.4.3** Moody diagram

4.5. Generalized Bernoulli's Theorem

4.5.1With energy production **4.5.2With** load losses

4.6.Concept of boundary layer

Practical work:

Hydrostatic

ÿ Hydrostatic thrust

Hydrodynamics ÿ Spillways

ÿ Venturi

Assessment methods:

Questioning, Supervised homework, Practical work, Final exam

Bibliographic References:

Machine Translated by Google

[1] Fluid mechanics 2nd year PC-PC*/PSI-PSI* JM BREBEC – Ed HACHETTE

[2] Theoretical physics: Fluid mechanics LANDAU and LIFCHITZ – Ed ELLIPSES

[3] Fluid mechanics 2nd year PC, PSI: Corrected problems LUMBROSO– Ed DUNOD

[4] Applied fluid mechanics OUZIAUX – Ed DUNOD

[5] Fluid mechanics and hydraulics: courses and problems, RANALD– Ed SCHAUM

[6] Fluid mechanics Power prep, PC-PSI A. HEINRICH – Ed BREAL

HALF	Subject title	Credit coefficient		Code
S3	**Rational Mechanics**	**2**	**4**	IST 3.5
VHS	**Course**	**Practical work**	**Practical work**	
45h00	1h30	1h30	-	

Prerequisites:

- Point mechanics
- Mathematical Analysis
- Algebra

Goals :

- Provide all the elements and tools allowing the study of the mechanics of rigid bodies or rigid body systems.
- Learn how to pose a problem relating to rational mechanics in emphasizing the judicious choice of benchmarks and parameters to address a given problem.

Content of the subject:

Machine Translated by Google

Chapter 1: Mathematical reminders (elements of vector calculation).
1.1. Vectors 1.1.

Basic properties 1.2. Scalar
product 1.3. Cross

product 1.4. Mixed product

1.5. Projection of

vectors 1.5.1. Orthogonal

projection of a vector onto an axis 1.5.2. Orthogonal projection of

a vector onto a plane **1.2.** Torsors 2.1. Definition: 2.2. Properties of
torsors 2.2.1.

Equivalence of two

torsors: 2.2.2. Zero torsor: 2.2.3.

Sum of two torsors: 2.2.4. Multiplication of a
torsor by a scalar: 2.3.

Central axis of a torsor 2.4. Step of the

torsor 2.5. Torque torsor

Chapter 2: Statics 2.1.
Generalities and basic definitions 2.1.1.

Definition and physical meaning of force 2.1.2. Force

systems 2.1.3. Operations on force

(composition, decomposition, projection)

A. Geometric decomposition of a force B. Resultant of
two concurrent forces

2.2. Static.

2.2.1. Moment of a force about a point 2.2.2. Moment of a

force about an axis 2.2.3. Varignon's theorem 2.2.4. Static

equilibrium condition 2.2.5.

Connections, support and reactions

Chapter 3: kinematics of the rigid solid.

3.1. Reminders on the kinematic quantities for a material point.

3.2. Solid body kinematics 3.2.1.

Definitions: (Rigid solid, Rotation velocity vector)

3.2.2. Velocity field of a moving solid - Varignon formula: 3.2.3. Equiprojectivity of the velocity

field of a solid 3.2.4. Kinematic torsor 3.2.5. Acceleration field 3.3. The

laws of composition of motions

3.3.1. Composition of velocities 3.3.2.

Composition of accelerations 3.3.3. Composition of

rotation vectors 3.4. Fundamental

motions 3.4.1. Translational motion: 3.4.2.

Pure rotational motion around an axis 3.4.3. Helical
motion (translation + rotation)

3.4.4. Plane-on-plane movement *Title:*

Machine Translated by Google

Assessment methods:

Question, Supervised Assignment, Final Exam

Bibliographic references:

- Mr. Mantion, exercises and problems in mechanics; Armand Colin.
ÿ H. Gie, JP Sarmant, mechanics volume 1, Lavoisier.
ÿ T. Hani, General Mechanics, OPU
ÿ JC Bone, General Mechanics, Dunod University.
ÿ Annequin and Boutigny, mechanics course, Vuibert.
ÿ P. Brousse, Mechanics II, Armand Colin.

HALF	Subject title	Credit coefficient		Code
S3	Computer Science 3 (Matlab)	**2**	**2**	IST 3.6
VHS	**Course**	**Practical work**	**Practical work**	
45h00	1h30	-	1 hour 30 minutes	

Prerequisites:

Computer Science 1 and Computer Science 2

Goals :

- Introduce the learner to programming in the MATLAB / Simulink environment

Content of the subject:

Part One

1- What is MATLAB?
2- Matlab interface
3- Basic operations 4- 2D and 3D display
5- Declaration of variables, vectors and matrices.

Machine Translated by Google

6- Matrix manipulation.
7- Conditional programming (if .elseif)
8- Loops (for, while)
9- Functions (structure of a simple function)

Part Two (Simulink)

10- Simulink environment
11- Basic toolboxes
12- Construction of a Simulink diagram (first-order, second-order system)
13- Simulation under Simulink (configuration and data export)

Assessment methods:

Questioning, Supervised homework, Practical work, Final exam

HALF	Subject title	Coefficient	credits	Code
S3	Computer-aided design	1	1	IST 3.7

VHS	Course	Practical work	Practical work
10:30 p.m.	-	-	1h30

Objectives:

Introduction to the use of computer-aided design tools using two software programs (AutoCad and SolidWorks) in order to optimize the production of a part, diagram or assembly.

Teaching content:

Chapter 01: Introduction to CAD (1.5 h)

1. Part I: 2D/3D modeling using computer tools

ÿ CAD software
ÿ CAD software
ÿ CAM software
ÿ Simulation software

2. Part II: Principle of operation of 3D modelers

ÿ Polygonal modeling

Machine Translated by Google

ÿ Modeling by curves (NURBS) ÿ Modeling by surface subdivision ÿ Modeling by implicit surfaces ÿ Modeling by geometries ÿ Volumetric modeling

Chapter 02: AutoCad (11 h)

Part I: 2D Drawing

1. Software presentation 2. Cartesian and polar coordinates 3. Basic drawing

ÿ Use drawing aids: snapping, grid ÿ Annotate and compose plans ÿ Create a 2D plan ÿ Manage scales and display ÿ Create and manage libraries ÿ Import and export in different formats ÿ Manage and save layouts ÿ Edit plans (printer/plotter) ÿ Manage layers and blocks 4. Drawing and modification commands

Part II: 3D Modeling

1. User coordinate system in space (UCS)
2. Basic elements and Boolean operation 3. Visualization and display

Chapter 03: SOLIDWORKS (10:00)

Part I: PIECES

1. Introduction
2. User interface
3. SKETCH 4. FUNCTION

Part II: ASSEMBLY

1. Introduction
2. User interface
3. Constraints

Part III: PLANNING

1. Introduction 2. User interface 3. Background
4. View layout *Title:*

Industrial Electrical Systems

Machine Translated by Google

5. Annotation.

Bibliographic references:

ÿ AutoCAD 2009, Olivier Le Frapper, Edition Eni 2009.

ÿ The secrets of the AutoCAD designer, Patrick Diver, Pearson Edition 2010.

ÿ SolidWorks 2012, Thierry CRESPEAU, Edition Eni 2012.

Assessment methods:

Question, Supervised Assignment, Final Exam

HALF	Subject title		Credit coefficient		Code
S3	Technical English		2	2	IST 3.8
VHH	**Course**	**Practical work**	**Practical work**		
45h00	-	3:00 a.m.	-		

Prerequisites : Foreign language 1 and 2

Goals :

— To reinforce grammar rules.
— To train students to read and understand technical passages.
— To identify and understand technical concepts and vocabulary.
— To take part in discussion on scientific topics.
— To listen to recorded passages and comprehend functional English.
— To communicate using concepts and terminology taught in classroom

Content of the Material:

Unit one: Describing amounts and quantities	
Discovering language (language outcomes)	Developing skills (skills and strategic outcomes)
a) Grammar—pronunciation Prepositions Phrasal verbs Comparing / contrasting b) Vocabulary	a) Functions: Drawing graphs, diagrams and charts Completing a diagram ÿ Interpretation of diagrams ÿ Transformation of descriptions into diagrams, charts...

Machine Translated by Google

Vocabulary related to amounts and quantities Numbers and figures Graphs, charts and diagrams Mathematical symbols used in engineering Greek letters and abbreviations used in engineering	ÿ Making comparisons based on diagrams ÿ Inductions based on diagrams and tables b) Listening & speaking Listening to a presentation Listening for specific information Listening for general ideas Note taking Speaking from notes Making a speech c) Reading & writing: Reading — Reading for specific info Reading for general Rephrasing Responding to a text Reading a graph/report Analyzing and making a synthesis Writing from a flow chart

Unit two: Instructing and giving advices 1. Topic one: Safety at work 2. Topic two: Instruction manual Discovering language

(language outcomes)	Developing skills (skills and strategic outcomes)
a) Grammar—pronunciation The imperative or Modals If-clauses Active / passive form, Pronouncing weak forms of could, should Pronunciation of must, can, should in the passive Weak forms of was and were Pronunciation of final ÿed' and ÿch' b) Vocabulary Forming nouns by adding suffix —ty to adjectives Forming opposites by adding prefixes dis—, il,.. Forming adjectives with suffixes —ive and —al Forming new words with prefixes de— and dis— Forming new words with suffixes —ic and —ment	a) Functions: Expressing condition with if Expressing warnings with unless Expressing obligation with have and must Expressing obligation, ability and possibility (modals) Instructing & giving advice (imperative) Inductions based on diagrams b) Listening & speaking Asking for and giving advice and warning using should, ought to and had better c) Reading & writing Reading a warning notice, an instruction manual/ leaflet Skimming Scanning Identifying and using reference words Writing a warning notice, an instruction manual/ leaflet

Teaching Activities and Tasks: • Text-based activities • Small and large group discussions • Exploration of theme • Lecture and exposition • Pre-review of vocabulary • Reading Project (Assessment Information Attached) • Writing Portfolio (Including product and process: assessment information attached)

Machine Translated by Google

• Oral presentation •
Quizzes •
Debates •
Other activities as assigned by instructor

Assessment method: Continuous assessment + final exam

Bibliographic references:

A wide variety of materials, ranging from articles and exercises created for the course to literary works and English textbooks depending on the course chosen.

Detailed programs of subjects for the 4th grade th semester

Machine Translated by Google

Material Information Sheet

HALF	Subject title Coefficient Code		
S4	Numerical Analysis 2 Anal.Num.2	4	

VHS	1.5 hour	Practical work	
67h30	course	1h30 1h30	

Prerequisites:

- ÿ A good knowledge of the analysis of functions of a real variable and the basics of matrix calculation.

Objectives:

This course provides an introduction to scientific computing. Its objective is to:

- ÿ present basic numerical methods for solving concrete engineering problems using a computer.
- ÿ Identify the difficulties linked to the numerical resolution of a problem on a computer real.
- ÿ Know how to develop and implement problem discretization methods continuous.
- ÿ Master and know how to implement the basic techniques of numerical analysis matrix.
- ÿ Know how to implement basic numerical calculation techniques.

Content of the subject:

Chap. 1 Polynomial Interpolation and Approximation 1.1. Lagrange Interpolation: Existence and Uniqueness of the Lagrange Polynomial, Calculation of the Lagrange Polynomial, Estimation of the Approximation Error.

Machine Translated by Google

1.2. Newton interpolation: table of divided differences, Newton polynomial, estimation of the approximation error.

1.3. Hermite interpolation: existence and uniqueness of the interpolation polynomial of Hermite, estimation of the approximation error.

1.4. Least squares approximation: classical least squares method, orthogonal polynomials, trigonometric polynomials, fast Fourier transform.

1.5. Spline functions.

Chap. 2 Numerical Derivation and Integration 2.1.
Numerical derivation: first derivative, two-point formulas, three-point formulas, higher-order derivatives, estimation of the derivation error.
2.2. Numerical integration: elementary quadrature methods, Newton-Cotes formulas, Gauss formulas, estimation of integration error.

Chap. 3 First-order differential equations 3.1. Euler-Cauchy
method: estimation of the discretization error, influence of rounding errors, implicit Euler method.

3.2. Runge-Kutta methods: Runge-Kutta method of order 2, Runge-Kutta method of order 4.

3.3. Systems of first-order ordinary differential equations.
3.4. Boundary condition problems: finite difference method, simple 1D example with Dirichlet, Neumann and mixed conditions.

Practical work: ÿ

Interpolation and polynomial approximation ÿ Derivation and numerical integration ÿ First-order differential equations

Assessment methods:

Questioning, Supervised homework, Practical work, Final exam

Bibliographic references:

[1] Jean-Pierre Demailly, numerical analysis and differential equations, EDP Sciences (2006).

[2] AlfioQuarteroni, Riccardo Sacco, Fausto Saleri, Numerical Methods: Algorithms, Analysis and Applications, Springer-Verlag (2007).
[3] AlfioQuarteroni, Fausto Saleri, Paola Gervasio, scientific computing: courses, corrected exercises and illustrations in matlab and octave, Springer-Verlag (2010).
[4] Won Young Yang, Wenwu Cao, Tae-Sang Chung, applied numerical methods using matlab, John Wiley end sons (2005).
[5] Jean-Louis Merrien, numerical analysis with matlab, Dunod (2007).
[6] André Fortin, numerical analysis for engineers, Presses internationales Polytechnique (2011).

Machine Translated by Google

[7] William Ford, numerical linear algebra with applications using matlab, Elsevier Inc (2015).

[8] Cleve B. Moler, numerical computing with matlab, Siam (2004).
[9] Grégoire Allaire, Sidi Mahmoud Kaber, numericallinearalgebra, Springer (2008).
[10] Luc Jolivet, Rabah Labbas, analysis and numerical analysis: course reminder and corrected exercises, Lavoisier (2005).
[11] Jacques Rappaz, Marco Picasso, introduction to digital analysis, Polytechnic and University Presses of Romandie (2004).
[12] Nicholas J. Higham, accuracy and stability of numerical algorithms, siam (1996).
[13] John Hubbard, Florence Hubert, scientific computing from theory to practice: illustrations with maple and matlab, University of Provence, Marseille (2005).

HALF	Subject title	Credit coefficient		Code
S4	**Numerical analysis 2**	**3**	**5**	IST 4.1

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:

ÿ A good knowledge of the analysis of functions of a real variable and the basics of matrix calculus.

Objectives:

This course provides an introduction to scientific computing. Its objective is to:

ÿ present basic numerical methods for solving concrete engineering problems using a computer.

ÿ Identify the difficulties linked to the numerical resolution of a problem on a computer real.

ÿ Know how to develop and implement problem discretization methods continuous.

ÿ Master and know how to implement the basic techniques of numerical analysis matrix.

ÿ Know how to implement basic numerical calculation techniques.

Content of the subject:

Chap. 1 Polynomial Interpolation and Approximation 1.6.

Lagrange Interpolation: Existence and Uniqueness of the Lagrange Polynomial, Calculation of the Lagrange Polynomial, Estimation of the Approximation Error.

1.7. Newton interpolation: table of divided differences, Newton polynomial, estimation of the approximation error.

Machine Translated by Google

1.8. Hermite interpolation: existence and uniqueness of the interpolation polynomial of Hermite, estimation of the approximation error.
1.9. Least squares approximation: classical least squares method, orthogonal polynomials, trigonometric polynomials, fast Fourier transform.
1.10. Spline functions.

Chap. 2 Numerical Derivation and Integration 2.1.
Numerical derivation: first derivative, two-point formulas, three-point formulas, higher-order derivatives, estimation of the derivation error.
2.2. Numerical integration: elementary quadrature methods, Newton-Cotes formulas, Gauss formulas, estimation of integration error.

Chap. 3 First-order differential equations 3.1. Euler-Cauchy
method: estimation of the discretization error, influence of rounding errors, implicit Euler method.

3.2. Runge-Kutta methods: Runge-Kutta method of order 2, Runge-Kutta method of order 4.

3.3. Systems of first-order ordinary differential equations.
3.4. Boundary condition problems: finite difference method, simple 1D example with Dirichlet, Neumann and mixed conditions.

Practical work: ÿ
Interpolation and polynomial approximation ÿ Derivation and numerical integration ÿ First-order differential equations

Assessment methods:
Questioning, Supervised homework, Practical work, Final exam

Bibliographic references:

[1] Jean-Pierre Demailly, numerical analysis and differential equations, EDP Sciences (2006).

[2] AlfioQuarteroni, Riccardo Sacco, Fausto Saleri, Numerical Methods: Algorithms, Analysis and Applications, Springer-Verlag (2007).
[3] AlfioQuarteroni, Fausto Saleri, Paola Gervasio, scientific computing: courses, corrected exercises and illustrations in matlab and octave, Springer-Verlag (2010).
[4] Won Young Yang, Wenwu Cao, Tae-Sang Chung, applied numerical methods using matlab, John Wiley end sons (2005).
[5] Jean-Louis Merrien, numerical analysis with matlab, Dunod (2007).
[6] André Fortin, numerical analysis for engineers, Presses internationales Polytechnique (2011).
[7] William Ford, numerical linear algebra with applications using matlab, Elsevier Inc (2015).

[8] Cleve B. Moler, numerical computing with matlab, Siam (2004).

Machine Translated by Google

[9] Grégoire Allaire, Sidi Mahmoud Kaber, numericallinearalgebra, Springer (2008).
[10] Luc Jolivet, Rabah Labbas, analysis and numerical analysis: course reminder and corrected exercises, Lavoisier (2005).
[11] Jacques Rappaz, Marco Picasso, introduction to digital analysis, Polytechnic and University Presses of Romandie (2004).
[12] Nicholas J. Higham, accuracy and stability of numerical algorithms, siam (1996).
[13] John Hubbard, Florence Hubert, scientific computing from theory to practice: illustrations with maple and matlab, University of Provence, Marseille (2005).

HALF	Subject title		Credit Coefficient		Code
S4	General electricity		2	4	IST 4.2
VHS	**Course**	**Practical work**	**Practical work**		
45h00	1h30	1h30	-		

Prerequisites:
Basic notions of mathematics and physics.

Objectives: Objectives:

ÿ Learn the basics of electricity

Become familiar with the basic circuits used in order to be able to identify the different functional blocks of an electrical diagram

Content of the material

Chapter 1. Continuous Regime and Fundamental Theorems
Definitions (dipole, branch, node, mesh), voltage and current generators (ideal, real), voltage-current relationships (R, L, C), voltage divider, current divider. Fundamental theorems: superposition, Thévenin, Norton, Millmann, Kennelly, Equivalence between Thévenin and Norton, Maximum power transfer theorem.

Chapter 2: Study of circuits in transient regime
RC circuit in transient regimes (charge and discharge), RL circuits in transient regimes, RLC circuits in transient regimes.

Chapter 3: Study of elementary circuits in sinusoidal mode
Electrical signal, Sinusoidal regime, Phase systems, Representation of a sinusoidal signal, Fresnel diagram, Simple dipoles subjected to a sinusoidal regime, Resistance, Coil, Capacitor, Generalization of Ohm's law, Complex impedance and admittance, Complex impedances and admittances of elementary dipoles (R, L, C), Association of impedances, Case of a real capacitor, Case of a real coil, Study of a series RLC circuit.

Machine Translated by Google

Chapter 4: Fundamental laws of alternating current electrical circuits

Dipole, Electric circuit, Kirchhoff's laws, Node law (Kirchhoff's first law), Mesh law (Kirchhoff's second law), Mesh current method, Millman's theorem, Superposition theorem, Thévenin and Norton's theorems, Thévenin's theorem, Kennelly's theorem, Transition from triangle circuit (ÿ) to star circuit (T), Transition from star circuit (T) to triangle circuit (ÿ).

Chapter 5: Electrical powers in sinusoidal mode

Energy and power, Electrical power, Electrical energy, Energy transformation, Receiver, Generator, Energy conservation and efficiency, Power in sinusoidal regime, Instantaneous power, Instantaneous power of elementary dipoles, Power triangle, Boucherot's theorem, Measurement of electrical power, Measurement of power factor, Improvement of power factor.

Chapter 6. Passive Quadrupoles

Representation of a passive network by a quadrupole (Z, Y, ABCD). Quantities characterizing the behavior of a quadrupole in an assembly (input and output impedance, voltage and current gain), application to adaptation. Passive filters (low-pass, high-pass, etc.), Gain curve, Phase curve, Cutoff frequency, Bandwidth.

Assessment methods:

Questioning, Supervised homework, Practical work, Final exam

Bibliographic references

T. Neffati. General Electricity. 2008. Dunod Editions, D. Bohn. .
General Electricity. 2009. SAEP Editions, Y. Granjon. General
Electricity. 2009. Dunod Editions.
G. Séguier. Industrial Electrotechnics. Technical and Documentation Editions. 1980.
JP Six and Vandeplanque. Exercises and problems in Electrical Engineering. Ed. Tech. and Doc. 1980
C. Toussaint. Solved Problems in Electrical Engineering. Dunod Edition. 1970.
C. Toussaint. Electrical Engineering Course. F-1-2 and 3. Dunod Edition. 1970.
Search. Electrical engineering. Volumes 1-2 and 3. Dunod Editions. 1976.
Fouillé and C. Naudet. Problems of general electricity. Dunod Editions, 1972.
Saint-Jean, Electrotechnics and Electrical Machines. Editions Eyrolles. 1980.
Mr. Bornand, Electronics Volumes 1 and 2

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S4	Fundamental electronics		2	4	IST 4.3
VHS	Course	Practical work	Practical work		
45h00	1h30	1h30	-		

Prerequisites :
Course on Structure of Matter and Electricity and Magnetism (Physics 2).

Goals :
This course allows the student to understand the properties, electrical models and characteristics of electronic components: diodes, bipolar transistors and operational amplifiers. These components are used in the construction of numerous electronic assemblies performing very varied functions or operations.

Content of the subject:

CHAPTER 1: INTRODUCTION TO SEMICONDUCTORS

1. Concepts of semiconductors (Conductivity, diffusion, energy layers, etc.)
2. Semiconductor materials (Silicon, Germanium, etc.).
3. Intrinsic property of silicon.
4. Property of doped silicon.
5. N and P semiconductors.
6. PN junction in equilibrium

CHAPTER 2: THE QUADRIPOLES

1. Representation of a passive network by a quadrupole.
2. The quantities of the equivalent model of a quadrupole assembly (input and output impedance, voltage and current gain), application to adaptation.
3. Passive filters (low-pass, high-pass, etc.), Bode diagram, Gain curve, Phase curve, Cutoff frequency, Bandwidth.

CHAPTER 2: DIODES

1. Operation of a diode.
2. Forward and reverse bias of a diode
3. Current-voltage characteristics of the diode
4. Diode Models (Ideal and Small Signal)

Machine Translated by Google

5. Special diodes: Zener diode, Schottky diode, Capacitive diode, Tunnel effect diode, Light emitting diode, Photodiodes, Photoconductive cells.

6. Diode applications: Clipping, Locking, DC power supply circuits (single-wave and double-wave rectifications, Zener diode stabilization, etc.), Voltage multiplier.

CHAPTER 3: BIPOLAR TRANSISTORS

1. Definition and transistor effect.
2. Static regime of bipolar transistors (Characteristics network of an NPN bipolar transistor, limits of use of a transistor (Breakdown voltages, Maximum current, Maximum power))
3. Polarization of an NPN transistor (by base resistance, by resistive bridge and emitter resistance)
4. Effect of polarization on the characteristic network of an NPN transistor (charge line, rest point, etc.)
5. Bipolar transistor in dynamic mode (hybrid parameters and equivalent diagram of the NPN transistor)
6. Fundamental amplifiers with bipolar transistors: EC, CC, BC (link capacitors, decoupling capacitors, equivalent diagram, voltage gain, decibel gain, bandwidth, current gain, input and output impedances).
6. Push-pull assembly
7. the simple differential amplifier

CHAPTER 4: FIELD EFFECT TRANSISTORS

1. Definition of a junction field effect transistor
2. Polarization of JFET transistors
3. The equivalent diagram in linear mode
4. Common-source JFET amplifiers
5. JFET transistors in switching

CHAPTER 5: OPERATIONAL AMPLIFIERS

1. Linear operation of an operational amplifier (characteristics, equivalent diagram, feedback).
2. Basic assemblies of the operational amplifier in linear mode (Inverting, Non-inverting, Adder, Subtractor, Comparator, Follower, Differentiator, Integrator.
Logarithmic, Exponential.
3. Operational amplifiers in non-linear mode (The comparator, The Schmitt trigger, astable and monostable assemblies)

Assessment method: Written test, supervised assignment, final exam

Bibliographic references:

1. A. Malvino, Principle of Electronics, 6th Edition Dunod, 2002.
2. T. Neffati, Introduction to Analog Electronics, Dunod, 2008.
3. Y. Granjon, B. Estibals and S. Weber, Electronics: The entire course in files, Dunod, 2015
4. T. Floyd, Electronic Components and Application Systems, 5th Edition, Dunod, 2000.
5. F. Milsant, Electronics Course (and Problems), Volume 1, Eyrolles.
6. M. Kaufman, Electronics: Components, Volume 1, McGraw-Hill, 1982.
7. P. Horowitz, Treatise on Analog and Digital Electronics, Volumes 1 and 2, Publitronic-Elektor, 1996.

Machine Translated by Google

8. M. Ouhrouche, Electrical Circuits, International Polytechnic Press, 2009.
9. I. Jelinski, All Electronics in Exercises, Vuibert, 2000.

HALF	Subject title	Coefficient	Credits	Code
S4	Resistance of materials	**3**	**5**	IST 4.4

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:

- ÿ Mathematics (Integral and Differential Calculus)
- ÿ Mechanics (the laws of statics)

Objectives:

ÿ Assimilate the fundamental concepts of RDM ÿ Understand the importance of the choice of geometric shapes in RDM ÿ Become familiar with the concepts of internal forces ÿ Understand the relationship between external loading and internal forces
ÿ Learn to draw reduction element diagrams and use them
ÿ Know how to interpret the different stress diagrams ÿ Size construction parts

Content of the subject:

1. HYPOTHESES OF THE RESISTANCE OF MATERIALS
1.1. Purpose of the resistance of materials
1.2. General assumptions 1.3. Definitions of stresses

2. GEOMETRIC CHARACTERISTICS OF PLANE SECTIONS 2.1. Characteristics in any axis 2.1.1. Static moment 2.1.2. Center of gravity 2.1.3. Quadratic moment of inertia 2.1.4. Radius of gyration 2.1.5. Product of inertia 2.1.6. Polar moment of inertia 2.1.7. Parallel axes theorem

2.2. Geometric characteristics of composite plane sections 2.3. Main characteristics 2.3.1. Moment of inertia with respect to axes of variable direction 2.3.2. Principal axes of inertia/ Principal moments of inertia

3. CONCEPTS OF CONSTRAINTS

Machine Translated by Google

3.1. Stress vector at a point 3.2. Stress
plane state and principal directions: MOHR graphical representation 3.3. Principal axes of inertia/Principal moments of inertia

4. SIMPLE STRESSES 4.1. Simple traction and
compression 4.1.1. Definition

4.1.2. Relationship between normal force and elongation
4.1.3. Hooke's Law
4.1.4. Strength Condition 4.2. Simple
Shear 4.2.1. Definitions and
Assumptions 4.2.2. Strength Condition
4.2.3. Applications 4.3. Torsion
4.3.1. Definition and
Assumptions
4.3.2. Study of a Square Section
4.3.3. Applications (Hollow Shaft and
Solid Shaft)
4.4. Plane bending
4.4.1. Definition and hypotheses
4.4.2. Simple bending (study and distribution of stresses)
4.4.3. Pure bending (study and distribution of constraints)
4.4.4. Deflected bending (study and distribution of stresses)
4.4.5. Constraints and radius of gyration
4.5. Beams 4.5.1.
Definition and hypotheses 4.5.2.
Reduction elements (M,N,T)
4.5.3. (M,N,T) diagrams

RDM Practical Work

ÿ TP 1: Tensile Tests ÿ TP 2:
Bending Tests. ÿ TP 3: Torsion
Tests

Assessment methods:

Questioning, Supervised homework, Practical work, Final exam

Bibliographic references:

ÿ Treatise on material resistance (Massonet)

ÿ Resistance of Materials (Prof. Bourahla)

Machine Translated by Google

HALF	Subject title		Coefficient	Credits	Code
S4	Signal Theory		2	4	IST4.5
VHS	**Course**	**Practical work**	**Practical work**		
45h00	1h30	1h30	-		

Prerequisites : Analysis and Algebra courses.

Goals :

- Acquire notions on the “mathematical description” of signals.
- Highlight the main characteristics of the signals (frequency distribution, energy, etc.) and analyze the modifications undergone during the transmission or processing of these signals.

Content of the subject:

CHAPTER 1: GENERAL INFORMATION ABOUT SIGNALS

1. Definition of the concept of signal and transmission of information
2. Classification of signals (morphological, spectral, etc.),
3. Vector representation of signals
4. Concepts of power and energy. Examples of basic signals (rectangular pulse, triangular pulse, ramp, unit step, sign, Dirac, etc.)

CHAPTER 2: ANALYSIS OF CONTINUOUS-TIME DETERMINISTIC SIGNALS

1. Periodic signals: Fourier series decomposition (Fourier spectrum of periodic signals)

2. Aperiodic signals with finite energy: Continuous-time Fourier transform (properties: Linearity, Homothety, Delay theorem, Time-frequency duality, Modulation theorem, Integration and derivation /in time), Energy Spectral Density, Parseval Identity, etc.).

3. Fourier transforms of infinite energy signals.

CHAPTER 3: LAPLACE TRANSFORM

1. Definition of the Laplace transform
2. Laplace transforms of certain common signals (Dirac, unit step, etc.)
3. Properties of the Laplace transform
4. The inverse Laplace transform
5. Formulation of the convolution product, properties of the convolution product.
6. Applications to Linear Time-Invariant Systems (LIT) (Time and frequency analyses, and properties).

CHAPTER 4: SAMPLING

1. Ideal sampling: Definition.
2. Shannon-Nyquist Sampling Theorem
3. Spectrum overlap or aliasing
4. Reconstruction of sampled signals

Machine Translated by Google

CHAPTER 5: TIME-DISCRETE DETERMINIST SIGNALS

1. Definitions and examples of discrete signals.
2. Properties of discrete signals (Periodicity, Energy, Average power, etc.).
3. Autocorrelation function of a discrete signal (with finite energy, with finite average power, periodic)
4. Cross-correlation function of two discrete signals (finite energy, finite average power)
5. Convolution product.

CHAPTER 6: DISCRETE FOURIER TRANSFORM (DFT)

1. Definition and properties of DFT (direct DFT, inverse DFT, linearity, translation of the discrete signal, symmetry, circular convolution, Parseval equality).
2. Comparison between the Fourier transform and the DFT.
3. Analysis method (Weighting windows, Zero padding technique or filling with zeros, etc.).

Assessment method:

Written test, supervised homework, final exam.

Bibliographic references:

1. A. Ouahabi, ÿ Theoretical Foundations of the Signalÿ, OPU, 1993.
2. F. de Coulon, ÿTheory and signal processingÿ, PPUR Edition. 2013.
3. B. Picinbono, ÿTheory of signals and systems with solved problemsÿ, Edition Bordas, 1989.
4. JP Delmas, ÿElement of signal theory: Deterministic signalsÿ, Collection telecommunications education, ELLIPSES, 1995.
5. M. Benidir, ÿSignal Theory and Processing, Volume 1: Representation of Signals and Systems - Course and Corrected Exercises'', Dunod, 2004.
6. M. Benidir, ÿSignal Theory and Processing, Volume 2: Basic Methods for Signal Analysis and Processing - Course and Corrected Exercises'', Dunod, 2004.

HALF	Subject title		Coefficient	Credits	Code
S4	**Measurement and metrology**		**2**	**3**	IST 4.6
VHS	**Course**	**Practical work**	**Practical work**		
45h00	1h30	-	1h30		

Prerequisites:
Notions of mathematics, notions of physics, electrical circuits

Objectives:
ÿ Acquire basic notions in metrology

Machine Translated by Google

ÿ Know the limits of an experimental measurement
ÿ Evaluate uncertainty
ÿ Apply different techniques to measure electrical quantities

Content of the subject:

Metrology:

- General information, standards, metrology and quality,
- Metrology category: scientific metrology, industrial metrology, legal metrology, metrology vocabulary
- General information on measurement: units of measurement, methods of measurement, standards of measurement, measurement errors,
- Calculations of measurement errors: absolute uncertainty, relative uncertainty, presentation of a measurement result,

Electrical measurement:

- Methods of measuring electrical quantities: direct, indirect methods, bridge method, resonance method,
- Measurement of electrical quantities: measurement of currents and voltages,
- Analog measuring devices,
- Digital measuring devices.
- Chronometric measurements,

Assessment method: Written test, practical work, final exam.

Bibliographic references:

[1] . Lorenzo Zago, Metrology Bases, High School of Engineering and Management of the Canton of Vaud, 2012.
[2] . PA. Paratte, Treatise on Electricity, volume XVII, Measurement Systems, Polytechnic Press French-speaking Switzerland.
[3]. JP Bentley, Principles of measurement systems, Pearson education, 2005.
[4] . J. Niard et al, Electrical measurements, Nathan, 1981
[5] . D. Barchesi, Physical Measurement and Instrumentation, Ellipses 2003.
[6]. JP Holman, Experimental Methods for Engineers, McGraw-Hill 1994.
[7]. https://langloisp.users.greyc.fr/metrologie/cm/index.html
[8]. http://www.doc-etudiant.fr/Sciences/Physique/Cours-Introduction-a-la-Metrologie-Industrial-8223.htmlFM

HALF	Subject title	Coefficient	credits	Code
S4	**Computer Science 4**	**2**	**2**	IST 5.7

VHS	Course	Practical work	Practical work
45h00	1h30	-	1h30

Prerequisites: Computer Science 1, Computer Science 2

Goals :
- Introduce the learner to Python programming

Machine Translated by Google

Content of the subject:

Chapter 1. Installing and Using Python Chapter
2. Basics 2-A. Interactive Mode
and Script Mode , 2-A-1. Python Calculator ,
2-A-2. Using Operators: +, -,
*, /, //, %, and ** , 2-A-3.c Precedence 2-B. Variable and Data Type :
2-B-1. Variable
Initialization, Variable Modification,
Compound Assignment 2-B-2. Data Type: (. Number, Character, String)

2-B-3. Conversion (str function)
2-C. Predefined function 2-
C-1. Use the functions of the math module (abs, max, min, pow, round, sin, sqrt, log, exp, acos, etc.)

2-C-2. Print function 2-
C-3. Formatted output (use the format function)
2-C-4. Input Function 2-
C-5. Function Import 2-D. Source
Code 2-D-1. Variable
Naming Rule 2-D-2. Comment **Chapter 3.**
Conditional Structures
(Minimal if Form, if-else Form, Full if-elif-else Form)

The limits of the simple if condition Comparison
operators Predicates and booleans
The keywords and, or
and not **Chapter 4. Loops** The
while loop The for loop Nested
loops The keywords
break and
continue **Chapter 5.**
Functions Creating functions Default
values of parameters Signature
of a function The return
statement Modules, The import method
The import method: from …
import …

Packages
Importing Packages
Creating Your Own Packages
Chapter 6: Lists and Tuples Creating
and Editing Lists Defining a List,
Creating Lists Inserting Objects into a List Adding
an Element to the End of the List
Inserting an Element into the List
Concatenation of Lists

Machine Translated by Google

Removing items from a list
The keyword del
The remove method
The list path
The enumerate function
Creating tuples

Chapter 7: Dictionaries Creating and Editing Dictionaries
Create a dictionary
Deleting keys from a dictionary
The path methods
Key Route
Course of values
Traversing keys and values simultaneously
Dictionaries and function parameters

Chapter 8: Objects and Classes

Describe objects and classes, and use classes to model objects. Define classes with data fields and methods.
Construct an object using a constructor that invokes the initializer to create and initialize data fields.

Chapter 9: Files Relative and Absolute Paths
Reading and writing to a file
Opening the file
Close the file
Read the entire file
Writing to a file
Writing other data types
The keyword with
Saving objects to files
Save an object to a file

Assessment method: Continuous assessment, practical work, final exam

Bibliographic references:

[1] .Allen B. Downey Think Python: How to Think Like a Computer Scientist, O'Reilly Media, 2015;
[2] .Zed A. Shaw Learn Python 3 the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code, Addison-Wesley Professional, 2017;
[3] .Barry, P. Head first Python: A brain-friendly guide. “O’Reilly Media, Inc.”, 2016;
[4] .Ramalho, L.. Fluent Python. “O’Reilly Media, Inc.”, 2022;
[5] .Swinnen, G.. Learning to program with Python 3. Editions Eyrolles, 2012;
[6] .Le Goff, V.. Learn to program in Python. Editions Eyrolles, 2019;
[7] .Matthes, E. Python crash course: A hands-on, project-based introduction to programming. no starch press, 2019;

Machine Translated by Google

HALF	Subject title	Coefficient	Credits	Code
S4	**Computer Aided Design**	**2**	**2**	IST 4.8

VHS	Course	Practical work	Practical work
45 hours	-	-	**3:00 a.m.**

~~Prerequisites~~:

ÿ Industrial design ÿ

Mechanical construction technology ÿ Systems design

~~Goals :~~

Introduction to the use of computer-aided design tools using two software programs (AutoCad and SolidWorks) in order to optimize the production

Machine Translated by Google

of a part, diagrams or an assembly

Content of the subject:

Chapter 1: Introduction to CAD

- 2D/3D modeling using computer tools
- Operating principle of 3D modelers

Chapter 2: Autocad

- **2D drawing**

5. Software presentation
6. Cartesian and polar coordinates
7. Basic drawing
8. Drawing and Editing Commands

- **3D Modeling**

4. User coordinate system in space (UCS)
5. Basic elements and Boolean operation 6.

Visualization and display

Chapter 3: SOLIDWORKS

- Presentation of SolidWorks software • File management (Parts, assembly, drawing)
- Creation of parts ÿ The sketch
  - ÿ Volume creation functions (Bossages)
  - ÿ Advanced features
  - ÿ Creation assistance tools •

Creation of assemblies • Drawing techniques

Assessment methods:

Questionnaire, Practical work, Final exam

Bibliographic references:

ÿ AutoCAD 2009, Olivier Le Frapper, Edition Eni 2009.

ÿ The secrets of the AutoCAD designer, Patrick Diver, Pearson Edition 2010.

SolidWorks 2012, Thierry CRESPEAU, Edition Eni 2012.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S4	**Expression techniques, information and communication**	**01**	**01**	IST 4.9
VHS	**Course**	**Practical work**	**Practical work**	
10:30 p.m.		1h30	-	

Prerequisites: prior knowledge

Languages (Arabic; French; English)

Goals :

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

Content of the material:

Machine Translated by Google

Chapter 1: Researching, Analyzing, and Organizing Information

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

Chapter 2: Improving Expressiveness

Take into account the communication situation, Produce a written message, Communicate orally, Produce a visual and audiovisual message, Improve group communication skills.

Chapter 3: Developing autonomy, organizational and communication skills within the framework of a project approach

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

Definition, Activities using ICT, Mastery of ICT skills, Evolution of ICT, Information and communication services

Chapter 5: Searching, Using, and Retrieving Information.

Search directories (YAHOO, GOOGLE), Search engines, Query and search language, Retrieving and printing an HTML page, Retrieving an image, Downloading a file or software, Playing an HTML file locally, Playing a multimedia file saved on the Web.

Chapter 6: ICT Rights

Computer crime, Media law, Electronic communications law, Electronic commerce law, Internet governance, etc.

Chapter 7: Securing Sensitive Information, Protecting Confidential Data and Preventing Nuisances.

Backup of important data, "Informatique et Libertés" law, Dangers of the Internet, Computer hacking, Machine protection, Protection against viruses, Protection against cyber threats or online threats (Phishing, spam emails, spyware, malware, ransomware, viruses and trojanhorses, man-in-the-middle attacks, etc.), Prevent data loss, Spam, Hoaxes, Cryptology, Electronic signature….

Assessment method: Continuous assessment, final exam

Bibliographic references *(Books and handouts, websites, etc.)*

1. Jean-Denis Commeignes, 12 methods of written and oral communication – 4th edition, Michelle Fayet and Dunod 2013.
2. Denis Baril, Sirey, Techniques of written and oral expression, 2008.
3. 3- Matthieu Dubost, Improving your written and oral expression: all the keys, Edition Ellipses 2014.
4. Allegrezza Serge and Dubrocard Anne (edited by). Internet Econometrics. Palgrave Macmillan Ltd, 2011. ISBN-10: 0230362923; ISBN-13: 9780230362925
5. Anduiza Eva, Jensen J. Michael and JorbaLaja (edited by). Digital Media and Political Engagement Worldwide. Cambridge UniversityPress - MUA, 2012. ISBN-10: 1107668492; ISBN-13: 9781107668492
6. Baron GL, and Bruillard E. Computing and its users in education. Paris, PUF, 1996. ISBN-10: 2130474926; ISBN-13: 978-2130474920
7. Online Chantepie P. and Le Diberder A. Digital revolution and cultural industries. Benchmarks. 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,

Machine Translated by Google

2012. ISBN-10: 2916571612; ISBN-13: 978-2916571614

10. GreenfieldDavid. “The Addictive Properties of Internet Usage.” In Internet Addiction, 133?153. John Wiley & Sons, 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

Detailed programs of subjects for the 5th semester

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S 5	Fundamental electrical engineering		2	3	IST 5.1
VHS	**Course**	**Practical work**	**Practical work**		
45h00	1h30	1h30			

Prerequisites

Complex calculation, fundamental laws of electricity (Ohm's Law, Kirchhoff's laws, etc.), Analysis of single-phase alternating current electrical circuits, magnetostatics.

Goals

To deepen the student's knowledge in the calculation of balanced and unbalanced three-phase circuits and in the calculation and dimensioning of magnetic circuits. To know electrical transformers (structure, operating mode, equivalent diagrams and tests).

Content of the material

Chapter 1 Reminders on single-phase electrical circuits (1 week)

- Value and representations of a sinusoidal quantity
  Effective value, vector representation, complex notation
- Impedances.
- Apparent, active and reactive power, power factor
- Usual methods of circuit studies.

Chapter 2. Balanced Three-Phase Electrical Circuits (3 Weeks)

- Definitions; fundamental properties and rotation operator.
- Star and delta coupling of the three phases
- Equivalent single-phase diagrams
- Powers; definitions and expressions; three-phase power measurements
- Study of three-phase circuits

Machine Translated by Google

Chapter 3 Unbalanced Three-Phase Electrical Circuits (2 weeks)

- Definition and determination of symmetrical components.
- Method of measuring symmetrical components.
- Relationship between the components of the two current and voltage systems.
- Conducting calculations using symmetric components in an example simple.

Chapter 4. Magnetic Circuits (2 Weeks)

- Reminders on the laws of magnetostatics (Field, induction, magnetic force, laws of Lenz).
- Magnetic materials and permanent magnets hysteresis cycle
- Calculation of magnetic circuits in linear and saturated regime • Iron core coils in alternating current.

Chapter 5 Single-Phase Electrical Transformers (4 Weeks)

- Constitution
- No-load and load operations. Voltage and current ratios.
- Equivalent diagrams. Determination of the elements of the equivalent diagram.
- Characteristics. Secondary voltage drop and efficiency.
- General information on special transformers. Autotransformers and transformers of currents.

Chapter 6 Three-Phase Transformers (3 Weeks)

- Constitution. Magnetic circuit, coupling of windings
- Operation in balanced mode. Equivalent single-phase diagram. Features.
- Operation in unbalanced mode
- Parallel operation of two transformers. Circulating current.

Assessment method: Continuous assessment 40%, Exam 60%

Bibliographic references

[1].G. *Séguier,* F. Notelet, Industrial *Electrotechnics ,* Technique and Documentation, Paris, 3rd edition, 2006.

[2].M. Kostenko; L. Piotrovski Electrical Machines (Volumes 1 and 2), Mir Moscow Edition

[3]. Max Marty, Daniel Dixneuf, Delphine Garcia Gilabert; Principle of electrical engineering: Dunod Sciences Sup Edition

[4]. H. Lumbroso, Problems solved on electrical circuits, Dunod.

[5]. JP Perez, R. Carles and R. Fleekinger, Electromagnetism Foundations and Applications, 3rd Edition, 1997.

[6]. A. Fouillé, Electrotechnics for the Use of Engineers, Dunod, 1963

[7]. MARCEL Jufer, Electromechanics, Polytechnic and University Presses Romandes-Lausanne, 2004.

[8]. Edminster, Theory and Applications of Electric Circuits, Mc. Graw Hill.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S 5	Field theory		2	3	IST 5.2
VHS	Course	Practical work	Practical work		
45h00	1h30	1h30			

Prerequisites

Concepts on: - the sources of electric and magnetic fields. - the electric field and potential produced by a charge distribution. - the magnetic field produced by an electric current.

Goals

This subject allows the student to acquire advanced notions in electromagnetism.

Content of the subject:

Chapter 1 Mathematical Reminders (1 Week)

- Vector analysis and coordinate systems.

Chapter 2. Electrostatics (3 weeks)

- Electrostatic fields in vacuum and in dielectric media.

Chapter 3. Magnetostatics (3 weeks)

- Magnetic field and induction, magnetization of material media and electrodynamic forces.

Chapter 4. Electromagnetic induction phenomenon. (3 weeks)

- Quasi-stationary hypothesis; electromagnetic induction phenomenon. Induced currents. Lenz's law.

Chapter 5. Electromagnetic fields in variable regimes (4 Weeks)

- Maxwell's equations (local and integral formulation); Poyting vector and energy.
- Electromagnetic waves in vacuum and in material media.

Assessment method: (type of assessment and weighting) CC: (TC+TP) 40%, Exam 60%

Bibliographic references

[1].Joseph A. Edminister, Electromagnetism, Course and Problems - Schaum Series.

[2].Emile Durand: Electrostatics Volume 1: distributions; Volume 2: General problems drivers.

Machine Translated by Google

[3].Emile Durand: Magnetostatics [4].Paul
Lorrain, Dale Corson, and François Lorrain, "Electromagnetic Phenomena: Course, Exercises and Solved Problems", 2002.
[5].Garing, "Electromagnetic waves in vacuum and conductive media: Exercises and corrected problems", 1998.

[6].Michel Hulin, "Nicole Hulin, and Denise Perrin, Maxwell's equations: waves Electromagnetics. Course, exercises and solved problems", 1998.

HALF	Subject title	Credit	Coefficient	Code
S5	**Power Electronics**	2	3	IST 5.3

VHS	Course	Practical work	Practical work
45 hours	01h30min	01h30min	

Prerequisites:
General electricity, fundamental electrical engineering, power semiconductor components.

Goals :
Understand the basic principles of power electronics. Understand the operating principle and use of power semiconductor components. Understand the operation of the main static converters. Acquire the basic knowledge for a technical choice according to the field of application of a static power converter.

Teaching content:

Chapter 1. Introduction to Power Electronics Introduction to power electronics, its role in electrical energy conversion systems. Classification of static converters (according to the switching mode, according to the conversion mode). Non-sinusoidal periodic quantities (effective values, averages, form factor, ripple rate. THD;….). Study of the static and dynamic characteristics of the different power semiconductor components. Definition of the different switching modes. **3 weeks**

Chapter 2. AC - DC Conversion Single-phase rectification controlled and non-controlled, load type R, RL, RLE., Three-phase rectifiers controlled and controlled, load types R, RL, RLE. Analysis of the commutation phenomenon (encroachment) in static rectification converters uncontrolled and controlled. **3 weeks**

Chapter 3. AC - AC 3 Week Conversion
Single-phase and three-phase dimmer with R and RL load. Principle of the single-phase Cyclo converter.

Chapter 4. DC - DC Conversion Buck and boost chopper, with load R, RL and RLE. **3 weeks**
Two-quadrant reversible chopper. Four-quadrant reversible chopper.

Machine Translated by Google

Chapter 5. DC - AC Conversion **3 weeks**

Single-phase inverter, half-bridge and full-bridge connection with R and RL load. Full-wave and offset control. Three-phase inverter in full-wave and offset control.

Assessment methods:

Quizzes, Supervised Homework, Final Exam.
Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1. L. Lasne, “Power Electronics: Course, Case Studies and Corrected Exercises”, Dunod, 2011.
2. P. Agati et al. “Aide-mémoire: Electricity-Control and Power Electronics– Electro-technology”, Dunod, 2006.
3. J. Laroche, “Power Electronics – Converters: Course and Corrected Exercises”, Dunod, 2005.
4. G. Séguier et al. “Power Electronics: Course and Corrected Exercises”, 8th edition; Dunod, 2004.
5. D. Jacob, “Power electronics - Operating principle, dimensioning”, Ellipses Marketing, 2008.
6. G. Séguier, “Power electronics, basic functions and their main applications”, Tech et Doc.
7. H. Buhler, “Power Electronics”, Dunod
8. CW Lander, “Power Electronics,” McGraw-Hill, 1981
9. H. Buhler, “Regulation and Control Electronics; Treatise on Electricity”.
10. F. Mazda, ÿPower Electronics Handbook: Components, Circuits and Applicationÿ, 3rd Edition, Newness, 1997.
11. R. Chauprade, “Controls of alternating current motors (Power electronics)”, 1987.
12. R. Chauprade, “Direct current motor controls (Power electronics)”, 1984.

Machine Translated by Google

HALF	Subject title		Coefficient Credits Code		
S5	Heat transfer		2	3	IST 5.4
VHS	Course	Practical work	Practical work		
45h00	1h30	1h30			

Prerequisites:

- ÿ Basic knowledge of physics and thermodynamics.
- ÿ Understanding of differential equations and linear algebra.
- ÿ Familiarity with the concepts of heat, temperature and thermal properties of materials.

Teaching objectives

- ÿ Understand the fundamental principles of heat transfer by conduction, convection and radiation.
- ÿ Be able to apply the laws and equations that govern heat transfer to solve real-life problems.
- ÿ Study the mechanisms of heat transfer in different materials and systems.
- ÿ Analyze and design heating, cooling and insulation systems thermal.
- ÿ Understand the practical applications of heat transfer in various fields such as than engineering, meteorology, materials physics, etc.

Content of the subject:

Chapter I: Heat Transfer: General Information (2 weeks)

I.1. The importance of the study of heat transfer. I.2. Thermodynamics and heat transfer

I.3. Fundamental concepts (Heat flow, Flux density, Temperature fields, Temperature gradient, Isothermal surface).

I.4. The different modes of heat transfer

I.5. Formulation of a heat transfer problem

Chapter 2: Steady-State Heat Transfer by Conduction II.1. Introduction to Thermal **(3 weeks)**

Conduction, II.2. Fourier's Law, II.3. Thermal Conductivity II.4. Heat Equation II.5. Spatio-Temporal Boundary Conditions.

II.6. Unidirectional Heat Transfer. II.7. Multidirectional Heat Transfer

Chapter 3: Heat transfer by conduction in variable regime and without change of state (2 weeks)

III.1. Unidirectional heat transfer in variable regime. (Uniform temperature medium, Semi-infinite medium, Thick medium of finite dimensions (or Limited medium).

III.2. Multidirectional conduction in variable regime

Chapter 4: Convective Heat Transfer (3 weeks)

Machine Translated by Google

IV.1. Introduction. IV.2. Modeling of convective heat transfer

IV.3. Boundary layers in convective transfer. IV.4. Laminar and turbulent flow. IV.5. Conservation equations: Conservation equation of mass, momentum and energy. IV.6. Boundary layer equations. IV.7. Dimensional analysis. IV.8. Forced convection. IV.9. Free (or natural) convection.

Chapter 5: Heat Exchangers (2 weeks)

V.1. Introduction: Description, Hypotheses and conventions. V.2. Geometric characteristics of the exchangers.

V.3. Main types of heat exchangers. V.4. Expression of the exchanged flow in a simple tubular exchanger. V.5. Efficiency of an exchanger. V.6. Number of transfer units. V.7.

Calculation of an exchanger

Chapter 6: Heat Transfer by Radiation (2 weeks)

6.1. General. Definitions (Nature of radiation, Definitions)

6.2. Laws of radiation (Lambert's law, Physical laws)

Assessment method:

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

Bibliographic references: 1. Heat

transfer, André Giovannini, Benoît Bédat, Cépaduès, 2012

2. Thermal transfers, Ana-Maria Bianchi, Yves Fautrelle, Jacqueline Etay, PPUR polytechnic presses, 2004

3. Thermal Transfer by Alexis Clerc (2019)

4. Applied Thermal Science by Roger Ghisolfi (2016)

V. Fluid Mechanics and Thermal Transfers by Yves Le Coq and Jean-Louis Legrand (2014)

6. Thermal Transfers by Bernard Pau (2012)

7. Thermodynamics and Heat Transfers by Michel Rieu and Jean-Pierre Talbot (2008)

8. Engineering Techniques: https://www.techniques-ingenieur.fr/

9. Cooling and Thermal Transfers: https://www.lendingm.com/the-refrigerator-transfers-heat-from-the-cold-cooling-coils-to-warm/

HALF	Subject title	Credit Coefficient		Code
S5	**Servitudes 1**	2	3	IST 5.5

Machine Translated by Google

VHS	Course	Practical work	Practical work
45 hours	1h30min	01h30min	

Prerequisites:
Basic mathematics (Algebra, Integral and differential calculus, Analysis, complex, etc.).
Fundamentals of signal processing, basic electronics (linear circuits).

Goals :
- Review the properties of control structures of continuous linear systems,
- Approach the models of basic dynamic systems.
- Explore the time and frequency analysis tools of basic systems.

Teaching content:

Chapter 1: Introduction to Servo Systems (2 weeks)
• History of automatic regulation systems, • Terminology and definition, Concept of systems,
• Dynamic behavior, Static behavior, Static systems, Dynamic systems,
• Linear systems, Introductory examples, Open-loop systems, Loop systems closed,
• Main elements of a servo chain, Reasoning for a servo,
• Performance of controlled systems.

Chapter 2: Systems Modeling: (2 weeks)
• Representation of systems by their differential equations, • Laplace transform, from the differential equation to the transfer function,
• Functional blocks and subsystems, Simplification rules,
• Representation of dynamic systems by flow graphs, Masson's rule,
• Calculation of transfer functions of looped systems.

Chapter 3: Time Responses of Linear Systems: (2 weeks)
• Definition of the response of a system, Transient regime, Permanent regime, Notions of stability,
• Static speed and precision, Impulse response (1st and 2nd order),
• Temporal characteristics,
• Step response (1st and 2nd order) of first and second order systems from the time response, •
Higher order systems, Influence of poles and zeros on the response of a system

Chapter 4: Frequency Responses of Linear Systems (3 weeks)
• Definition, Bode and Nyquist diagrams
• Frequency characteristics of basic dynamic systems (1st and 2nd order), Margins of phase and gain.

Chapter 5: Stability and precision of servo systems (3 weeks)
• Definition, Stability conditions, • Algebraic Routh-Herwitz criterion, Reversal criteria in Nyquist and Bode planes, Margins of stability,

Machine Translated by Google

• Accuracy of servo-controlled systems, Static accuracy, Calculation of static deviation, • Dynamic accuracy, Characterization of transient regime

Chapter 6: State Representation of Controlled Systems (3 weeks)

State of a system and state variables, Resolution of state equations, Controllability of a system, Observability of the state of a system, Relationship between the state representation and the transfer function of a system, state representation of systems, Correction of controlled systems in the state space. Synthesis of state observers.

Assessment methods:

Quizzes, Supervised Homework, Final Exam

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

Bibliographic references :

1. Norman, S Nise, Control Systems Engineering; John Wiley & Sons; 8th EMEA edition (May 17, 2019)
2. Katsuhiko Ogata, Modern Control Engineering: Fifth Edition Kindle Edition; 2020
3. EK Boukas, Servo-controlled systems, Editions of the Polytechnic School of Montreal, 1995.
4. P. Clerc. Continuous automatic, sampled: IUT Electrical Engineering-Computer Science
5. Industrial, BTS Electronics-Mechanics-Computer Science, Editions Masson (198p), 1997.
6. Ph. de Larminat, Automatic, Editions Hermes 2000.
7. P. Codron and S. Leballois, Automatics: continuous linear systems, Dunod Editions 1998.
8. Y. Granjon, Automatics: Linear, nonlinear, continuous-time, continuous-time systems discreet, state representation, Editions Dunod 2001.
9. M. Rivoire and J.-L. Ferrier, Course in Automation, volume 2: control, regulation, analog control, Editions Eyrolles 1996.
10. Y. Thomas, Signals and linear systems: corrected exercises, Editions Masson 1993.

HALF	Subject title		Credit Coefficient		Code
S 5	**Combinatorial and sequential logic**		2	3	IST5.6
VHS	**Course**	**Practical work**	**Practical work**		
45h00	1h30	1h30			

Prerequisites:

ÿ Basics of Boolean algebra: Logical operations (AND, OR, NOT), Boolean identities, De Morgan's laws, simplification of Boolean expressions.

ÿ Number systems: Binary bases, conversion between bases, representation of whole and negative numbers.

ÿ Mathematical functions: Definition, properties, graphical representation.

Machine Translated by Google

Goals:

Understand common combinational circuits. Know how to represent some applications of combinational circuits using standard tools such as truth tables and Karnaugh tables.
Introduce sequential circuits through flip-flop circuits and counters.

Content of the subject:

Chapter I: Number Systems and Information Coding (2 weeks)

Representation of a number by codes (binary, hexadecimal, BCD, signed and unsigned binary, etc.), base change or conversion, unweighted codes (Gray code, error detection and correction codes, ASCII code, etc.), arithmetic operations in binary code.

Chapter II: Boolean Algebra and Simplification of Logical Functions (2 weeks)

Logical variables and functions (OR, AND, NOR, NAND, XOR). Laws of Boolean algebra.
De Morgan's theorem. Complete and incomplete logical functions. Representation of logical functions: truth tables, Karnaugh tables. Simplification of logical functions: algebraic method, Karnaugh method.

Chapter III: Integrated Logic Circuit Technology (3 weeks)

Logical signals (conventions, imperfections, definition thresholds), integration and technologies, study of a eportelogic (general, time-dependent output, state-collector output), characteristics of CMOS and TTL integrated logic circuits.

Chapter IV: Combinational Circuits (3 weeks)

This chapter reviews the main combinational circuits with, for each of them, a general description, the list of existing integrated circuits, the cascading methods, the applications and their possible use for the realization of any combinational function. We study in particular the decoders, the priority encoders, the multiplexers, the demultiplexers, the parity generators and checkers, the comparators, the arithmetic circuits.

Chapter V: The Seesaws (2 weeks)

Introduction to sequential circuits. The RS flip-flop, the RST flip-flop, the D flip-flop, the master-slave flip-flop, the T flip-flop, the JK flip-flop. Examples of flip-flop applications: Frequency divider by n, Pulse train generator, etc.

It is advisable to present for each flip-flop the truth table, examples of chronograms as well as the limits and imperfections.

Chapter VI: Counters (2 weeks)

Definition, Classification of counters (synchronous, regular, irregular, asynchronous, complete and incomplete cycles). Creation of complete and incomplete synchronous binary counters, Excitation tables for JK, D and RS flip-flops, Creation of asynchronous binary counters modulo(n): complete, incomplete, regular and irregular. Programmable counters (start from any state).

Machine Translated by Google

Assessment methods:

Review: 100%

Bibliographic references:

Letocha; Introduction to Logic Circuits; Mc-Graw Hill Edition.

JC Lafont; Digital electronics courses and problems, 124 exercises with solutions; Ellipses Edition.

R. Delsol; Digital Electronics, Volumes 1 and 2; Berti Edition

P. Cabanis; Digital electronics; Dunod Edition.

Mr. Gindre; Combinatorial Logic; Ediscience Edition.

H. Curry, Combinatory Logic II. North-Holland, 1972 JP.

Ginisti, Combinatory Logic, Paris, PUF (coll. “Que sais-je?” n°3205), 1997.

JL. Krivine, Lambda calculus, types and models, Masson, 1990, chap. Combinatorial logic, English translation available on the author's website.

R. Katz Contemporary Logic Design, 2nd ed. Prentice Hall, 2005.

M. Gindre, Digital electronics: combinatorial logic and technology: courses and exercises, Mc Graw Hill, 1987 C. Brie, Combinatorial

and sequential logic, Ellipses, 2002.

HALF	Subject title		Coefficient	Credits	Code
S5	Applied Numerical Methods - Python		2	3	IST5.7
VHH	**Course**	**Practical work**	**Practical work**		
45h00	1h30	-	1h30		

Prerequisites:

Subjects taught in TC-ST: Numerical Analysis 1 and 2; Computer Science 1, 2, 3, 4

Objectives:

This course is a consolidation of the knowledge acquired in semesters 1, 2, 3 and 4 in numerical analysis and computer science. After reminders on programming in Python language and numerical methods necessary for the resolution of certain problems related to electrical engineering, students will have to develop in the form of practical work programs in Python for their resolutions.

The main objectives of this program are:

- Consolidate the knowledge already acquired during previous semesters in numerical analysis and computer science by developing programs in Python for solving problems in numerical analysis.
- Resolution of partial differential equations
- Programming and testing of some optimization methods

Machine Translated by Google

Content of the subject:

Chapter 1. Reminders on programming in Python (one week)

I.1 Introduction to Python I.2
Data Types and Expressions
I.3 Conditional Instructions
I.3 Repetitive instructions (loops)
I.4 Functions and procedures - Local variables - Global variables
I.5 Files (reading and writing)
I.6 Graphics
I.7 Libraries NumPy SciPy mathplotlib ….

Chapter 2. Methods for solving systems of equations (3 weeks)

II.1 Methods for solving nonlinear equations II.2 Methods for solving systems of linear equations II.3 Methods for solving systems of nonlinear equations (Jordan, Gauss, Seidel, Newton methods and optimization methods)

Chapter 3. Methods for solving systems of differential equations (3 weeks)

II.4 Methods for solving first- order ordinary differential equations , application to solving systems of ordinary differential equations of order higher than 1.

Chapter 4. **Solving Partial Differential Equations (4 weeks)**

Finite differences, finite elements

Chapter 5. Optimization Methods: Deterministic and Stochastic (4 weeks)

Practical work:

- ÿ TP1 Resolution of non-linear equations
- ÿ TP2 Resolution of linear systems: Direct methods; Iterative methods
- ÿ TP3 Resolution of ordinary differential equations and systems of equations
- ÿ TP4 Resolution of partial differential equations
- ÿ TP5 Optimization methods ÿ Project for solving a problem related to electrical engineering based on the Python programming.

These projects are assigned to students at the beginning of the semester to prepare for presentation before the end of the semester.

Bibliographic references:

[1] Michaël Baudin, Numerical Methods with Python Theory, Algorithms, Implementation and Applications with Python 3 Dunod Edition 2023

[2] Q. Kong, T. Siauw, A Bayen, Python programming and numerical methods. https://pythonnumericalmethods.studentorg.berkeley.edu/notebooks/Index.html

Machine Translated by Google

[3] J. Kiusalaas, Numerical Methods in Engineering with Python 3, Cambridge university Press 2013

[4] André Fortin, numerical analysis for engineers, Presses internationales Polytechnique (2011).

Download site: https://www.python.org/downloads/

Official Python documentation site: docs.python.org

[5] G. Allaire, Numerical Analysis and Optimization, Edition of the Polytechnic School, 2012

[6] Computational methods in Optimization, Polak [7] , Academic Press, 1971.

Optimization Theory with applications, Pierre DA, Wiley Publications, 1969.

[8] Taha, HA, Operations Research: An Introduction, Seventh Edition, Pearson Education Edition, Asia, New Delhi, 2002.

[9] SS Rao, Optimization – Theory and Applications, Wiley-Eastern Limited, 1984.

Assessment methods:

Continuous assessment 40%, Exam 60%,

HALF	Subject title	Coefficient	Credits	Code
S5	TP Servo	1	2	IST 5.8

VHS	Course	Practical work	Practical work
10:30 p.m.	-	-	1h30

Prerequisites:
Basic mathematics (Algebra, Integral and differential calculus, Analysis, complex, etc.).
Fundamentals of signal processing, basic electronics (linear circuits).

Goals :
- Review the properties of control structures of continuous linear systems,
- Approach the models of basic dynamic systems.
- Explore the time and frequency analysis tools of basic systems.

Practical work

TP 1: Study of the behavior of 1st , 2nd and 3rd order systems

Machine Translated by Google

Analog and computer simulation, Measure the parameters that characterize the different responses: rise time; response time; 1st maximum overshoot, peak time and precision, Observe the response of an unstable system

TP 2: Frequency responses and system identification

Determination of the frequency characteristics of a servocontrol, with the aim of identifying the transfer function of a system. Application to a motor.

TP 3: Position control of a DC motor, difference between position and speed.

The influence of gain on the stability and static error of the system. The influence of speed feedback on the behavior of the system.

TP 4: Controlling the speed of a direct current motor

The operation of the elements and the controlled system in open and closed loop, The influence of the gain on the stability of the system, The influence of the gain and the load on the static error of the system, The influence of the current feedback on the dynamic behavior of the system.

Assessment methods:

Continuous assessment: 100%.

Bibliographic references:

1. Norman, S Nise, Control Systems Engineering; John Wiley & Sons; 8th EMEA edition (May 17, 2019)
2. Katsuhiko Ogata, Modern Control Engineering: Fifth Edition Kindle Edition; 2020
3. EK Boukas, Servo-controlled systems, Editions of the Polytechnic School of Montreal, 1995.
4. P. Clerc. Continuous automatic, sampled: IUT Electrical Engineering-Computer Science
5. Industrial, BTS Electronics-Mechanics-Computer Science, Editions Masson (198p), 1997.
6. Ph. de Larminat, Automatic, Editions Hermes 2000.
7. P. Codron and S. Leballois, Automatics: continuous linear systems, Dunod Editions 1998.
8. Y. Granjon, Automatics: Linear, nonlinear, continuous-time, continuous-time systems discreet, state representation, Editions Dunod 2001.
9. M. Rivoire and J.-L. Ferrier, Course in Automation, volume 2: control, regulation, analog control, Editions Eyrolles 1996.
10. Y. Thomas, Signals and linear systems: corrected exercises, Editions Masson 1993.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S5	Power Electronics TP	3	4	IST 5.9
VHS	**Course**	**Practical work**	**Practical work**	
10:30 p.m.	-	-	01h30min	

Prerequisites:
General electricity, fundamental electrical engineering, power semiconductor components.

Goals :
Understand the basic principles of power electronics. Understand the operating principle and use of power semiconductor components. Understand the operation of the main static converters. Acquire the basic knowledge for a technical choice according to the field of application of a static power converter.

Content of the practical work:

TP 01: Single-phase and three-phase uncontrolled rectifier (R, L load).

TP 02: Single-phase and three-phase controlled rectifier (R, L load).

TP 03: Series and parallel chopper.

TP 04: Single-phase dimmer (Load R, L).

TP 05: Three-phase dimmer.

TP 07: Single-phase inverter.

TP 08: Three-phase inverter.

Assessment methods: Continuous assessment: 100%.

Bibliographic references:

Machine Translated by Google

1. L. Lasne, “Power Electronics: Course, Case Studies and Corrected Exercises”, Dunod, 2011.
2. P. Agati et al. “Aide-mémoire: Electricity-Control and Power Electronics– Electro-technology”, Dunod, 2006.
3. J. Laroche, “Power Electronics – Converters: Course and Corrected Exercises”, Dunod, 2005.
4. G. Séguier et al. “Power Electronics: Course and Corrected Exercises”, 8th edition; Dunod, 2004.
5. D. Jacob, “Power electronics - Operating principle, dimensioning”, Ellipses Marketing, 2008.
6. G. Séguier, “Power electronics, basic functions and their main applications”, Tech et Doc.
7. H. Buhler, “Power Electronics”, Dunod
8. CW Lander, “Power Electronics,” McGraw-Hill, 1981
9. H. Buhler, “Regulation and Control Electronics; Treatise on Electricity”.
10. F. Mazda, ÿPower Electronics Handbook: Components, Circuits and Applicationÿ, 3rd Edition, Newness, 1997.

HALF	Subject title		Coefficient	Credits	Code
S5	Combinatorial and sequential logic		2	3	IST5.10
VHH	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	-	-	1h30		

Prerequisites:

ÿ Basics of Boolean algebra: Logical operations (AND, OR, NOT), Boolean identities, De Morgan's laws, simplification of Boolean expressions.

ÿ Number systems: Binary bases, conversion between bases, representation of whole and negative numbers.

ÿ Mathematical functions: Definition, properties, graphical representation.

Goals:

Understand common combinational circuits. Know how to represent some applications of combinational circuits using standard tools such as truth tables and Karnaugh tables.
Introduce sequential circuits through flip-flop circuits and counters.

Practical work TP No. 1:
TTL and CMOS integrated circuit technology.
Understand and test the different logic gates

TP N°2: Study and implementation of common combinatorial logic functions
Example: switching circuits (MUX and/or DMUX), coding and decoding circuits,

TP No. 3: Study and creation of an arithmetic combinational circuit
Creation of an adder and/or subtractor circuit for 2 4-bit binary numbers.

TP No. 4 : Study and creation of a combinational logic circuit

Machine Translated by Google

Implementing a logic function using logic gates. Example: a 7-segment display and/or a 2's complement generator for a 4-bit number and/or a 4-bit Gray code generator.

TP No. 5: Study and creation of meter circuits
Incomplete asynchronous counter circuits using flip-flops, Irregular cycle synchronous counter circuits using flip-flops

Assessment methods:

Continuous assessment: 100%

Bibliographic references:

Letocha; Introduction to Logic Circuits; Mc-Graw Hill Edition.

JC Lafont; Digital electronics courses and problems, 124 exercises with solutions; Ellipses Edition.

R. Delsol; Digital Electronics, Volumes 1 and 2; Edition Berti P. Cabanis;

Digital Electronics; Edition Dunod.

Mr. Gindre; Combinatorial Logic; Ediscience Edition.

H. Curry, Combinatory Logic II. North-Holland, 1972 JP.

Ginisti, Combinatory Logic, Paris, PUF (coll. “Que sais-je?” n°3205), 1997.

JL. Krivine, Lambda calculus, types and models, Masson, 1990, chap. Combinatorial logic, English translation available on the author's website.

R. Katz Contemporary Logic Design, 2nd ed. Prentice Hall, 2005.

M. Gindre, Digital electronics: combinatorial logic and technology: courses and exercises, Mc Graw Hill, 1987 C. Brie, Combinatorial

and sequential logic, Ellipses, 2002.

Machine Translated by Google

HALF	Subject title		Coefficient Credits Code		
S5	Fundamental Electrotechnics		1	2	IST5.11
VHH	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	-	-	1h30		

Prerequisites:
Complex calculation, fundamental laws of electricity (Ohm's Law, Kirchhoff's laws, etc.), Analysis of single-phase alternating current electrical circuits, magnetostatics.

Goals :
To deepen the student's knowledge in the calculation of balanced and unbalanced three-phase circuits and in the calculation and dimensioning of magnetic circuits. To know electrical transformers (structure, operating mode, equivalent diagrams and tests).

Teaching content: Subject content

TP.1 Single-phase electrical circuits
Power measurement and power factor improvement
TP. 2 Iron core coil
Determination of hysteresis cycles **TP.3**
Single-phase and three-phase electrical circuits
Star-delta connection; current and power measurements for three-phase loads.
TP. 4 Single-phase transformer
No-load, short-circuit and load tests (resistive and inductive)
TP.5 Three-phase transformer.
Hourly index, no-load, short-circuit and load tests, coupling of two transformers

Assessment method : Continuous assessment: 100%

Bibliographic references [1] G

Séguier, F. Notelet, Industrial Electrotechnics, Technique and Documentation, Paris, 3rd edition, 2006.

[2]M. Kostenko; L. Piotrovski Electrical Machines (Volumes 1 and 2), Mir Moscow Edition.

Machine Translated by Google

[3]Max Marty, Daniel Dixneuf, Delphine Garcia Gilabert; Principle of electrical engineering: Dunod Sciences Sup Edition.
[4]H. Lumbroso, Problems solved on electrical circuits, Dunod.
[5]JP Perez, R. Carles and R. Fleekinger, Electromagnetism Foundations and Applications, 3rd Edition, 1997.

[6] A Fouillé, Electrotechnics for the Use of Engineers, Dunold, 1963.
[7]MARCEL Jufer, Electromechanics, Polytechnic and University Presses Romandes-Lausanne, 2004.

[8]Edminster, Theory and Applications of Electric Circuits, Mc. Graw Hill.

HALF	Subject title		Coefficient	Credits	Code
S5	Technical English related to the specialty		1	2	IST5.12
VHH	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	-	-	1h30		

Recommended prior knowledge:

— Basic English vocabulary and grammar

— Fundamental knowledge of electrical systems

Course Objectives:

The objective of this course is to strengthen fundamental knowledge of the English language and to introduce and familiarize the student with technical vocabulary, particularly in the field of electrical engineering. At the end of this course, the student will have acquired the necessary knowledge that allows him to write and present a technical or scientific report in English.

Course content:

Chapter 1: Reminder on grammar: common tenses in academic writing (4 weeks)

- ÿ Present simple and present continuous.
- ÿ Past simple and past continuous.
- ÿ Present perfect and present perfect continuous.
- ÿ Past perfect and past perfect continuous.

Chapter 2: Remainder on English for mathematics (3 weeks)

- ÿ Equations writing and spelling

Chapter 3: Terminology of electrical engineering (3 weeks)

- ÿ Conductors/insulators/semiconductors.
- ÿ Circuit elements.
- ÿ Power electronics elements.
- ÿ Electric Machines elements.
- ÿ Control systems Elements.

Chapter 4: Technical writing and presentation (4 weeks)

Machine Translated by Google

ÿ Electric system description.

ÿ Technical report writing and presentation.

Evaluation method:

Final Exam: 100%.

References:

1. PT Danison, Practical Guide to Writing in English: Usage and Rules, Practical Advice, Organization Editions 2007.
2. A.Chamberlain, R. Steele, Practical guide to communication: English, Didier 1992.
3. R. Ernst, Dictionary of applied techniques and sciences: French-English, Dunod 2002.
4. PT Danison, Practical guide to writing in English: uses and rules, practical advice, Editions d'Organisation 2007.
5. A. Chamberlain, R. Steele, Practical Guide to Communication: English, Didier 1992.
6. R. Ernst, Dictionary of applied techniques and sciences: French-English, Dunod 2002.
7. J. Comfort, S. Hick, and A. Savage, Basic Technical English, Oxford University Press, 1980.
8. EH Glendinning and N. Glendinning, Oxford English for Electrical and Mechanical Engineering, Oxford University Press 1995.
9. TN Huckin, and AL Olsen, Technical writing and professional communication for non-native speakers of English, McGraw-Hill 1991.
10. J. Orasanu, Reading Comprehension from Research to Practice, Erlbaum Associates 1986.

Machine Translated by Google

Detailed programs of subjects for the 6th semester

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S6	**Electrical Machines**	**3**	**5**	**SEI 6.1**

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:

Fundamental electrical engineering, basics of electromagnetism, fundamental notions of electrical engineering, analysis of direct current electrical machines.

Objectives:

The objective of this module is to provide the student with the fundamental concepts and basic notions of alternating current electrical machines. This includes the design of synchronous and asynchronous machines, electromechanical energy conversion equations and the calculation of the various electrical and mechanical quantities of alternating current machines.

Content of the subject:

Chapter 1: General Principles

Principle of electromechanical energy conversion. Principle of stator/rotor coupling: the primitive machine. Windings of electrical machines. Calculation of magnetomotive forces. Mechanical equation.

Chapter 2: Synchronous Machines

Generalities and equations of the smooth-pole synchronous machine. Study of the operation of the synchronous machine. Different excitation systems. Armature reactions. Elements on the salient-pole synchronous machine without and with dampers.

Potter diagrams, two-reactance diagrams, and Blondel diagrams. Elements of permanent magnet machines. Alternators and parallel coupling.

Synchronous motors, starting…

Chapter 3: Asynchronous Machines

Generalities. Equation. Equivalent diagrams. Torque of the asynchronous machine.

Characteristics and diagram of the asynchronous machine. Motor/generator operation, starting, braking.

Deep slot and double cage motors, single-phase asynchronous motors.

Chapter 4: Direct Current Machines Structure

of direct current machines. Equations of direct current machines.

Starting, braking and speed adjustment modes for DC motors.

Commutation phenomena. Armature saturation and reaction. Auxiliary commutation poles. Motor/generator operation.

Practical work:

Machine Translated by Google

TP No. 1: Load characteristics of an asynchronous motor
TP No. 2: Determination of the circular diagram of an asynchronous machine **TP No. 3:**
Alternator - operating diagram **TP No. 4:** Load characteristics
of a synchronous motor under load - V curves.

Assessment method:

Written tests, supervised homework, final exam, practical work reports.

Bibliographic references:

- J.-P. Caron, JP Hautier: Modeling and control of the asynchronous machine, Technip, 1995.
G. Grellet, G. Clerc: Electric actuators, Principles, Models, Controls, Eyrolles, 1996.
- J. Lesenne, F. Notelet, G. Séguier: Introduction to advanced electrical engineering, Technique et Documentation, 1981.
- Paul C. Krause, Oleg Wasyzczuk, Scott S, Sudhoff, ÿAnalysis of Electric Machinery and Drive Systemsÿ, John Wiley, Second Edition, 2010.
- PS Bimbhra, ÿGeneralized Theory of Electrical Machinesÿ, Khanna Publishers, 2008.
- AE, Fitzgerald, Charles Kingsley, Jr, and Stephan D, Umanx, ÿ Electric Machineryÿ, Tata McGraw Hill, 5th Edition, 1992

HALF	Subject title	Credit Coefficient	Code

Machine Translated by Google

S6	Power Electronics 2	3	5	SEI 6.2

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:

Goals :

Content of the subject:

Practical work:

Assessment method:

Written tests, supervised homework, final exam, practical work reports.

Bibliographic references:

HALF	Subject title	Credit Coefficient		Code
S6	Electrical Networks	3	5	SEI 6.3

Machine Translated by Google

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:
Basic course in fundamental electrical engineering (electricity and circuit, electric and magnetic field, power, three-phase system, alternator, motor, transformer).

Teaching objectives Provide an
overview of the management and sizing of the electrical energy network (transport and distribution).

Content of the material:

Chapter 1: General information on electrical networks •
Organization of the electrical network
- Power plants
- Electrical substations (power transformers, measuring transformers (current and voltage), circuit breakers, disconnectors, other equipment of a station,…)
- Other network elements (supports, conductor cables, overhead lines, underground lines, earth cables, busbars, insulators); Dispatching center.

Chapter 2: Modes of transport, distribution and distribution of electrical energy
- Description of electrical networks (structure of electrical networks, voltage level);
- Topology of electrical networks (HT/MT source stations, MT networks, HTA/BT stations, BT networks).

Chapter 3: Modeling of power lines • Longitudinal
characteristics (resistance, longitudinal reactance, concept of mean radius geometric and geometric mean distance);
- Transverse characteristics (transverse reactance, conductance due to the corona effect);
- Calculation of electrical networks (General operating equations, Equivalent circuits, Calculation of voltage drop, FERRANTI effect);
- Power transmitted and power factor compensation in the lines.

Chapter 4: Transformers and Relative Unit System
- Reminders (single-phase and three-phase transformers, modeling and determination of transformer parameters, transformer coupling (different modes, choice of coupling));
- Parallel connection of three-phase transformers (interest, conditions, hourly index);
- Main types of transformers (current measurement, voltage measurement, regulator in load, phase shifter, three-winding and autotransformer);
- Relative unit system (basic quantities (power, voltage, impedance), choice of base, change of base).

Chapter 5: Calculation of short-circuit currents

Machine Translated by Google

- Calculation of short-circuit currents (causes, consequences, different types, concept of symmetrical and asymmetrical short circuit, etc.); •

Calculation of short-circuit currents using symmetrical components (symmetrical component method, construction of sequential networks, etc.);

- Equivalent impedances of the network elements.

Practical work

TP 1: Study of the performance of a line and improvement of the power factor.
TP 2: Voltage regulation using the reactive energy compensation method using capacitors.

TP 3: Direct current model: Power distribution and calculation of voltage drops.
TP 4: Parallel operation of transformers.

Assessment methods:

Quizzes, Supervised Homework, Final Exam
Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

[1] **Debaprya.DAS,** "Electrical power system", Indian institute of technology, New Delhi, **2006.**

[2] **John J. Grainger, WUliam D. Stevenson, Jr.** "Power system analysis", North Carolina State University, **1994.**

[3] **J. Duncan Glover, Mulukutla S. Sarma, and Thomas J. Overbye,** "Power System Analysis and Design, Fifth Edition, SI", failure electrical, llc, USA, **2008**

[4] J. Lewis Blackburn, "Symmetrical Components for Power Systems," Department of Electrical Engineering, Ohio State University Columbus, Ohio, 1993.

[5] Jean-Pierre Muratet, "economic and planning elements for networks of electricity transmission and distribution", ALSTOM, 1998.

[6] Serge Pichot , "HT transmission lines" *FCI SAAE Transmission,* 1998.

[7] Daniel. Noel, "MV/LV Substations", ALSTOM, 1998.

[8] Industrial electrical network design guide T & D, "Electrical network architecture"; Schneider electric, 6 883 427/A.

[9] LV electrical network design guide, "Transformer, definitions and characteristic parameters"; Schneider electric, B92.

[10] "GRTE organization and missions", 10th National Conference on High Voltage CNHT16, May 2016.

[11] Avril Charles, "Construction of high-voltage overhead lines", Paris: Editions Eyrolles, 1974

[12] Souad Chebbi, "Faults in electrical networks", educational support, Virtual University of Tunis.

[13] Electrotechnics second edition, International Polytechnic Press, 1999.

[14] JC Gianduzzo: Courses and tutorials in electrical engineering, handouts of courses and tutorials for the EEA degree at the University of Bordeaux 1.

[15] L. Lasne: Electrical engineering for energy distribution, Course handout from the University of Bordeaux 1, 2004.

Machine Translated by Google

[16] T. Wildi: Electrical Engineering Third edition, Laval University Press, 2000.
[17] N. HADJSAID, JC SABONNADIERE, ÿElectrical Lines and Networks 1: Electrical power lines', edition: HERMES - LAVOISIER, 2007; **[18]** B. DE METZ-NOBLAT,
ÿAnalysis of three-phase networks in disturbed conditions using symmetrical components', Schneider technical notebook No.: 18, 2002;

HALF	Subject title	Credit Coefficient		Code
S6	**Discrete servo systems and regulation**	**3**	**5**	**SEI 6.4**

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:
Knowledge of continuous linear servocontrol. Fundamental notions of processing signal, basic electronics (linear circuits). Basic mathematics (Algebra, Calculus integral and differential, Analysis, complexes, etc.).

Goals :
Master the principle and structure of control loops and choice of appropriate regulator.
Study of sampled systems. Analyze discrete systems and synthesize discrete regulators (PID, RST and state feedback

Machine Translated by Google

Teaching content:

Chapter 1: Introduction to regulation • Concepts of regulation.

• Components of a control loop (industrial process, actuators, sensors, regulators, signal conditioner, setpoint, measurement, disturbance, quantities

• Characteristics, regulating quantities, regulated quantities, disturbing quantities), • Diagram of a regulated system, Constituent elements of a regulation loop, symbols, functional diagrams and loops, performance criteria of a regulation

Chapter 2: Continuous regulators: P, PI, PD, PID:

• Characteristics, Structures of PID regulators (parallel, series, mixed),

• Electronic achievements.

• Selection criteria, Dimensioning methods (flat criterion, symmetrical criterion, Ziegler Nichols method, etc.)

• Adjustment of Regulators by imposing a tracking model.

• Application: adjusting the speed of an MCC

Chapter 3: Analysis of Sampled Systems

• Fundamentals of signal sampling, • Z-transform: properties and applications, • Sampled transfer function,

• Association of sampled systems,

• Harmonic, impulse and step responses,

• Analysis of sampled servo systems, sampled stability.

Chapter 4: Synthesis of sampled servocontrols

• Digital regulators.

• Pseudo-frequency synthesis and bilinear transformation,

• Choice and sizing of regulators (classical, modern and empirical methods).

Chapter 5: Analysis and Synthesis in State Space Definitions, Stability, Controllability, Observability.

Practical work

TP 1: Characteristics of regulators
TP 2: Speed regulation of an MCC motor
TP 3: Pressure regulation
TP 4: Temperature regulation

TP 5: Simulation of sampling and reconstitution operations
TP 6 : Time and frequency analysis of basic sampled systems
TP 7: Control of electrical systems by digital phase advance/phase delay regulator

TP 8: RST type numerical control: Case study
TP 9: Digital control by state feedback: Application for electrical systems

Machine Translated by Google

Assessment methods:

Quizzes, Supervised Homework, Final Exam
Continuous assessment: 40%; Final exam: 60%.

Bibliographic references:

1. E. Dieulesaint, D. Royer, Applied Automation, 2001.
2. P. De Larminat, Automatics: Control of linear systems. Hermes 1993.
3. KJ Astrom, T. Hagglund, PID Controllers: Theory, Design and Tuning, Instrument Society of America, Research Triangle Park, NC, 1995.
4. A. Datta, MT Ho, SP Bhattacharyya, Structure and Synthesis of PID Controllers, Springer-Verlag, London 2000.
5. Jean-Marie Flaus, Industrial Regulation, Editions Hermes 1995.
P. Borne, Analysis and regulation of industrial processes volume 1: Continuous regulation. Editions Technip.
7. T. Hans, P. Guyenot, Regulation and enslavement Editions Eyrolles.
8. R. Longchamp, Numerical control of dynamic systems, automatic course, Presses Polytechnics and universities in French-speaking Switzerland 2006.
9. http://www.technologuepro.com/cours-genie-electrique/cours-6-regulation-industrielle/

10. R. Longchamp, “Numerical Control of Dynamic Systems”, Polytechnic and University Presses of Romandie.

11. H. Buhler, “Sampled Settings”, Volumes 1 and 2, Presses Polytechniques et Universitaires Romandes.

12. KJ Astrom, B. Wittenmark, “Computer Controlled Systems,” Prentice Hall. Computational Academic Press, 1971. methods in Optimization, Polak 13. ,
J. Ledin, ÿEmbedded Control Systems in C/C++: An Introduction for Software Developers Using MATLABÿ, CMP books, 2003.
14. T. Wescott, ÿApplied Control Theory for Embedded Systemsÿ, Newnes, 2006.
15. GF Franklin, JD Powell, M. Workman, Digital control of dynamic systems, 3rd Ed, Pearson Educations, 2005

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S6	**Diagrams and devices**	**2**	**4**	**SEI 6.5**

VHS	Course	Practical work	Practical work
45 hours	1h30		1h30

Prerequisites:

- Fundamental electricity, Fundamental electronics

Goals :

- Learn the different types of protection and control devices for electrical installations as well as how to carry out an electrical installation.

Teaching content:

Chapter 1: General information on equipment

— Operating faults and anomalies, Role and classification of protections,

— Basic functions of the equipment (sectioning, control, protection, — Classification of the equipment (choice of equipment, characteristics of electrical equipment, protection of the equipment, classes of electrical equipment), Protection provisions.

Chapter 2: Phenomena related to currents and voltage:

— Overcurrents, Electrodynamic forces, — Calculation of arc resistance, Effects of the arc on contact, — Overvoltages, Insulation, breakdown, rigidity, Ionization of gases.

Machine Translated by Google

Chapter 3: Electric current interruption phenomena:

— Arc ignition (in air and in oil), — Principle of arc cutting (in air and in oil),
— Arc extinction conditions, Recovery voltage.
— Different arc cutting techniques

Chapter 4: Switching and Interrupting Equipment

— Contacts, terminals and connections, socket outlets, disconnectors, switches (definition, role and characteristics),
— Switches (definition, role and characteristics), Contactors (definition, role and characteristic).

Chapter 5: Protective equipment

— Fuses (role and operation, types),
— Thermal relay (definition, role, type and characteristics),
— Circuit breakers (definition, role, types and characteristics)

Chapter 6: Development of electrical diagrams

— Symbols of electrical installations,
— Conventions and standardization,
— Examples of reading control and power diagrams,
— Practical determination of the minimum cross-section of the pipeline conductors

Practical work

TP1: The main lighting assemblies.
Socket installation, single-switch installation, double-switch installation, two-way installation, installation with remote switch, installation with timer.
TP2: Manual control of a contactor and two contactors : by switch, by push button, remotely by two impulse buttons, remotely by several push buttons.

TP3: Starting a three-phase asynchronous cage motor in one direction
TP4 : Starting an asynchronous motor in both directions
TP5 : Star/delta starting of an asynchronous motor

Assessment methods:

Final exam, practical work reports.

Bibliographic references :

1. Christophe Preve-Hermes, Protection of electrical networks, Paris-1998.
2. SH Horowitz, AG Phadke, Power System Relaying, second edition, John Wiley & Sons 1995.
3. L. Fechant, LV electrical equipment, Distribution devices, Engineering techniques, Electrical engineering treatise, D 4 865.
4. Jensen - Helsel, Engineering Drawing and Design, 7th Ed., McGraw-Hill Book Company, New York, (August 15, 2007).

Machine Translated by Google

5. Thierry Gallauziaux, David Fedullo, Edition Eyrolles; Electrical diagram memo; collection: DIY notebooks; 2009 (2nd edition)
6. IEEE Std 315-1975 (Reaffirmed 1993), Graphic Symbols for Electrical and Electronic Diagrams.

HALF	Subject title	Credit Coefficient		Code
S6	**Signal processing**	**2**	**4**	**SEI 6.6**

VHS	Course	Practical work	Practical work
45 hours	1h30		1h30

Prerequisites:

- Signal theory
- The mathematical bases

Objectives:

Master the tools for time and frequency representation of analog and digital signals and systems and perform basic processing such as filtering and digital spectral analysis.

Content of the subject:

Chapter 1. Reminders of the main results of signal theory Signals, Fourier series, Fourier transform and Parseval's theorem, convolution and correlation. **(2 Week)**

Chapter 2. Analysis and synthesis of analog filters Time and frequency analysis of analog filters, passive and active filters, first and second order low-pass filters, first and second order high-pass filters, band-pass filters, other filters (Chebyshev, Butterworth). **(4 Weeks)**

Chapter 3. Signal Sampling From Continuous Signal to Digital Signal
Sampling, reconstruction and quantization. **(1 Week)**

Chapter 4: Discrete Transforms and Windowing (3 Weeks)
From Discrete-Time Fourier Transform (DTFT) to Fourier Transform Discrete (DFT), Fast Fourier Transform (FFT).

Chapter 5: Analysis and synthesis of digital filters **(5 Weeks)**
Filter template definition

Machine Translated by Google

RIF and RII filters

Lattice filters

Synthesis of RIF filters: window method

Synthesis of digital IIR filters: Bilinear method

Practical work:

TP 1: Representation of signals and applications of the Fourier transform under Matlab

TP 2: Analog Filtering

TP 3: Discrete Fourier Transform

TP 4: Digital Filtering IIR

TP 5: RIF Digital Filtering

Assessment method:

Final exam, practical work reports.

Bibliographic references:

1- Francis Cottet, Signal processing and data acquisition ÿ Course and corrected exercises s, 4th edition, Dunod, Paris, 2015.

2- Tahar Neffati, Analog Signal Processing: Course, Ellipses Marketing, 1999.

3- Messaoud Benidir, Signal Theory and Processing: Basic Methods for Analysis and signal processing, Dunod, 2004.

4- Maurice Bellanger, Digital Signal Processing: Theory and Practice, 9th edition, Du nod, Paris, 2012.

5- Étienne Tisserand Jean-François Pautex, Patrick Schweitzer, Analysis and processing of signals, methods and applications to sound and image 2nd year edition, Dunod, Paris, 2008.

6- Patrick Duvaut, François Michaut, Michel Chuc, Introduction to signal processing - exercises, corrections and course reminders, Hermes Science Publications, 1996.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S6	**Internship in a company 1**	**1**	**1**	**SEI 6.7**

VHS	Course	Practical work	Practical work
10:30 p.m.			1h30

Prerequisites:

Goals :

Content of the subject:

Practical work:

Assessment method:

Internship report and presentation: 100%.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
S6	**Entrepreneurship and business management**	**1**	**1**	**SEI 6.8**
VHS	**Course**	**Practical work**	**Practical work**	
10:30 p.m.	1h30			

Prerequisites:
Business management

Goals :

-Understand the basic principles of the business creation process.

- Provide the fundamental elements of advice in the different phases of business creation.

-The different types of financing for a micro-enterprise in the Algerian context.

-Concrete realization of a business plan and financing file.

Teaching Content: Chapter 1:

Launching the Creation Process

1. Why start a business?

Assessment of entrepreneurial skills; 2.

3. Business idea;

4. Basic elements for launching the business creation process (o4 elements)

Chapter 2: Strategic Planning

1. Importance of planning
2. Mission and Vision Statement
3. Defining SMART goals
4. SWOT as a strategic planning technique
5. Conducting market research

Chapter 3: The Business Plan

1. What is a business plan?
2. Why do we need to develop a Business Plan?
3. What are the elements of a good business plan?

Chapter 4: Commercial Operations

1. What is the operating budget?
2. How to manage product costs and operating costs?
3. What are production costs and how to manage them?

Chapter 5: The Company's Marketing Strategy

1. The basics of marketing a product or service;

Machine Translated by Google

2. Exploring the competition and creating marketing activities accordingly;
3. The pricing strategy
4. Sales forecasts

Chapter 6: The Company's Communication Strategy

1. The Communication Plan
2. Communication Action

Chapter 7: Sources and Types of Financing for Business Creation

1. Do you need external financing?
2. What are the types of financing?
3. What are the sources of funding in your region?
4. Support structure in Algeria

Assessment methods:

Mini projects, Final exam,

Bibliographic references :

1- BASSE, O. (2006), The Entrepreneurial Manager, Pearson Education, Paris
2- BOUCHARD, V (2009). Intrapreneurship, innovation and growth: entrepreneurship in the company, Dunod, Paris.
3- FAYOLLE, A. (2005), Introduction to entrepreneurship, Dunod, Paris4-
4- FAYOLLE, A. (2004), Entrepreneurship, learning to undertake, Dunod, Paris
5- HERNANDEZ, EM (2001), Entrepreneurship: theoretical approach, l'harmattan 6.
6- JANSEN, F. (2009), Entrepreneurship: an introductory manual to entrepreneurship, de Boeck
7- PAPIN, R. (2013), Business creation: create, manage, develop, take over, outside collection, Dunod, 15th edition
8- SION, M. (2007), Succeeding with your business plan: methods, tools and tips, Dunod, Paris
9- SURLEMONT, B. and KEARNY, P (2009), Pedagogy and Entrepreneurship, de Boeck

HALF	Subject title	Coefficient	Credits	Code
S6	**Materials in electrical engineering and High Voltage Technology**	**1**	**1**	**SEI 6.9**
VHS	**Course**	**Practical work**	**Practical work**	

Machine Translated by Google

10:30 p.m.	1h30		

Prerequisites:
Electric and magnetic field theory.

Objectives:
The objective of this module is to enable the student to acquire in-depth physical knowledge of materials used in the field of electrical engineering. Acquire the basic notions and fundamental concepts of high voltage and its industrial applications.

Content of the subject:

Chapter 1: Conductive Materials Basic Concepts, Classification of Conductors and Properties According to Their Use.

Chapter 2: Magnetic materials Magnetism at the microscopic and macroscopic scales, Classification of magnetic materials, Magnetization mechanisms and technical characteristics of magnetization, Soft ferromagnetic materials, Areas of use, Hard ferromagnetic materials, Characteristics and areas of application of permanent magnets, Notions of energy in magnetic materials, Magnetic losses, measurement of losses in fixed and rotating fields.

Chapter 3: Dielectric materials Polarization phenomena, Resistivity, Dielectric strength and Dielectric losses, Physico-mechanical properties, Electro-insulating materials.

Chapter 4: General information on high voltage
Voltage domains, Usefulness of high voltage, Choice of HV equipment, technological and industrial applications of high voltage

Chapter 5: General information on stresses due to HV Aims and methodology of HV, Stresses related to voltage, Stresses related to current, Protection against overvoltages and overcurrents.

Chapter 6: High Voltage Measurement High voltage sources, High voltage measurement.

Chapter 7: Transient phenomena in high voltage Origins of overvoltages, Lightning phenomenon and impact on electrical installations, Overvoltages during operations, Different protection techniques.

Assessment method:
Final exam.

Bibliographic references:

Machine Translated by Google

- P. Robert, “Electrical Engineering Materials”, Dunod.
- F. Piriou, “Electrical Engineering Materials”, MGE 2000, Germes.
- Gérald Roosen, "Semiconductor materials and nitrides for optoelectronics", - - Hermès. - P. Tixador, "Superconducting Materials", Hermès.
- G. LeRoy, C. Gary, B. Hutzler, J. Hamelin, J. Fontaine, "The dielectric properties of air and very high voltages", Editions Eyrolles, 1984.
- D. Kind, H. Kärner. "High voltage insulation technology: Textbook for Electrical Engineers", FriedrVieweg&Sohn, 1985.
- André Faussurier, Robert Servan, "Materials in electrical engineering", Dunod Paris, 1971.
- A. Chabloz, "Materials Technology", Switzerland 1980.

Machine Translated by Google

Detailed programs of subjects for the 7th semester

HALF	Subject title	Credit Coefficient		Code
07	Industrial Automation 1	3	5	SEI 7.1

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites: prior knowledge —

Fundamental notions in electricity, electronics and mechanics.

— Advanced skills in combinational and sequential logic, including coding systems, logic equations, Karnaugh tables, and other related concepts. In addition, a thorough understanding of microprocessors is essential.

Machine Translated by Google

Objectives:

To enable the student to acquire the following knowledge: — In-depth understanding of the components of an Industrial Programmable Logic Controller (PLC).
— Mastery of API programming techniques.
— Master the graphic representation tools of automated systems (Grafcet).
— Ability to make changes to the automation program.
— Carry out programming and configuration of programmable logic controllers.

Contents: Chapter 1:

Introduction to Automated Systems — Basics of Automated Systems.
— Structure of automated systems.
— Classification of automated systems.
— Automated system and industrial process.
— Structure of an automated production system (SAP)
— Specification of the levels of the specifications.
— Hardware and software architecture of an automated system.
— From hard-wired logic to programmed logic.
— Examples of automated systems.

Chapter 2: Industrial Programmable Controllers — General Description; The Different Types of Controllers.
— Internal structure and description of the elements of an API.
— Input-output interfaces; Criteria for choosing an automaton.
— The different types of API data.

Chapter 3: Grafcet Tool — Introduction; Sequential analysis of a system.
— Rules for establishing the GRAFCET; Basic concepts; Transitions and oriented connections.
— Evolution rules; Sequence selection and simultaneous sequences.
— Organization of levels of representation; Particular structures.
— Connection between Grafcets; Advanced Grafcet Tool; Concepts of viewpoints.
— Hierarchical structures of a grafcet; Structure of a Sub-grafcet.
— Structure of a task GRAFCET. Forcing and freezing situations.
— Equation of a Graffet; Materialization of a Graffet. — Equations of the elements of the Grafcet; Equation.
— Practical examples.

Chapter 4: API Programming Languages — Introduction.

— Common objects.
— The different types of languages.
— The ladder language.
— Graphical and textual programming tools.
— Translation of a Grafcet into a ladder.
— Transcription of specifications in Grafcet.
— Synchronization of subsets.
— Presentation of heterogeneous networks.
— Presentation of communication modules and possible gateways between different types of networks.

— Addressing inputs/outputs.
— Programming of APIs (logic functions, storage function (Latching), timing function, counting function, regulation function, etc.).

Machine Translated by Google

— Complete applications.

Practical work:

TP 1: Getting to grips with the software used: discover the environment of each software and familiarize themselves with their basic tools

TP 2: Automation of a lamp ignition circuit

TP 3: Design and automation of an asynchronous motor starting circuit

TP 4: Use of a Time Delay and creation of a Counter

TP 5: Design and automation of a pump operating system.

TP 6: Design and automation of a traffic management system for a three-color traffic light system, in SFC, FBD, LD, IL languages.

Assessment methods:

Continuous assessment: 40% (20% TD + 20% TP), Final exam: 60%.

Bibliographic references:

— Industrial automation, Gérard Boujat et al., DUNOD 2023 edition.
— Automatism and automatic, Jean-Yves Fabert, ELLIPSES 2025 edition.
— GRAFCET, Edmond Peulot et al., DELAGRAVE edition 2009.
— From GRAFCET to Petri networks, Claude Foulard et al., HERMES edition 1992.

HALF	Subject title	Credit Coefficient		Code
07	Machine modeling electric	3	5	SEI 7.2

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites: prior knowledge

Basics of Electrical Machines

Goals :

The main objective is to deepen students' knowledge of the different mathematical models dedicated to the study of the dynamic behavior of electrical machines.

Content of the material:

Machine Translated by Google

Chapter 1: Physical and mathematical study processes

- Reminders on magnetically coupled circuits
- electromechanical conversion of energy - Inductance of the machine
- Symmetrical and relative components

Chapter 2: Generalized Electrical Machine Theory

- Idealized electric machine - Idealized electric machine in the natural frame
- Three-phase model of the generalized electric machine - Generalized electric machine in complex form - Transition from a three-phase system to a two-phase system and vice versa - Equation of motion of the electric machine.

Chapter 3: Modeling of Direct Current Electric Machines

- Model of the direct current machine on the d, q axes - Application of the generalized theory to the various excitation modes - Operation as a generator
- Engine operation

Chapter 4: Modeling of asynchronous machines

- Model of the linear three-phase asynchronous machine - Model of the saturated three-phase asynchronous machine - Model of single-phase asynchronous motors with permanent capacitor

Chapter 5: Modeling Synchronous Machines

- Modeling of synchronous motors without and with dampers - Modeling of synchronous generators without dampers.

Practical work:

TP 1: Modeling and simulation of a separately excited direct current motor;
TP 2: Modeling and simulation of a three-phase asynchronous motor
TP 3: Modeling and simulation of a permanent magnet synchronous generator.

Assessment methods:

Continuous assessment: 40% (20% TD + 20% TP), Final exam: 60%

Bibliographic references *(Books and handouts, websites, etc.)*

1. R. Abdessemed, “Modeling and simulation of electrical machines”, Ellipses, Collection, 2011.
2. M. Jufer, "Electric Drives: Design Methodology", Hermès, Lavoisier, 2010.
3. G. Guihéneuf, "Electric motors explained to electronics engineers, Projects: starting, speed variation, braking", Publitronic, Elektor, 2014.
4. P. Mayé, "Industrial electric motors, Bachelor's, Master's, engineering schools", Dunod, Collection: Sciences sup, 2011.
5. S. Smigel, "Modeling and control of three-phase motors. Vector control synchronous motors", 2000.
6. J. Bonal, G. Séguier, "Variable Speed Electric Drives". Vol. 2, Vol. 3.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
07	**Electrical networks 2**	2	4	**SEI 7.3**

VHS	Course	Practical work	Practical work
45 hours	1h30	-	1h30

Prerequisites: prior knowledge of
fundamental electrical engineering, - Electrical energy transport and distribution networks.
Matrix Calculus (Numerical Methods).

Goals :
The student will be able to model an electrical network, to calculate power flow, to calculate fault currents, to deal with the problem of optimal calculation of the power of the prediction of the state of a network.

Content of the material:

Chapter 1. Basic modeling of electrical networks Reminder on **s)**
(Representation of sinusoidal signals, Modeling of electrical network elements (Source, Line, Transformer, Load), Relative unit system).
Graph theory applied to electrical networks, Matrix formation algorithm

Machine Translated by Google

admittance and impedance of a RE, - Modification and inversion of the admittance matrix, Sparse matrix techniques.

Chapter 2: Calculation of fault currents
Reminder (Symmetrical components, Short circuit analysis: Thevenin equivalent circuit), Symmetrical and asymmetrical short-circuit currents of a large network, Fault voltages, Fault currents in lines, generators and motors, Readjustment of voltage phase shift, Calculation of short-circuit power, Algorithm for calculating fault currents.

Chapter 3. Power Flow Introduction, **)**

Load distribution equations,
Numerical methods applied for the resolution of charge flow (Gauss-Seidel, Newton Raphson, Fast decoupled method, others…, Algorithms and examples).

Chapter 4. Optimal distribution of power flow Introduction, Nonlinear **s)**
optimization function, Cost-production characteristics,
Numerical methods applied to a network without constraints and with constraints
Economic calculation of power without losses, Economic calculation of power with losses.

Chapter 5. Estimating the state of an electrical network
Measurements of P, Q, I and V,
Methods applied for Estimating the state of an electrical network, Detection and identification of bad measurements, Network observability and pseudo-measurements, Consideration of power flow constraints.

Practical work:

TP 1: Modeling of transmission line parameters;
TP 2: Construction of busbar admittance and impedance matrices
TP 3: Modeling power flow using the Gauss-Seidel algorithm
TP4: Modeling power flow using the Newton-Raphson algorithm
TP 5: Calculating faults on an electrical network
TP 6: Economic dispatching.

Assessment methods:
Continuous assessment: 40%, Final exam: 60%

Bibliographic references *(Books and handouts, websites, etc.)*

1. F. Kiessling et al, ÿOverhead Power Lines, Planning, design, construction'. Springer, 2003.
2. T. Gonen et al, ÿPower distribution', book chapter in Electrical Engineering Handbook. Elsevier Academic Press, London, 2004.
3. E. Acha and VG Agelidis, ÿPower Electronic Control in Power Systems', Newns, London 2002.
4. Turan Gönen: Electric power distribution system engineering. McGraw-Hill, 1986
5. Turän Gonen: Electric power transmission system engineering. Analysis and Design.

Machine Translated by Google

John Wiley & Sons, 1988
6. Göran Andersson, “Modelling and Analysis of Electric Power Systems”, ETH Zürich, 2008
7. R. Natarajan, Computer-Aided Power System Analysis, Marcel Dekker, 2002.
8. AR Bergen and V. Vittal: Power System Analysis, Prentice-Hall, 2000.
9. H. Saadat: Power System Analysis, McGraw-Hill, 1999.
10. William D.Stevensen, “Elements of power system analysis”, Edition (Dunod, Paris, 1999).
11. BM Weedy and BJ Cory: Electric Power Systems, John Wiley & Sons, 1998.
12. J. Arrillaga, CP Arnold, "Computer Analysis of Power Systems", University of Canterbury, Christchurch, New Zealand, JOHN WILEY & SONS, 1990.

HALF	Subject title	Credit Coefficient		Code
07	Advanced power electronics	2	3	SEI 7.4

VHS	Course	Practical work	Practical work
45 hours	1h30	-	1h30

Prerequisites: prior knowledge of power components.
Basic power electronics.

Goals :
Provide the electrical circuit concepts behind the different operating modes of the inverters in order to enable a deep understanding of their operation and to provide skills required in the design of power converters for UPS, Drives
Ability to analyze and understand the different operating modes of different power converter configurations.

Ability to design various single-phase and three-phase inverters.

Content of the material:

Chapter 1. Methods for modeling and simulation of semiconductors power

— Idealized characteristic of different types of semiconductors.
— Logical equations of semiconductors.

Machine Translated by Google

— Simulation methods for static converters.

Chapter 2: Switching mechanisms in static converters — Principle of natural switching.

— Forced switching principle.
— Calculation of switching losses

Chapter 3. Design methods for naturally commutated static converters — Commutation rules.

— Definition of the switching cell.
— Different types of sources.
— Power exchange rules, direct and indirect converters example: study of a cyclo converter.

Chapter 4. Design methods for forced-commutated static converters — PWM inverter.

— Sinusoidal absorption rectifier.
— PWM dimmer.
— Switching power supplies.

Chapter 5. Multi-level Inverter — Multi-level
Concept, Topologies, Comparison of Multi-level Inverters.
— PWM control techniques for PWM inverters - single-phase and three-phase impedance source.

Chapter 6. Power quality of static converters — Harmonic pollution
due to static converters (Case study: rectifier, dimmer).

— Study of harmonics in voltage inverters.
— Introduction to pollution control techniques

Practical work:

TP 1: Study of a switching cell **TP 2:** Three-phase
voltage inverter with PWM control **TP 3:** Sinusoidal absorption
rectifier **TP 4:** PWM dimmer **TP 5:** Three-phase
three-level voltage inverter
with NPC structure **TP 6:** Three-phase three-level voltage inverter in H bridge.

TP 7: Simulation of series, parallel, series-parallel active filters

Assessment methods:

Continuous assessment: 40%, Final exam: 60%

Bibliographic references *(Books and handouts, websites, etc.)*

1. A. Cunière, G. Feld, M. Lavabre, Power electronics, from the switching cell to industrial applications. Courses and exercises, Casteilla editions, 544 p. 2012.

2. H. Bühler, "Static converters", Polytechnic and University Press Edition French-speaking Switzerland 1991.

3. Technical Encyclopedia “Engineering Techniques”, treatise on Electrical Engineering,

Machine Translated by Google

vol. D4 articles D3000 to D3300.

4. Euzeli dos Santos (Author), Edison R. da Silva (Author), Mohamed E. El-Hawary ; Advanced Power Electronics Converters: PWM Converters Processing AC Voltages (IEEE Press Series on Power and Energy Systems) 1st Edition ; 2014.
5. Muhammad H. Rashid, Power Electronics Handbook, Fourth Edition 2018; Butterworth-Heinemann; https://doi.org/10.1016/C2016-0-00847-1

HALF	Subject title	Credit Coefficient		Code
07	Microcontrollers	2	3	SEI 7.5

VHS	Course	Practical work	Practical work
45 hours	1h30	-	1h30

Prerequisites: prior knowledge of
combinatorial and sequential logic, knowledge of programming.

Goals :
Understand the architecture of a microcontroller system Be able to
write a program in high-level language for a 16F877 microcontroller target and more generally transmit a culture of micro-programmed systems.
Mastering interrupt mechanisms, analog-to-digital converters of the PIC and the timers.
Be able to use microcontrollers (programming, system control).

Content of the material:

Chapter 1. Microprocessor-based microprogram systems

—Introduction to micro-program systems.
— Basic model of a microprocessor, operation of a microprocessor, architecture of a microprocessor

— The memoirs.

Chapter 2. Microcontroller

— From microprocessor to microcontroller.
— Presentation of a PIC microcontroller.

Machine Translated by Google

— Internal and external structures of the PIC 16f877A microcontroller
—Input/output ports
— Principle and source of interrupt in the PIC 16f877A

Chapter 3. C Programming of PICs with the CCS - C Compiler
— PIC programming tools, C language, basic rules
— Operators, variables and constants, functions,.
— Repetitive structures.
— Functions adapted to pic microcontrollers
—Structure of a C program.

Chapter 4. The analog-to-digital converter
— Description, progress of a conversion
— Converter configuration.
— Application: example of a multimeter.

Chapter 5. Timers
— Presentation of the timer.
— How the timer works
— Application: interruption of timer 1.

Practical work:
TP 1: PIC microcontrollers introduction to MPLAB
TP 2: Getting started with the EasyPic7 kit and the mikroC PRO for PIC compiler
TP 3: Handling LEDs, Push Buttons and 7-segment Displays in the EasyPic7 kit

TP 4: 7-segment displays in the EasyPic7 kit
TP 5: External interruption and Buzzer in the EasyPic7 kit
TP 6: LCD, LCD graphics & analog-digital conversion.
NB: This lab can be conducted as a mini-project where each group of students is asked to develop a mini-project based on PIC16F877A, with a short presentation at the end of the semester. Students always come to the lab sessions throughout the semester to discuss and solve any problems encountered.

Some suggested PIC based mini projects are listed below
MP1: Digital Temperature meter **MP2 :**
Automatic control of street lights **MP3 :** Digital
DC voltmeter **MP4 :** Speed
control of DC motor

Assessment methods:
Continuous assessment: 40%, Final exam: 60%

Bibliographic references *(Books and handouts, websites, etc.)*

1. J. Crisp, “Introduction to microprocessors and microcontrollers,” Elsevier, 2nd ed. 2004.
2. R. Zaks and A. Wolfe. From Component to System – Introduction to Microprocessors. Sybex, Paris, 1988.
3. C. Tavernier, PIC Microcontrollers Collection of Applications. Dunod, Paris, 2005.
4. Christian Tavernier, PIC 10, 12, 16 Microcontrollers, Description and Implementation, Dunod, 2007.

Machine Translated by Google

5. Pascal Mayeux, Learning to program Mid-Range PICs through experimentation and simulation, Dunod, 2010.
6. Research Design Labs, Programming With Pic Microcontroller, | Volume 1, Issue www.Researchdesignlab.Com

HALF	Subject title	Credit Coefficient		Code
07	Measurement techniques and sensors	2	3	SEI 7.6

VHS	Course	Practical work	Practical work
45 hours	1h30	-	1h30

Prerequisites: prior knowledge of General
Electricity, Fundamental Laws of Physics, Electrical and Electronic Measurements, Basic electronics.

Goals :
Know the different components of a measurement chain: The operating principle of a sensor, the metrological characteristics, the appropriate conditioner and basic knowledge concerning the data acquisition chain.

Content of the material:

Chapter 1. Introduction to the measurement of quantities and uncertainties
— Introduction, Qualities of measuring devices, Calibration of measuring devices.
— Graphic symbols of measuring devices.
— General measurement methods (Deflection, zero, resonance methods), Application exercises

Chapter 2. Measurement Methods
— Impedance measurements: Capacitance measurements, Inductance measurements, AC bridges.
— Continuous power measurements; Alternating power measurements; Indirect reactive power measurement method
— Phase shift measurements; Frequency and period measurements; Application exercises

Chapter 3. Measuring Devices
— Analog measuring devices: Classification of deflection devices, The moving coil galvanometer, Structure of the magnetoelectric ammeter, Structure of the magnetoelectric voltmeter,

— Operation of the electrodynamic wattmeter in alternating current

Machine Translated by Google

— Digital measuring devices: Analog-to-digital converters (ADCs), — Operating principle of a digital measuring device, Examples of digital measuring devices (Multimeter, Oscilloscope, etc.).

Chapter 4. Sensors
— Introduction: The constituent elements of a measurement chain, the sensors (passive, active), the conditioning circuits (divider, bridges, amplifiers and instrumentation amplifier).
— Classification of sensors:
— Temperature sensors: Platinum probe, thermistor, thermocouple, semiconductor thermometer, optical pyrometer.
— Photometric sensors: Photometric quantities, Photoresistor, photodiode, phototransistor. Position sensors: Resistive, inductive, capacitive, digital, proximity.
— Strain, force and pressure sensors. Rotational speed sensors
— Analog and digital tachometer. Flow, level, and humidity sensors.

Chapter 5. Data acquisition chain
— Architecture of the chain; Fundamental elements of the acquisition chain, — Functions of the acquisition chain

Practical work:
TP 1: Single-phase power measurement
TP 2: Three-phase power measurement
TP 3: Photometric sensors
TP 4: Mechanical quantity sensors: deformation, force; position, rotation speed
TP 5: Temperature sensors

Assessment methods:
Continuous assessment: 40%, Final exam: 60%

Bibliographic references (Books and handouts, websites, etc.)

1. M. Cerr, Industrial Instrumentation: T.1, Tec and Doc Edition.
2. M. Cerr, Industrial Instrumentation: T.2, Tec and Doc Edition.
3. P. Oguic, Measurements and PC, ETSF Edition.
4. D. Hong, Electrical Circuits and Measurements, Dunod, 2009.
5. W. Bolton, Electrical and Electronic Measurement and Testing, 1992.
6. A. Fabre, Electrical and electronic measurements, OPU, 1996.
7. G. Asch, Sensors in industrial instrumentation, Dunod edition, 2010.
8. L. Thompson, Electrical Measurements and Calibration: Fundamentals and Applications, Instrument Society of America, 1994.
9. Georges Asch and Collaborators, “Sensors in industrial instrumentation”, Dunod, 1998.
10. Ian R. Sintclair, “Sensors and transducers”, NEWNES, 2001.
11. JG Webster, “Measurement, Instrumentation and Sensors Handbook”, Taylor & Francis Ltd.
12. M. Grout, "Industrial instrumentation: Specification and installation of sensors and control valves", Dunod, 2002.
13. R. Palas-Areny, JG Webster, “Sensors and signal conditioning”, Wiley and Sons, 1991.
14. R. Sinclair, “Sensors and Transducers”, Newness, Oxford, 2001.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
07	Pneumatic and hydraulic actuators	2	3	SEI 7.7

VHS	Course	Practical work	Practical work
45 hours	1h30	-	1h30

Prerequisites: prior knowledge /

Goals :

To enable the student to acquire knowledge on the design, operation and calculation of the elements involved in automated industrial systems based on hydraulic and pneumatic energy.

Content of the material:

Chapter 1. Hydraulic and pneumatic energies in the functional chain of a system

— Definitions of hydraulic and pneumatic energy
— Energy storage and supply: power supply systems, storage systems, conditioning systems (filters, dehydrators, lubricators), safety systems (flow regulator), measuring systems.

— Types of energy converters (types of cylinders, pumps, etc.)
— Energy distributors (modulators) (presentation, types and designation of distributors)
— Conventional diagrams of hydraulic and pneumatic elements.

Chapter 2. Industrial hydraulic circuits

— General description
— Hydraulic circuit diagram
— Hydraulic power station (Constitution)
— Volumetric pumps and their associated quantities (calculations of displacement, flow rates, power, efficiency and drive torque, 'calculation example')
— Hydraulic receivers: Cylinders (dimensioning, pressure, section, speed, efficiency and power), Hydraulic motors (definition, types and calculations, example of calculation)

— Protection and regulation devices (valves, pressure and flow limiters and reducers, valves, etc.)

— Oils, characteristics and choices

Machine Translated by Google

Chapter 3. Pneumatic automation circuits

- Description

— Construction and diagram of a compressed air installation (compressed air production elements, pneumatic cylinders, connections, compressed air conditioning modules)

— Pneumatic symbols

— Examples of circuits.

Chapter 4. Automated Production Systems (SAP)

— Definition and example of an automated system.

— Description of an automated system

— Operative parts: composition, examples of sensors, examples of actuators (electric, hydraulic and pneumatic).

— Control parts: constitution, direct control mode (closed loop), control mode command with execution report (or closed loop)

— Human/machine interface

— The programmable logic controller (PLC): principles, PLC periphery, modular PLC design (digital modules, communication modules)

— Representation tools: by GRAFCET (definition, GRAFCET standards and basic graphic elements, examples) or by programming flowchart.

Practical work:

TP 1: Creation of a manual control (push button) for a single-acting cylinder (pneumatic or hydraulic)

TP 2: Creation of a manual control (push button) for a double-acting cylinder (pneumatic or hydraulic)

TP 3: Creation of an automatic control (repeated cycle) of a double-acting cylinder (pneumatic or hydraulic) using an end-of-course sensor)

TP 4: Creation of an automatic control (cycle programmed on the PLC) of a double-acting cylinder (pneumatic or hydraulic) using an end-of-stroke sensor.

Assessment methods:

Continuous assessment: 40%, Final exam: 60%

Bibliographic references *(Books and handouts, websites, etc.)*

1. Md. Abdus Salam, Fundamentals of Pneumatics and Hydraulics, Springer, 2022
2. Andrew Parr, Hydraulics and Pneumatics: A Technician's and Engineer's Guide, BH, 3rd Ed. 2011
3. J. Faisandeur, “Hydraulic and pneumatic mechanisms”, Dunod 2006.
4. S. Moreno, “Pneumatics in automated systems”, Eyrolle 2001.
5. 'Industrial hydraulic Systems, an introduction'', Englwood cliffs (new jersey), Prentice hall 1988.
6. R. Affouard, J. Diez, ''Hydraulic installations design and construction practice'', Paris, modern publishing company 1972.

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
07	Professional Personal Project	1	2	SEI 7.8

VHS	Course	Practical work	Practical work
10:30 p.m.	-	-	1h30

NB: Hourly volume outside quota
Tutoring: 1.5 hours of practical work per week

Prerequisites: prior knowledge /

Goals :

The Personal Project aims to provide professional-level experience in problem analysis and systems design, as well as the opportunity to practice and hone technical writing and oral presentation skills. All students must complete a total of two credit hours of the project course in a topic relevant to their area of specialization.

The PPP approach should lead the student to ask questions, to question his desires and his projects and not to remain fixed in a fixed idea or on the contrary in a fog. In this sense, it is important that the student learns to construct a discourse, to value his skills according to the situations he may encounter.
The objective is thus to learn to
enhance their academic and non-academic achievements.
At the end of this module, the student will be able to:

- Demonstrate an ability to apply knowledge of mathematics and science and in engineering
- Demonstrate an ability to design and conduct experiments, as well as analyze and interpret data
- Be able to gather, analyze and correlate professional information relating to their project
- Demonstrate an ability to identify, formulate and solve engineering problems
- Acquire knowledge and understanding of professional responsibility and ethics
- Demonstrate an ability to communicate effectively
- Be aware of the impact of engineering solutions in a global context, economic, commercial, environmental and societal
- Demonstrate an ability to use modern engineering techniques, skills and tools required for the practice of engineering.

Procedure, Tools and media used:

- Lab practical sessions to be planned (by group)
- Alternation between group work and individual work

Machine Translated by Google

- Round tables / Debates / exchange of ideas and information (brainstorming)
- Film screening, testimony, documentary.
- Examples of PPPs

Assessment methods:

Continuous assessment: 100%

Bibliographic references *(Books and handouts, websites, etc.)*

1. Goguelin, Pierre, Professional Project, Life Project, ESF, 1992
2. Croizier, Monique, Motivation, Personal Project and Learning, ESF, 1993
3. Lafont, Monique (coord.), Supporting a new idea in education. Notebooks educational No. 393, April 2001
4. Malderez, Angi, How to Practice Quality Tutoring: A Practical Guide, De Boeck, 2009
5. André, Christophe, Lelord, François, Self-esteem. Loving yourself to live better with it the others, Odile Jacob, 2008
6. Apec, The Déclic method. Building your professional project, Editions d'organisation. 2004
7. Gérard, François-Marie, Evaluating skills: practical guide, De Boeck, 2nd edition, 2009
8. Gilles, Dominique, Millaud-Collier, Claudie, Saulnier-Cazals, Josette, et al., Student Professional Project: the new data, ONISEP, 2002

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
07	Standards in Electrotechnics	1	1	SEI 7.9

VHS	Course	Practical work	Practical work
10:30 p.m.	1h30	-	-

Prerequisites: prior knowledge of
fundamental electrical engineering.

Goals :

1. Familiarize the student with the relationships of the different levels of standardization electric.
2. To enable the student to understand the mechanism of developing standards.
3. Summary of the main standards in electrical engineering.

Content of the material:

Chapter 1: International Standardization Organizations 1. International Electrotechnical Commission (IEC).
2. IEEE Standardization Association (IEEE SA).
3. National Electrical Manufacturers Association (NEMA).
4. American National Standard Institute (ANSI).
5. International Organization for Standardization (ISO).
6. International Society for Measurement and Control (ISA).
7. American Society of Mechanical Engineers (ASME).

Chapter 2: Development of an international standard

Chapter 3: IEC ELT Standards

Chapter 4: IEEE SA ELT Standards

Chapter 5: NEMA ELT Standards

Assessment methods:
Final exam: 100%

Bibliographic references *(Books and handouts, websites, etc.)*

1. M.-C. Radonde-Payen, International Electrical Standardization Organizations and their operation. Engineering techniques 2022.
2. ÿStandards and Patents - United States Standards - International'. University of Quebec at Chicoutimi, Library Department.

Machine Translated by Google

3. D.Fedullo, T.Gallauziaux, Developments in electrical standards, 4th edition. Ed. Eyrolles 2017.

4. Olivier Le jeune, Guide to electrical and electrical diagrams, http://www.positron-libre.com.
5. Soyed Abdessamï, Course manual and exercise: Industrial Electricity
6. P.Boye and A.Bianciotto, Schematics in electrical engineering, DELAGRAVE edition.
7. T.Gallauziaux and D.Fedullo, Memento of electrical diagrams.
8. Metatla Rachid, Standards and electrical diagrams, IAP, Skikda School.
9. NFC15-100 Standards, 2020 Schneider Electric Guide

Machine Translated by Google

HALF	Subject title	Credit Coefficient		Code
07	Production of electrical energy	1	1	SEI 7.10

VHS	Course	Practical work	Practical work
10:30 p.m.	1h30	-	-

Prerequisites: prior knowledge Basic knowledge of fundamental electrical engineering (electricity and circuit, electric and magnetic field, power, three-phase system, alternator, motor, transformer).

Goals :

Understand, master, and acquire the basic principles of the different methods of producing electrical energy using conventional means and renewable sources. Upon completion of this subject, students should become aware of the energy issue in general and the impact of electrical energy on socioeconomic life in particular.

Content of the material:

Chapter 1. General Information

History of electricity production. History of the evolution of electrical energy production in Algeria. Eco-design and sustainable development, renewable and non-renewable energies, economic aspects.

Chapter 2. Thermal power plants

Steam thermal power plant: Operating principle, water vapor, steam turbines, boilers, condensers and refrigerants, water station, choice of location, fuels, heat transmission, efficiency of a thermal power plant, diagrams used in the study of Water-Steam cycles: Carnot, Rankine, Hirn, Reheating and withdrawals.

Gas turbine power plant: Principle of operation, Joule cycle, types of combination of gas turbines with condensing steam turbines. Generator sets.

Chapter 3. Nuclear power plants

Definition of a nuclear power plant, principle of uranium fission, operating principle of a nuclear power plant, types of power plants, nuclear fuel, reprocessing and storage of waste, vitrification and storage, safety precautions to be highlighted in a nuclear power plant, radiation protection, environmental protection.

Chapter 4. Hydraulic power plants

Hydroelectric and tidal power plants: Available power, types of hydroelectric power plants, main parts of a hydroelectric power plant, pumped storage power plant.

Chapter 5. Wind Energy

Wind energy (wind turbines): Definition, the different components of a wind turbine, the different types of wind turbines, the power available and the power taken from the wind, electrical generators.

Chapter 6. Solar Energy

Contemporary situation, operating principles, photovoltaic systems, advantages and disadvantages, application sectors, grid-connected installations.

Chapter 7. Fuel Cells

Types of fuel cells and working principle

Machine Translated by Google

Assessment methods:
Final exam: 100%

Bibliographic references *(Books and handouts, websites, etc.)*

1. Sabonnadière Jean Claude, New energy technologies 1: Renewable energies, Ed. Hermès.
2. Gide Paul, The Great Book of Wind Power, Ed. Moniteur.
3. A. Labouret, Photovoltaic Solar Energy, Ed. Dunod.
4. Viollet Pierre Louis, History of hydraulic energy, Ed. Press ENP Chaussée.
5. Peser Felix A, Solar thermal installations: design and implementation, Ed. Moniteur, Dunod/The New Factory, 2013.
6. B. Robyns et al, Production of electrical energy from renewable sources (Coll. Electrical Energy Sciences and Technologies), Lavoisier, 2012.
7. G. Laval, Nuclear fusion: from fundamental research to energy production?, EDP Sciences, 2007.
8. V. Crastan, Power plants and alternative electricity production, Hermès-Lavoisier, 2009.

Machine Translated by Google

Detailed programs of subjects for the 8th semester

HALF	Subject title	Coefficient	credits	Code

Machine Translated by Google

08	Machine controls Electric	03	05	SEI 8.1

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites: Electrical machines, static converter, servo systems, open loop and closed loop regulation.

Goals :

- Understand, analyze and model the machine-converter assembly, carry out the wiring of the control and power circuits of the electrical machines.

Content of the subject:

1. Control devices of an industrial servo system

2. Control of the DC machine - Speed adjustment characteristic, - Calculation and dimensioning of a speed adjustment of the DC machine by action on the armature,

- Reversible operation in all four quadrants in terms of torque and speed.

3. Control of brushless motors

4. Robust DC machine position control (reference model adaptive control)

5. Control of the asynchronous machine -
Controls by action on the slip (Control by stator voltage, Control by rotor variables),

- Constant flux scalar control (U/f control =Cte, Imposed stator current control), - Vector control (decoupling, direct, indirect control),

- Sensitivity and adaptation of the vector control to the variation of rotor parameters.

- DTC control of the asynchronous machine.
- Robust sliding mode control of the asynchronous machine

6. Synchronous machine control - Self-piloted synchronous machine,
- Vector control of wound rotor synchronous machine (smooth pole, salient pole, with/without dampers),

- Vector control of the voltage-supplied permanent magnet synchronous machine.

TP:

1. Speed control of an MCC powered by a Rectifier, Experimentation on test bench.

2. Speed control of a chopper-powered MCC, Test bench experimentation,

3. Closed-loop scalar control of an asynchronous motor, Experimentation on a practical test bench,

Machine Translated by Google

4. Vector control of an asynchronous motor. Experimentation on a practical test bench.

5. Vector control of a synchronous motor. Experimentation on a practical test bench.

6. Speed/position control of a brushless motor. Experimentation on a practical test bench.

Assessment methods:

Continuous assessment : 40% (20% tutorials + 20% practical work), Exam: 60%

Bibliographic references:

- H. Buhler, ÿRegulation and control electronicsÿ, Dunod Edition.
- BK Bose, “Power Electronics and motor drives”, 2006, Edition Elsevier.
- BK Bose, ÿPower Electronics and variable frequency drivesÿ, IEEE Press Edition
- E. Acha, VG Agelidis, and Co, ÿPower Electronic control in Electrical Systemsÿ, Newnes OxfordEdition.

- H. Sira-Ramires, R. Silva-Ortigoza, ÿControl design techniques in Power Electronics devices”, Springer Edition.
- M. Barnes, “Variable speed drives in Power Electronics”, Elsevier Edition.
- Ned Mohan, ÿPower Electronics and Drivesÿ, MNPERE publication, USA.
- JP Louis, “Modeling of electrical machines for their control”, Hermes Sciences Publication.

- H. Buhler, “Adjustment by sliding mode”, Presses Polytechniques Romandes.
- M. Pinard, “Electronic control of electric motors”, Dunod Edition.
- R. Perret, “Electric Drives 2”, Edition Hermes Lavoisier.
- P. Degobert, B. François, JP Hautier “Vector control of the asynchronous machine”, 2007, Technip Edition.

- C. Canudas de Wit, “Modeling, Vector Control and DTC”, Edition Hermes.
- R. Alvarez Salas, “Control of the asynchronous machine”, European University Editions.

HALF	Subject title		Credit Coefficient		Code
S 8	Industrial electrical networks		3	5	SEI 8.2
VHS	Course	Practical work	Practical work		
67h30	1h30	1h30	1h30		

Machine Translated by Google

Prerequisites:

Fundamental Electrotechnics, Electrical Networks 1, Electrical Transmission and Distribution Networks

Goals:

The subject aims to give students the necessary knowledge on industrial electrical networks (architectures, diagrams and plans), the calculation of power balance, energy minimization, choice of electrical conduits, fault calculation and protection.

Content of the subject:

Chapter I. Network architectures

General structure of a private distribution network, The power source, The HTB delivery stations, The HTA delivery stations, The HTA networks and HTB networks within the site, The industrial networks with internal production.

Chapter II. Neutral regimes (NR)

The different neutral systems; The influence of the RN and earth connection diagrams used in LV; Indirect contact in low voltage according to the RN; Protection, Particularities of the DDR and cutting of the neutral conductor and phase conductors; Influence on the equipment of the cutting rules and protection of the conductors; Interaction between HV and LV; Comparison of the different low voltage RN-choices; RN used in high voltage.

Chapter III. Determination of conductor cross-sections

Benefits of ER compensation, Improvement of cos ÿ; ER compensation equipment; Location of capacitors; Determination of compensation power in relation to the energy bill; Compensation at the terminals of a transformer; Compensation of asynchronous motors; Optimal compensation; Activation of capacitor banks and protection; Presence of harmonics.

Chapter IV. Receivers and their power supply constraints

The different neutral systems; The influence of the RN and earth connection diagrams used in LV; Indirect contact in low voltage according to the RN; Protection, Particularities of the DDR and cutting of the neutral conductor and phase conductors; Influence on the equipment of the cutting rules and protection of the conductors; Interaction between HV and LV; Comparison of the different low voltage RN-choices; RN used in high voltage.

Chapter V. Power Sources

Power supply by RDPs; Alternators (synchronous generators), asynchronous generators, Advantages and disadvantages; Uninterruptible power supplies (UPS),

Chapter VI. Overvoltages and insulation coordination

Surges; Surge protection devices; Coordination of insulation in an industrial electrical installation,

Chapter VII. Reactive Energy Compensation

Benefits of ER compensation, Improvement of cos ÿ; ER compensation equipment; Location of capacitors; Determination of compensation power in relation to the energy bill; Compensation at the terminals of a transformer; Compensation of asynchronous motors; Optimal compensation; Activation of capacitor banks and protection; Presence of harmonics.

Machine Translated by Google

Practical work: Industrial electrical networks

TP1: Calculation and choice of pipes and electrical protection using calculation software
TP2: Earth connection diagrams
TP3: Technical and economic optimization of an internal industrial network
TP4: Sizing an industrial installation
TP5: Harmonics in an industrial network
TP6: Reactive energy compensation

Educational visits (Visits to industrial sites)

Assessment methods:

Continuous assessment : 40% (20% tutorials + 20% practical work), Exam: 60%

Bibliographic references:

1. Denis MARQUET, Didier Mignardot, Jacques SCHONEK, "Electrical Installation Guide 2010 - International IEC and French National NF Standards", Schneider Electric, 2010
2. Jean Repérant, "Industrial Electrical Networks - Introduction", Tech. Del'Ing., D5020, 2001
3. Jean Repérant, "Industrial Electrical Networks - Engineering", Tech. Del'Ing., D5022, 2001
4. Dominique SERRE, "LV Electrical Installations - Electrical Protection", Tech. Del'Ing., D5045, 2006

5. SOLIGNAC (G.). – Guide to Electrical Engineering of Internal Factory Networks 1076 p.bibl. (30 ref.) lectra Tech & Doc Lavoisier, EDF. Paris, 1985.

HALF	Subject title		Credit Coefficient		Code
S8	Industrial automation 02		3	5	SEI8.3
VHS	Course	Practical work	Practical work		
67h30	1h30	1h30	1h30		

- Identify the operating problems of a complex automation system controlled by a

Machine Translated by Google

Content of the subject:

Chapter 1: Technical system and concepts of automation — What is a system?
— Characteristic of a system.
— Global function.
— Of a system.
— Added value.
— Incoming work material.
— Outgoing work material.
— Control data.
— Secondary exits.
— Notions of automated systems.
— Industrial programmable controllers.
— Hardware structure of an automated system.
— Functional structure of an automated system.
Chapter 2: Modeling a technical system — Modeling tool.

— Examples of application.
Chapter 3: Functional analysis of a system — Functional analysis approach.
— Tools and methods.
— Top-down functional analysis method SADT.
— FAST functional analysis method.
— Overview of other methods (MERISE, UML, BPMN).
Chapter 4: Programming Programmable Logic Controllers — PLC Programming Languages.
— Transcription of a specification.
— Process Automation.
Chapter 5: Control and Supervision of an Automated System — Control of an Automated System.
— Supervision of an automated system.
— Human-Machine Interface (HMI).
— Control-Supervision Integration.
— SCADA data acquisition and processing system.
— Supervisory tasks.
— System Communication.
— Authentication and Authorization.
— Automated System Security.
— Fault Management.

Machine Translated by Google

— Diagnostic tools.
— Performance Monitoring.
— Human Intervention.

Chapter 6: GEMMA Graphical Analysis Tool (Guide to the Study of Start and Stop Modes)

— Operation and use of GEMMA.
— Advantages of GEMMA.
— Basic concepts of GEMMA —
Structuring of Gemma.
— Method of using GEMMA.
— Graphical representation.
— Notions of points of view.
— Hierarchical structures of a grafcet.
— Structure of a Sub-grafcet.
— Structure of a task grafcet.

Practical work on industrial automation 2: TP1: Getting to grips with the software used and discovering the environment of each software and familiarizing yourself with their basic tools TP2: Hardware configuration (HW hardware configuration) and project creation, connection and injection (How to load a program), simulation and execution of the program TP3: Design and automation of some industrial systems TP4: Introduction and configuration of views via a supervision environment TP5: Integration of a supervision interface in an automation project (control in start/stop mode of a motor, reversal of the direction of rotation of a motor).

TP6: Design of a GEMMA of an industrial system.

Assessment methods:

Continuous assessment : 40% (20% tutorials + 20% practical work), Exam: 60%

Bibliographic references:

— Industrial Programmable Automation, William Bolton, DUNOD 2019 edition.
— Industrial Programmable Automation, Gilles Michel, DUNOD edition 1993.
— GRAFCET: design-implementation in APIs, Simon Moreno et al., Casteilla edition 2000.

— Industrial Programmable Automation, Jean-Claude Humblo, Hérmes edition 1993.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S8	Modeling and identification of electrical systems		3	5	SEI8.4
VHS	**Course**	**Practical work**	**Practical work**		
67h30	1h30	1h30	1h30		

Content of the subject:

Chapter 1: Systems and Experiments —
General.

Machine Translated by Google

— Types of models,
— Models and simulation.
— How to obtain a model **Chapter 2:**

Mathematical model — Block diagram of a system.
— Characteristic variables.
— Internal and external representations of a system **Chapter**

3: Modeling of electrical systems — Modeling of a passive component.
— Modeling of an active component.
— Modeling of basic electrical circuits.

Chapter 4: Modeling tools — Bond graph (BG) or Causal information graph (CIG).
— Application to electrical circuits

Chapter 5: General Information on Identification — Definitions.
— Steps.
— SBPA Generation.
— Choice of model structure **Chapter 6:**

Graphic identification methods — Strejc method

—Broïda's method…

Chapter 7: Digital Identification Methods — Recursive Methods.

— Non-recursive methods

Practical work on modeling and identification of electrical systems: Practical work 1: Modeling and simulation of passive and active electrical circuits using equations of states and transfer functions.

TP 2: Modeling and simulation of electromechanical converters. (2 weeks)

TP 3: identification of electrical systems by input/output observations and validation of a structure (applications: electric machine, electric oven).

TP 4: Direct measurement of the response of an electrical system and by generation.

TP 5: Parametric identification of an electrical system using the Strejc and Broida.

TP 6: Digital identification (online) of a DC Machine by the Method of Least recursive squares MCR.

TP 7: Digital identification (online) of an AC Machine by the Method of Least recursive squares MCR.

Assessment methods:

Continuous assessment: 40% (20% TD + 20% TP), Final exam: 60%.

Bibliographic references: — ID

Landau, "Identification of systems", Hermès, 1998.
— E. Duflos, Ph. Vanheeghe, "Estimation Prediction", Technip, 2000.
— T. Soderstrom, P. Stoica, "System Identificationÿ, Prentice Hall, 1989.
— R. Hanus, "Automatic Identification", DE Boeck, 2001.
— L. Lennart, "System Identification: Theory for the User", Second edition, Prentice Hall 1999.

Machine Translated by Google

— P. Borne, Geneviève Dauphin-Tanguy, Jean-Pierre Richard, "Modeling and identification of processes", Technip, 1992.
— R. Ben Abdenour, P. Borne, M. Ksouri, M. Sahli, "Identification and digital control of industrial processes", Technip, 2001.
— E. Walter, L. Pronzato, "Identification of Parametric Models from Experimental Data", Springer, 1997.

HALF	Subject title		Credit Coefficient		Code
S8	Energy quality and EMC		2	4	SEI8.5
VHS	**Course**	**Practical work**	**Practical work**		
45 hours	1h30	1h30	-		

Content of the subject:

• Degradation of electrical power quality: Origins, characteristics and consequences. • EMC concept: Terminology, context, issues and compatibility margin. • EMC actors: Sources, victims and couplings. • Disturbances generated by power and digital electronic circuits:
switching, voltage and current distortions, malfunction, clock signal.
• Disturbances generated by electrostatic discharges: Static electricity, hygrometry, lightning, direct and indirect effects of lightning and models. • Equivalent electrical models of
electromagnetic effects: galvanic effect, self-magnetic and mutual effect, dielectric effect and antenna effect.

Machine Translated by Google

• Study and reduction of couplings: Types of coupling (conduction, radiation and ionization), modes of coupling (common and differential), equivalent coupling circuit and methods of reducing couplings (arrangement of equipment, arrangement of
cables and masses).
• EMC measurement and protection techniques: Ground, shielding, reducing effect, filtering
and overvoltage protection, clipping, measurement units and reference values, spectrum analyzer.

• Energy optimization and application to the industrial sector: Reduction of harmonics,
time and frequency filtering, passive and active filtering, decoupling of power supplies, compensation of reactive energy.
• Regulatory and normative provisions: Regulations in force

Assessment methods:

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

Bibliographic references: • P.

Degauque, A. Zeddam, “Electromagnetic compatibility: From basic concepts to
applications », Volume 1 and 2, Publisher Hermès - Lavoisier, 2007. • Alain
CHAROY « CEM – Parasites and disturbances of electronics », Volume 1: sources, couplings, effects (2006), Volume 2: Earths, masses, wiring (2006), Volume 3: Shielding, filters, shielded cables (2007), Volume 4: Power supply, lightning, remedies (2007), 2nd edition DUNOD • A. KOUYOUMDJIAN, « Harmonics and electrical installations », Edition GroupeSchneider,
1998 4. Jean-Louis COCQUERELLE, « CEM and power electronics », Edition TECHNIP, 1999.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S8	Industrial Computing		2	3	SEI8.6
VHS	**Course**	**Practical work**	**Practical work**		
45 hours	1h30	-	1h30		

Content of the subject:

Chapter 1: Introduction to Industrial Computing — Reminder of the different programmed circuits.
— Perceived on development and programming tools (uC, uP, programming in assembler, in C, Arduino, AVR, PIC, etc.).
Chapter 2: Peripherals and Interfaces —
Hardware connection of peripherals to the µ-Processor (Interfacing computers: PC, …).
— Description of the basic functions of the peripherals.
— The TOR Input/Output PORTS
— Time management or Timers (programming, initialization, use, etc.).
— Interruptions (programming, use).
Chapter 3: Communication Bus

Machine Translated by Google

— Communication and transfer of digital data.
— Serialization and deserialization.
— Characteristics of a serial link.
— Serial communication, RS232, RS422, RS485 serial port.
— I2C bus.
— MODBUS.
— DHCP.
— CAN bus.

Chapter 4: Data Acquisition

Analog-to-digital and digital-to-analog converters — Principles.

— Different achievements.

Assessment methods:

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

Bibliographic references: —

Dumas, Patrick, Industrial computing [printed text]: 28 practical problems with course reminders, Sciences Sup., 16362217, Paris 2004.
— Tavernier, Christian, Applications of PIC Microcontrollers, Dunod 2011.
— Sindjui, Cédric, The great guide to industrial control systems [text
[printed]: automation, instrumentation, local networks, automatic regulation, Paris: Lexitis, 2014.

— J Perrin and F Binet, Automation and industrial computing: Theoretical, methodological and technical bases, Nathan edition September 2004.
— Fernand Boéri and Frédéric Mallet, Industrial Computing and Java: Courses and Corrected Exercises, Dunod edition September 2003.
— Jean-Louis Boulanger, Securing industrial IT architectures, Hermès edition, April 2011.

— Henri Ney, Automation & industrial computing: industrial, industrial sciences and technologies, Nathan edition February 2000.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S8	Internship in a company 2		1	1	SEI8.7
VHS	**Course**	**Practical work**	**Practical work**		
1h30 per week	-	-	1h30		

Assessment method:

Internship report with presentation: continuous assessment 100%.

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S8	Compliance with standards and rules of ethics and integrity		1	1	SEI8.8
VHS	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	1h30	-	-		

Content of the subject:

I. Introduction to Intellectual Property (IP)

- Fundamental definitions and concepts of IP,
- Importance of IP in the field of exact sciences, - Historical evolution of IP laws

II. Legal bases of Intellectual Property - Main laws and international conventions on IP, - Types of IP rights (patents, copyrights, trademarks, etc.), - Procedures for filing and protecting IP rights

III. Patent Law

- Foundations and objectives of the patent system, -
Criteria for patentability of inventions in the exact sciences,
- Patent filing and granting procedures

IV. Copyright and Literary and Artistic Property (PLA)

Machine Translated by Google

- Basic concepts of copyright, - Protection
of scientific and technical works, - Limits and exceptions to
copyright in the context of the exact sciences

V. Management and Valorization of Intellectual Property

- IP management strategies in academic institutions and businesses,
- Valorization of IP rights for commercial purposes, Licenses, assignments and transfers of IP rights

VI. Ethics and Professional Conduct in Intellectual Property

Assessment methods:

Final exam

Bibliographic references:

- Galloux, JC, Industrial Property Law. Dalloz, 2003.
- Wagret F. and JM., Patents, trademarks and industrial property. PUF 2001
- Dekermadec, Y., Innovating through patents: a revolution with the internet. Insep 1999
- The engineer at the heart of innovation. Belfort-Montbéliard University of Technology
- http://ressources.univ-rennes2.fr/propriete-intellectuelle/cours-2-54.html
- The ABCs of Copyright, United Nations Educational, Scientific and Cultural Organization (UNESCO)

- Copyright in the cultural industries. - Cheltenham: E. Elgar, 2002. - XXII-263 p.
- Pierrick Malissard "Intellectual property "origin and evolution" 2010
- The website of the World Intellectual Property Organization www.wipo.int
- DGRSDT, Introduction to the process of creating a start-up, http://dgrsdt.dz/

DGRSDT, Intellectual Property Guide. http://dgrsdt.dz/

Machine Translated by Google

HALF	Subject title		Credit Coefficient		Code
S8	Reliability and industrial maintenance		1	1	SEI8.9
VHS	**Course**	**Practical work**	**Practical work**		
10:30 p.m.	1h30	-	-		

Content of the subject:

Chapter 1. General information on maintenance
History (standardized concepts and terminology, etc.), Role of maintenance and troubleshooting of equipment in industry, Elements of mathematics applied to maintenance, Behavior of equipment in service, Failure rates and reliability laws, Reliability models, The different forms of maintenance, Organization of maintenance and troubleshooting of electrical equipment, Classification of planned maintenance of electrical equipment.

Chapter 2. Organization and management of maintenance
Structure of workshops specializing in the repair of electromechanical converters,
Organization of maintenance operations, Main stages of troubleshooting technology for electrical machines, Study of different breakdowns of electrical machines and methods of their detection, Disassembly and reassembly technique, Tests and diagnostics before troubleshooting.

Chapter 3. Troubleshooting of various parts of electrical machines Troubleshooting
of the mechanical part, Troubleshooting of the electrical part, Calculation and verification of the parameters of electro-energetic systems, Recalculation of electro-energetic systems on other data of the nameplate, Assembly work and test method after troubleshooting.

Chapter 4. General information on computer-assisted maintenance (CAM)

Assessment methods:

Machine Translated by Google

Final exam

Bibliographic references:

1. G. Zwingelstein, “Failure diagnosis”, Hermès, Paris, 1997.
2. “Reliability-based maintenance”, Hermès, Paris, 1997.
3. Jean Henq, "Practice of preventive maintenance", Dunod, 2000.
4. Raymond Magnan, "Practice of industrial maintenance", Dunod, 2003.
5. Yves Lavina, "Industrial Maintenance, Function of the Company", 2005.
6. M. François, “Maintenance: method and organization”, Dunod, Paris, 2000.
7. M. François, “Maintenance: method and organization”, Dunod, Paris, 2000.
8. A. Boulenger, C. Pachaud, "Vibration diagnosis in preventive maintenance", Dunod, Paris, 2000. 9. Jean Henq, "Practice of preventive maintenance", Dunod, Paris, 2002.
10.R. Cuigent, "Maintenance Management", Dunod, Paris, 2002.
11. Rachid Chaib, "Maintenance and industrial safety in the company", Dar El Houda, Algiers, 2007.
P 12.S. Robert, S. Stéphane, "Maintenance: the MAXER method", Dunod, Paris, 2008
13.JFD Beaufort, “Use of relays for the protection of installations”, 1972.
14.Michel Pierre Villoz, "Protection and environment", Technique and engineer, 2006.
15.Nichon Margossian, "Professional Risks", Technique et ingénieur, 2006

Machine Translated by Google

Detailed programs of the 9th semester subjects

HALF	Subject title	Coefficient	Credits	Code

Title: ***Industrial Electrical Systems***

Establishment: University of Constantine 1

Academic year 2024-2025

Machine Translated by Google

S9	**Design of electric drive systems**	3	5	**SEI 9.1**

VHS	**Course**	**Practical work**	**Practical work**
67h30	1h30	1h30	1h30

Prerequisites:
The student must have prior knowledge of electrical networks, power electronics, electric motors, starting methods, as well as various types of loads, diagrams and equipment and finally notions of mechanics.

Goals :
Acquire the principles of proper sizing of an electric drive system.
This involves taking into account a multitude of factors and a thorough understanding of all system components, such as the electrical network, the driven machine, environmental constraints, motors and variable speed drives, and mechanical power transmission components. Investing time in accurate sizing can result in significant technical and economic benefits.

Course content: Chapter 1:
Electrical drives and transmission mechanisms
a) 1.1. Construction of electric drives.
— Mechanical characteristics of electric motors.
— Mechanical characteristics of driven machines.
— Calculation of the parameters of the load brought back onto the motor shaft.
— Make an initial choice of engine for the established regime (preliminary choice).
b) Mechanical transmission.
— Transmit without changing the speed (Couplings).
— Transmit with speed modification. (Gear reducers, Wheel and worm system, Transmission by a gear train, Transformation of rotary motion into rectilinear motion, Wheel and rack system, Pulley belt system)

Chapter 2. Checking the choice of engine — Correct the choice of engine adapted to the conditions of use.
— Types of service of electric motors.
— Engine check.
— Life cycle cost of an electric motor.

Chapter 3: Sizing of variable speed drives

a. Criteria for choosing a variator motor
b. Starting electric motors
- ÿ Starting by wired technology (direct, star/delta)
- ÿ Start by API programmed technology
- ÿ Start by variable speed drive

c. Calculation of the power of a variable speed drive for an electric drive

Chapter 4: Industrial Applications

ÿ Industrial sizing of a drive system: electric reduction motor mechanics and speed variator.
— Sizing of an electrical cabinet intended for an electric drive.

Machine Translated by Google

Practical work

TP 1: Getting started with SolidWorks software
TP 2: Drawing of a 3D part of revolution with dimensions and drawing
TP3: Drawing of a prismatic part in 3D with dimensions and drawing
TP4: Assembly of two parts and study of movement
TP5: Drawing a speed reducer using SolidWorks
TP6: Drawing of an electrical cabinet with its components using SolidWork

Assessment methods:

Continuous assessment: 40% (tutorials: 20% and practical work: 20%); Final exam: 60%

Bibliographic references :

1. Denis MARQUET, Didier Mignardot, Jacques SCHONEK, "Electrical Installation Guide 2010 - International IEC and French National NF Standards", Schneider Electric, 2010.
2. Dominique SERRE, "LV Electrical Installations - Electrical Protection", Tech. del'Ing., D5045, 2006.
3. Catherine Le Trionnaire Electrotechnical Vade-mecum Networks Production Machines industrial systems electrical engineering level A. Released: September 25, 2010.
4. Philippe LE BRUN "Asynchronous machine", Technology, choice and supply of asynchronous machines Lycée Louis ARMAND.
5. E. Francis, "Mechanical construction: power transmission", Volume 1, ISBN: 2-10-049125-1 2006.
6. E. Francis, "Mechanical construction: power transmission", Volume 2, ISBN: 2-10-049750-2 2006.
7. Francis, "Mechanical construction: power transmission", Volume 3, ISBN: 2-10-049749-3 2006

HALF	Subject title	Credit Coefficient		Code
S9	**Artificial intelligence techniques**	3	5	IST 9.2
VHS	**Course**	**Practical work**	**Practical work**	
67h30min	01h30min		03h00min	

Machine Translated by Google

Prerequisites:
Dynamic systems, concepts of mathematical analysis, concepts of optimization, concepts of probability.

Goals :
To enable the student to become familiar with artificial intelligence techniques applied to the field of system control and optimization.
Understand the basics of artificial intelligence techniques and their use in control, optimization, diagnostics, and decision support. The module covers the different topologies of neural networks and their learning algorithms, the various basic concepts of fuzzy logic and its applications, and finally, the principle of heuristic methods and their programming.

Course content: Chapter 01:

Introduction to Artificial Intelligence (AI)
- Natural and artificial intelligence.
- Forms of Artificial Intelligence.
- Main areas of AI.
- AI techniques used in electrical engineering.

Chapter 2: Fuzzy Logic and Its Applications General
Basics. Fuzzy Sets. Linguistic Variables. Membership Function. Fuzzy Logic Operators. General Structure of a Fuzzy Command. Fuzzification. Inference Engine or Decision Block. Inference Methods. Defuzzification. Fuzzy Identification and Command.

Chapter 3: Neural Networks Topology of
neural networks. Layered networks. Static networks. Dynamic neural networks. Learning neural networks. Supervised and unsupervised learning.

Chapter 04: Adaptive networks and neuro-fuzzy networks.
- Hybrid systems - Neuro-fuzzy systems
- Adaptive Neuro-Fuzzy Inference System (ANFIS)
- Training of an ANFIS network

Chapter 06: Evolutionary Computing and Collective Intelligence Algorithms
- Genetic algorithm
- Genetic programming
- Particle swarm optimization algorithm
- Ant colony algorithm

Chapter 07: Probability and probabilistic reasoning.
- Probabilistic reasoning -
Bayesian networks

Chapter 08: Expert systems and their applications.
- Expert systems -
Fuzzy expert systems -
Application to decision-making -
Application to diagnosis

Machine Translated by Google

Assessment methods:

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

Content of the practical work:

TP 01: Introduction to fuzzy logic.
TP 02: Artificial neural networks.
TP 03: Adaptive networks and neuro-fuzzy networks.
TP 04: Genetic algorithms.
TP 05: Particle swarm optimization algorithm.
TP 06: Expert systems and probabilistic reasoning.

Bibliographic references:

1. PA Bisgambiglia, Fuzzy logic and its applications, Hermès-science
2. H. Buhler, Fuzzy Logic Control, PPR
3. HeikkiKoivo, Soft computing
4. DR Hush & BG Horne,"Progress in Supervised Learning Neural Networks," IEEE signal proc. magazine, Vol.10, No.1, pp.8-39, Jan. 1993.
5. B. Kosko, “Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence," Englewood Cliffs, NJ: Prentice-Hall, 1992.
6. LXWang, “Adaptive Fuzzy Systems & Control: Design & Stability Analysis”: Prentice-Hall, 1994.
7. David E. Goldberg, Genetic Algorithms, Edit. Addison Wesley, 1994.
8. Hansrued IBühler, “Fuzzy Logic Control”
9. Pierre-yves Glorennec, “Learning algorithms for fuzzy inference systems”
10. P. Borne, J. Rozinoer, J.-Y. Dieulot, L. Dubois, “Introduction to fuzzy control”
11. Bernadette Bouchon-Meunier, Laurent FOULLOY, MOHAMMED RAMDANI, “Logic fuzzy. Corrected exercises and application examples »
12. BERNADETTE BOUCHON-MEUNIER, “Fuzzy logic and its applications”
13. Hung T. NGUYENNADIPURAM R. PRASAD, CAROL L. WALKER • ELBERT A. WALKER, “A First Course in Fuzzy and Neural Control”
14. FAKHREDDINE O. KARRAY, CLARENCE DE SILVA, “Soft computing and intelligent systems design. Theory, tools and applications »
15. PIERRE. BORNE, MOHAMED BENREJEB, JOSEPH HAGGÈGE, “Neural networks. Presentation and applications”
16. BEGHDADI HADJ ALI, SENOUCI MOHAMED, “Neural Networks: Theory and practical "
17. G. DREYFUS, J. –M. MARTINEZ, M. SAMUELIDES, MB GORDON, F. BADRAN, S. THIRIA, L. HERAULT, “Neural networks. Methodology and applications”
18. LÉON PERSONNAZ,ISABELLE RIVALS, “Formal neural networks for modeling, control and classification »
19. CHRISTINE SOLNON, “Optimization by ant colonies”
20. NICOLAS MONMARCHE, FREDERIC GUINAND, PATRICK SIARRY “Artificial Ants 1. From the basics of optimization to industrial applications”
21. STUART RUSSELL, PETER NORVIG, “Artificial Intelligence, with more than 500 exercises »

Machine Translated by Google

22. JOHANN DREO, ALAIN PETROWSKI, PATRICK SIARRY, ÉRIC TAILLARD, "Metaheuristics for Hard Optimization: Simulated Annealing, Taboo Search, Evolutionary Algorithms and Genetic Algorithms, Ant Colonies"
23. PATRICK SIARRY ET ALL, “Metaheuristics: Simulated Annealing, Taboo Search, Variable Neighborhood Search, GRASP Methods, Evolutionary Algorithms, Artificial Ants, Particle Swarms, and Other Optimization Methods ”

HALF	Subject title	Coefficient	Credits	Code
S9	**Monitoring and diagnosis of electrical systems**	3	5	**SEI 9.3**

VHS	Course	Practical work	Practical work
67h30	1h30	1h30	1h30

Prerequisites:
Electrical machines, Electrical circuits, Signal theory, Numerical analysis

Machine Translated by Google

Goals :

Diagnosis is the reasoning leading to the identification of the cause (origin) of a failure, of a problem or anomaly. This course allows you to become familiar with diagnostic tools industrial failures based on knowledge of the symptom(s) to determine the cause(s). The course is divided into a set of chapters that enrich the student's skills in the use of diagnostic techniques and analytical skills when faced with problem situations while having the necessary tools for establishing a rigorous and effective approach. This subject will allow the student to acquire essential knowledge for avoiding breakdowns in the interests of reliability and continuity of service in an electrical installation.

Teaching content:

Chapter 1: Introduction to Fault Diagnosis Techniques

Definitions: What is the purpose of a diagnosis, Normal operation, Breakdown and fault, Failure, Disturbance, Residual, Detection, Fault localization, Fault identification, Signature, Monitoring, Supervision. Diagnostic methodology: How to make a diagnosis?, Logical steps of a fault search, Localization of the defective element de-energized and energized, Diagnosis and search for the cause. Intervention methodology: Permanent monitoring, Inspection, Replacement of the defective element and verifications, Intervention report, Fault classification: Location, Modeling, Temporal characteristics, Monitoring using models: Physical redundancy (hardware), Analytical redundancy, Fault detection and isolation (FDI), Principle of diagnosis: Diagnostic architecture, Generation of model-based residues: Obtaining signature tables, Model-based diagnostic methods, State observer-based approaches

Chapter 2: Fault Diagnosis Tools

Sensors, Signal Visualization, Signal Processing, Spectral Analysis: Tools and Techniques.

Chapter 3: Inspections, directives, interventions

Specificity of industrial installations in terms of inspections, Diagnosis of control and power equipment, Use of manufacturer data and reference values,
Control of the degradation curve and situation of operating thresholds

Chapter 4: Preventive maintenance of equipment

Reading electrical diagrams composed of power, control and/or remote control circuits.
Periodic check of connector tightening, condition of conductors, and overheating.
Control of leakage currents, nominal intensity, voltage.

Chapter 5: Diverse practical case studies

Motor, conveyor, control system.

Chapter 6: Introduction to diagnosis using intelligent methods

Expert systems, State graphs, Fuzzy logic, Neural networks, Genetic trees, etc.

Practical work

TP No. 1: Fault diagnosis tools in the case of permanent monitoring of a system electric
TP No. 2: Diagnosis of control and power equipment

Machine Translated by Google

TP No. 3: Vibration analysis of rotating machines with establishment of technical data sheet for exploitation is in maintenance

TP No. 4: Analysis of lubricants for rotating machines with preparation of a sheet technique to be used in maintenance

TP N°5: Application of intelligent fault diagnosis techniques in cases of multi-symptoms and multi-causes

Assessment methods:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references :

1. J. Montmain, J. Ragot, D. Sauter, Supervision of complex processes, Lavoisier, 2007.

2. L. Ljung, Systems Identification: theory for the User. Prentice-Hall, 2nd edition, 1999.

3. PSR Murty, Power System Analysis, BS Publications, 2007.

4. Brown D, Harrold D, Hope R, Control System Power and Grounding Better Practice, Elsevier, 2004.

5. G. Cullman, Elements of Informational Calculation, Library of the Electrical-Mechanical Engineer. Ed. Albin Michel.

6. JD Glover, MS Sama, TJ Overbye, “Power Systems Analysis and Design”, 4th Edition, Thompson-Engineering.

7. Robert Radvanovsky and Jacob Brodsky, Handbook of SCADA/Control Systems Security, Second Edition, CRC Press; 2016.

HALF	Subject title	Coefficient	Credits	Code
S9	**Smart electrical systems**	3	5	**SEI 9.4**

VHS	Course	Practical work	Practical work
67h30	1h30		3:00 a.m.

Prerequisites:

Knowledge of industrial installations. Knowledge of automated systems. Knowledge of industrial monitoring.

Goals :

The objective of the subject is to understand industrial electrical systems in terms of intelligence, and to facilitate the understanding of intelligent solutions in industry and integration methodologies. Indeed, technological development has favored the realization of intelligent structures, namely intelligent buildings and intelligent electrical networks. Thus, the student, through this subject, will have the opportunity to explicitly understand intelligence in the tertiary sector and to participate in its design.

Teaching content:

Chapter 1: Basic notions of the intelligence of tertiary installations.

Chapter 2: Presentation of intelligent systems in industry.

Machine Translated by Google

Chapter 3: Integration of smart solutions in the building.

Chapter 4: Smart Grids

Chapter 5: Intelligence and Security.

Chapter 6: Intelligence and Supervision System

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

Bibliographic references :

1. Schneider Electric and Legrand technical notebooks.

2. “Build Your Own Smart Home”, Robert C. Elsenpeter Toby J. Velte, , 2003 by The McGraw-Hill

3. Legrand practical guide, 2010 4.

“Automatic fire detection” installation rule APSAD 2003 5. Legrand safety guide

“Emergency lighting and fire alarm systems”
2005.

6. “Smoke Extraction: Concepts and Regulations Around the World” L GUENFAF, Ed les pages Bleux 2020

7. “Building Management System” Siemens

8. “TECHNICAL BUILDING MANAGEMENT The KNX protocol for optimal energy performance ” Christophe Lavergne, Marc-Antoine Micaelli,
Ed DUNOD 2017

Machine Translated by Google

HALF	Subject title	Coefficient	Credits	Code
S9	**Power Electronics Design**	3	5	**SEI 9.5**

VHS	Course	Practical work	Practical work
67h30	1h30		3:00 a.m.

Prerequisites:
Fundamental knowledge of power electronics and microcontrollers

Goals :
The power electronics design engineer studies, designs, and develops all or part of the power electronics components. He or she proposes and justifies the most innovative/high-performance solutions from a technical and economic perspective, in accordance with the client's specifications and their objectives in terms of cost, quality, safety, and environmental friendliness.

Teaching content:

Chapter 1 : Modern Power Semiconductor Devices with Control Circuits

Chapter 2: Advanced DC/DC and DC/AC Power Conversion Topologies

- Interface with the AC/DC electrical network

Machine Translated by Google

- Multilevel converters
- Resonant converters
- Switching power supplies

Chapter 3: Analysis and synthesis of converter control methods

Chapter 4: Hardware/software integration of control, command and power systems.

Chapter 5: Converter Monitoring and Diagnostics

Chapter 6: Modeling Converters

— Quasi-stationary models —
Dynamic models.

Chapter 7: Design of converters in various application fields (DC/DC converter, DC/AC converter, resonance converters, etc.)

Assessment methods:

Continuous assessment: 40%; Exam: 60%.

Bibliographic references :

1. Frede Blaabjerg; Control of power electronic converters and systems. ISBN: 9780128194331

2. Ned Mohan; Power electronics. ISBN: 0-471-30576-6

ULL; High-Power Drives Converters and AC

Simone Buso, Paolo Mattavelli; Digital Control in Power Electronics, Morgan and Claypool Publishers, 2015

3. Remus Teodorescu; Grid converters for photovoltaic and wind power systems. ISBN:978-0-470-05751-3

Muhammad H. Rashid; Power electronics circuits, devices, and applications. ISBN: 0-13-122815-3

4. J. Montmain, J. Ragot, D. Sauter, Supervision of complex processes, Lavoisier, 2007.

Machine Translated by Google

HALF	Subject title	Coefficient	Credits	Code
S9	**Facility design BT**	2	3	**SEI 9.6**

VHS	Course	Practical work	Practical work
45h00			3:00 a.m.

Prerequisites:

• Have knowledge of electrical equipment and current electrical standards, • Mastery of the PC environment and Microsoft Windows tools

Goals :

The evolution of technology and the complexity of projects require the designer of low-voltage electrical installations to use software for the design of low-voltage installations. The objective of this module.

ÿ Reminder of the basics of designing low-voltage electrical installations.
ÿ Master the basic functionalities of software for designing electrical installations low voltage (example Caneco BT).

Teaching content:

ÿ Objectives of low voltage electrical design.
ÿ Reminder of standard electrical parameters.
ÿ Reminders on hardware technology and electrical symbols.
ÿ Electrical regulations and standards.
ÿ Neutral regimes.
ÿ The methodology Design of low voltage electrical installations.
ÿ Power balance and determination of the operating current IB.
ÿ Determination of the In ratings of the circuit breaker triggers.
ÿ Determination of cable sections.

Machine Translated by Google

- ÿ Determination of voltage drop.
- ÿ Determination of short-circuit currents.
- ÿ Choice of protective devices.
- ÿ Selectivity of protections.
- ÿ Implementation of the filiation technique.
- ÿ Optimization of the selectivity of protections.
- ÿ Selectivity reinforced by coordination.
- ÿ Verification of the protection of people.
- ÿ Reactive energy compensation.
- ÿ Introduction to harmonic disturbances.
- ÿ Master the basic functionalities of software for designing electrical installations Low Voltage.
- ÿ Application exercises and final synthesis exercise.

Assessment methods:

Continuous assessment.

Bibliographic references :

1. J. Marie BROUST, Industrial electrical equipment and installations, Dunod, Paris, 2008.
2. A. BIANCOTE and P. BOYE, 1, Standardized construction in electrical engineering, Volume Delagrave, July 1997.
3. C. PREVE and R. JEANOTE, Electrical Network Design Guide industrial``, Technical Report, Schneider Electric No. 68883 427/A, February 1997.
4. S. LOGIACO, “Safety studies of electrical installations”, Technical notebook No. 184, Schneider Electric, January 1999.
5. The Great, Technical Guide, Coordination between protection devices``, Technical report, January 2015.
6. Schneider Electric, 7. BT and HTA Distribution Guide, Technical Report, 2012.
Technical Union of Electricity and Communication (UTE), low-voltage electrical systems, Facilities December 2002.
8. The Great, Power Guide, Distribution and power up to 4000A ``, Report technique, 2007 Edition

Machine Translated by Google

HALF	Subject title	Coefficient	Credits	Code
S9	**Documentary research and dissertation design**	1	1	**SEI 9.7**

VHS	Course	Practical work	Practical work
10:30 p.m.	1h30		

Prerequisites:
Basic computer tool

Goals :
Know how to collect informative data using interfaces and bibliographic databases, master the tools necessary for effective information research. Know how to verify that the information is valid and useful for its use in an educational and scientific document. Show the importance of citation and respect for the work of others. Know how to present the work carried out in an adequate, educational and scientific manner.

Teaching content:

Chapter 1: Identifying the Research Topic
Analysis of the research topic, translation of concepts into keywords, meaning of terms, linguistic definition, information sought.
Chapter 2: Types of resources and sources of information
Resources : library catalogs, bibliographic databases, search engines (interface)

Sources: Reference works (dictionaries, thesauri, encyclopedias, manuals, etc.), monographs (books), periodicals, electronic documents, websites, etc.
Chapter 3: Location of documents
Search question, search operators, search equation, engines and meta-engines
research, formalization of research, specificities of search engines
Chapter 4: Information Processing
Evaluation of documents, synthesis of selected documents, links between different parts, final plan
and organization of documentary research
Chapter 5: Bibliography and plagiarism References Systems for presenting a bibliography (Harvard system, Vancouver system, mixed system, etc.) and citation of sources
Chapter 6: Plan and stages of the dissertation

Machine Translated by Google

Cover page, useful sections (acknowledgments, table of abbreviations, list of figures, etc.), Introduction, methodology, results, discussion, recommendations, conclusion and perspectives, table of contents, bibliography, appendices.

Chapter 7: Writing Techniques and Standards

Formatting and numbering titles, typography and punctuation, writing, scientific language, style, grammar, syntax, spelling, saving, securing and archiving data.

Chapter 8: Workshop:

Critical study of a manuscriptPresentation of a poster, presentation of oral communication, defense of a thesis,

Chapter 10: Tools and

software for writing Word processing, equation editors, automatic management of the bibliography, etc.

Assessment method:

Final exam: 100%

Bibliographic references :

1. Guide for writing bibliographic references in ISO-690 style, ISARA – La Source Documentation Center – 2019-2020, iso 690 reference guide.pdf (umc.edu.dz)
2. Maryse Gagnon, Francis Farley-Chevrier, “Guide to Documentary Research”, Presses de lÿUniversité de Montréal, 2004.
3. Philippe Accard, “Dissertation Writing Methodology Course - 2020/2021”, HAL Id: hal-02988035 https://hal.uvsq.fr/hal-02988035, Submitted on 4 Nov 2020. Dissertation Writing Methodology Course - 2020/2021 (uvsq.fr)

Machine Translated by Google

HALF	Subject title	Coefficient	Credits	Code
S9	**Industrial hygiene and safety**	1	1	**SEI 9.8**

VHS	Course	Practical work	Practical work
10:30 p.m.	1h30		

Prerequisites: Basic knowledge of electrical safety

Goals :

To prepare future engineers capable of understanding the general principles of industrial hygiene and safety, particularly in the field of electrical engineering. The main focus is on aspects relating to the work environment, risk and nuisance management, and the prevention of health and safety at work.

Teaching content:

1. Organization of security at the company level.
2. Work environment – Ergonomics 3. Risk prevention 4. Electro-pathology
5. Standardized data on human electrical safety 6. Consequences of direct and indirect contacts in the different neutral systems
7. Causes and prevention of accidents 8. First aid 9. Qualification 10. Labor legislation and rights.

Assessment method:

Final exam: 100%

Bibliographic references :

[1] Technical documentation, http: //biblio.enp.edu.dz
[2] R. Choquet, “Electrical safety – Prevention techniques”, Dunod, 1984.
[3] M. Babin, “Health and safety at work”, Lamy (sa), 2011.
[4] G. Gibeault, O. Gauthey, X. Bernard, “The keys to health and safety at work - Principles and management methods”, AFNOR, 2004.
[5] M. Noulin, “Ergonomics”, Octarès, 2002.
[6] B. Péribère, “The guide to safety at work. The manager’s tools”, Afnor, 2013.
[7] C. Conseil, “Manager - Health and safety at work, For a human approach to risk prevention”, Dunod, 2013.

[8] F. Gillet-Goinard, “The Health-Safety-Environment Toolbox” – 2nd Edition, Dunod, 2013.

Machine Translated by Google

IV- Agreements / Conventions

Machine Translated by Google

STANDARD LETTER OF INTENT

(In the case of specialized engineering training co-sponsored by another university establishment)

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

Subject: Approval of co-sponsorship of specialized engineering training entitled: Systems
Industrial Electrical

Allow us to address this specialty to you in the electrotechnical engineering program with an option in Industrial Electrical Systems, given that this sector is based on a strong demand for employability in several companies, notably SONELGAZ and SONATRACH, as well as several public and private companies. The department in question is equipped with sufficient materials, research laboratories and appropriate personnel to provide this training.

The university has signed several partnership agreements to handle student internships.

The university hereby declares that it co-sponsors the above-mentioned specialized engineering training throughout the training accreditation period.

To this end, the university will assist this project by:

- Giving his point of view in the development and updating of teaching programs,

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

SIGNATURE of the legally authorized person:

FUNCTION :

Date :

Machine Translated by Google

Conventions

N° 06 2021 exp: 2026

الجمهورية الجزائرية الديمقراطية الشعبية
République Algérienne Démocratique et Populaire

سوناطراك
sonatrach

Société Nationale pour la Recherche, la production le Transport, la Transformation et la Commercialisation des Hydrocarbures

Université Frères MENTOURI CONSTANTINE1

N° 06/2021

CONVENTION CADRE DE COOPERATION

DANS LES DOMAINES DE LA RECHERCHE SCIENTIFIQUE ET DU DEVELOPPEMENT TECHNOLOGIQUE

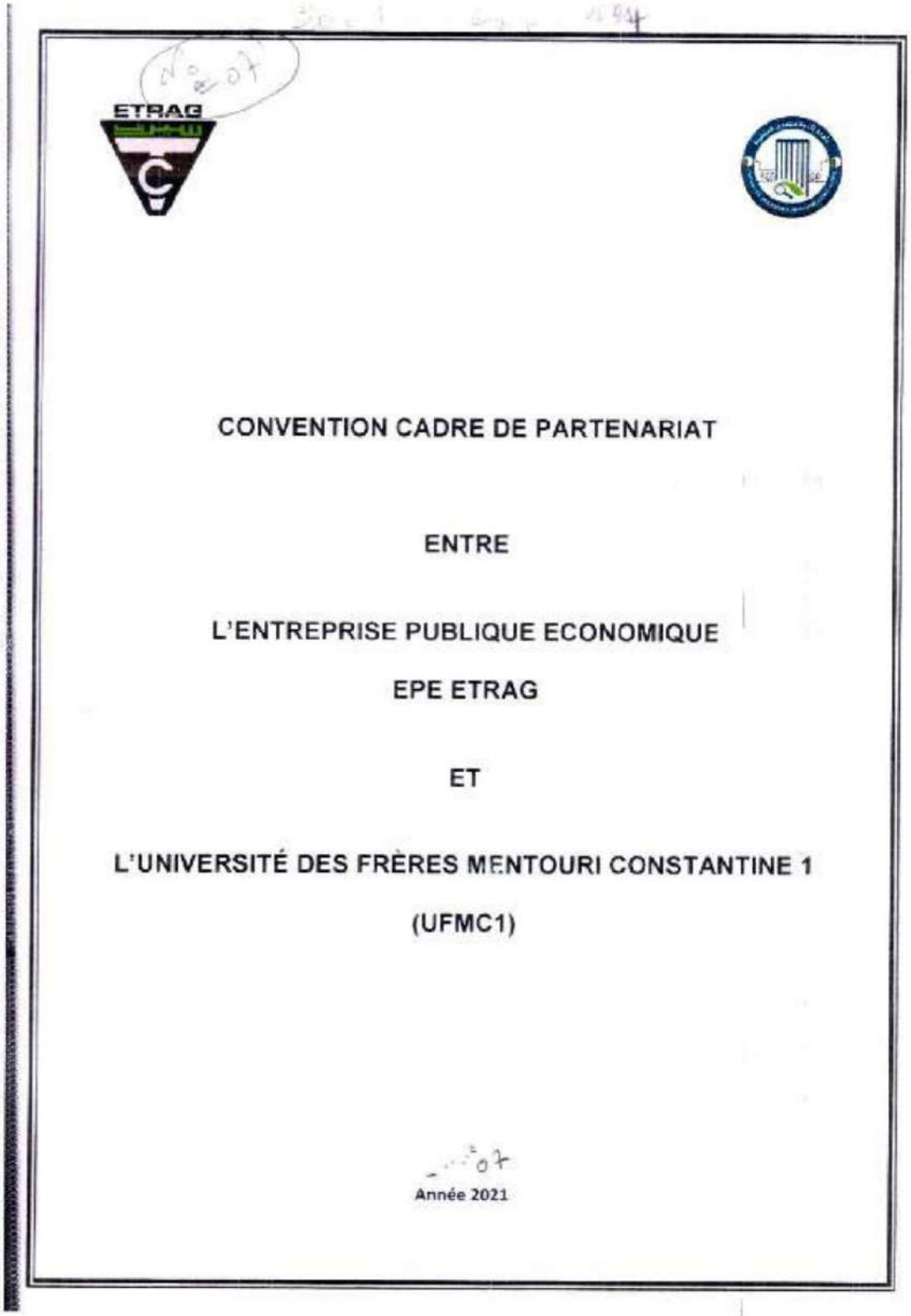
LA SOCIETE NATIONALE POUR LA RECHERCHE, LA PRODUCTION, LE TRANSPORT, LA TRANSFORMATION ET LA COMMERCIALISATION DES HYDROCARBURES SONATRACH

Et

L'UNIVERSITE FRERES MENTOURI CONSTANTINE 1
MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET LA RECHERCHE SCIENTIFIQUE

CONVENTION CADRE DE COOPERATION ENTRE SONATRACH ET UNIVERSITE DE FRERES MENTOURI CONSTANTINE 1

Machine Translated by Google



CONVENTION CADRE DE PARTENARIAT

ENTRE

L'ENTREPRISE PUBLIQUE ECONOMIQUE

EPE ETRAG

ET

L'UNIVERSITÉ DES FRÈRES MENTOURI CONSTANTINE 1

(UFMC1)

Année 2021

Machine Translated by Google

Ministère de l'Enseignement Supérieur
et de la Recherche Scientifique
Université des Frères Mentouri Constantine

n° 18

OAIC

CONVENTION CADRE DE PARTENARIAT

ENTRE

L'UNIVERSITÉ DES FRÈRES MENTOURI CONSTANTINE

ET

L'OFFICE ALGÉRIEN INTERPROFESSIONNEL DES CÉRÉALES (OAIC)

Année 2022

Machine Translated by Google

N°14

الشعبية الديمقراطية الجزائرية الجمهورية

République Algérienne Démocratique et Populaire
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique

CONVENTION CADRE DE COOPÉRATION

Entre

L'entreprise SARL **RAMY MILK**,
dont le siège social est sis, Zone industrielle Rouïba et représentée par Monsieur : MAOUCHI ABD ELHAKIM, en qualité de gérant, ayant tous les pouvoirs à l'effet de la présente convention.

Et

L'Université Frères Mentouri Constantine 1
Sis, Route de Ain El Bey, représentée par le Professeur **Benchohra CHOUL** recteur de l'Université, ayant tous les pouvoirs à l'effet de la présente convention.

Machine Translated by Google

V - Opinions and Visas of the Administrative and Consultative Bodies

Training title: Electrical Engineering option (specialty):
Industrial Electrical Systems

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

Machine Translated by Google

VI – Notice and Visa of the Regional Conference

- CPND-ST visa -

(National Educational Committee for the field of science and technology)

FAVORABLE OPINION

TRAINING OFFER

STATE ENGINEER (ST course)

Sector: Electrical engineering

Title: Industrial Electrical Systems

- University of CONSTANTINE 1 -

Algiers, August 17, 2024

وزارة التعليم العالي و البحث العلمي
اللجنة البيداغوجية الوطنية لميدان العلوم و التكنولوجيا
CPND ST

رئيس اللجنة البيداغوجية الوطنية
لميدان العلوم و التكنولوجيا
الأستاذ: إسعدي رشيد

Machine Translated by Google