

REPUBLIQUE DU CAMEROUN

MINISTÈRE DE L'ENSEIGNEMENT SUPERIEUR

REPUBLIC OF CAMEROON

MINISTRY OF HIGHER EDUCATION



CAMEROON HIGHER NATIONAL DIPLOMA TRAINING PROGRAM

Volume 7

QUATERNARY SECTOR

September 2018

QUATERNARY SECTOR

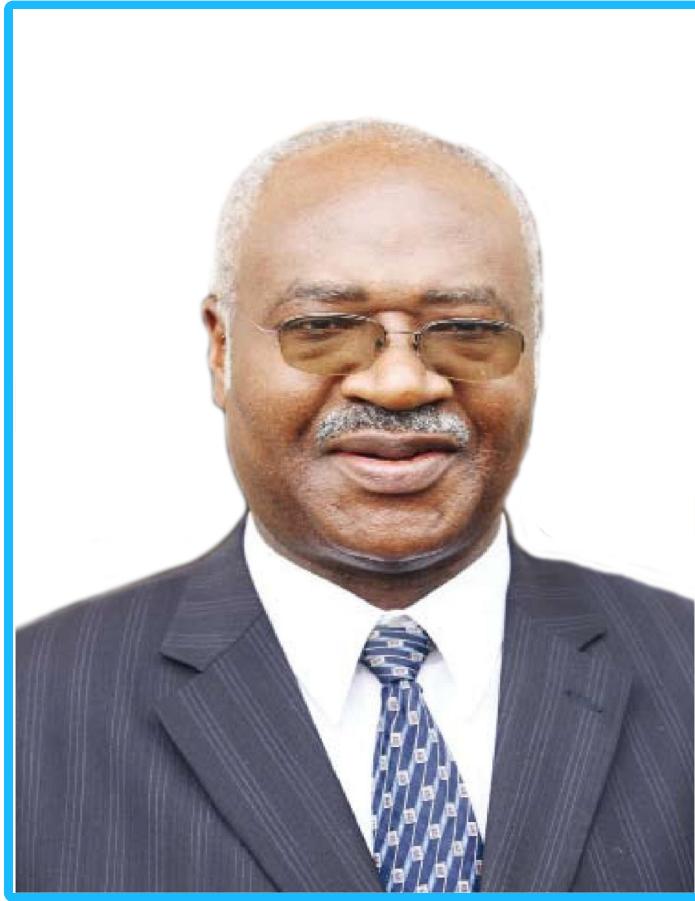
VOLUME 7





H.E. PAUL BIYA
President of the Republic of Cameroon,

"We need to radically transform the image of higher education in Cameroon"
(10th February 2008)



H.E. PHILEMON YANG
Prime Minister, Head of Government,

"In Higher Education, the Government is striving not only to increase and diversify training offers for the Cameroonian youth, but also to ensure quality, social relevance and professionalization of teachings. Furthermore, it is providing better working and living conditions to the members of the university community"

(26th November 2013)



Prof. JACQUES FAME NDONGO

**Minister of Higher Education,
Chancellor of Academic Orders**

"We must translate into reality the new vision of the University prescribed by the Head of State through far-reaching changes that seek, amongst other things, the improvement of the quality of university services in the areas of teaching and research, to make our universities more attractive and competitive at the national, sub-regional and international levels"

(Excerpt of the New Year Wishes Speech
at the University of Yaounde I, January 2010)

FOREWORD

Since November 2015, the Ministry of Higher Education has undertaken a vast and ambitious operation to review training programmes in the Brevet de Technicien Supérieur (BTS) and Higher National Diploma (HND) cycles. This initiative was incumbent on us as a categorical imperative since it became obvious that the programmes that were so far implemented had become obsolete because of the exponential evolution of the labour market.

If we recall that the programmes in question dated, most of them, as far back as 2001 and that they were developed as institutions and fields of study were set up, one easily understands why their review had become a must. Moreover, the advent of the BMD introduced innovations in our training and certification process that needed to be taken into account, especially as many BTS and HND holders now aspire to register in professional Bachelor's and Master's Degrees.

In order to reconcile this professional requirement with the legitimate need of students to pursue their academic programmes, we requested the support of three main stakeholders : representatives of the business world, teachers-experts from our universities and professional schools, proprietors/proprietresses of Private Institutions of Higher Education.

These three major stakeholders had the opportunity to brainstorm during the two (02) seminars we organized, the first took place on 28th November 2015 and the second on 16th march 2018, at the National Advanced School of Engineering of Yaounde I. The programmes that we are now putting at the disposal of the national university community is the fruit of their deliberations.

We can thus note that, thanks to this brainstorming, new fields of study emerged, others have been redesigned, while others have disappeared altogether, either because the labour market was already saturated, or because they had become inoperative. Trainings identified have been organized according to sectors of activity known to date : primary, secondary, tertiary and quaternary. Within these sectors, they have been divided into training areas, fields of study and specialties. We therefore have 7 major training areas, 21 fields of study and 130 specialties. These training areas have been grouped in a programme-document in 7 volumes, distributed as follows :

Volume 1 : Trainings of the Primary Sector (461 pages) ;

Volume 2 : Trainings of the Secondary Sector (356 pages) ;

Volume 3 : Trainings of the Secondary Sector (Continued) (514 pages) ;

Volume 4 : Trainings of the Tertiary Sector (627 pages) ;

Volume 5 : Trainings of the Tertiary Sector (Continued) (784 pages) ;

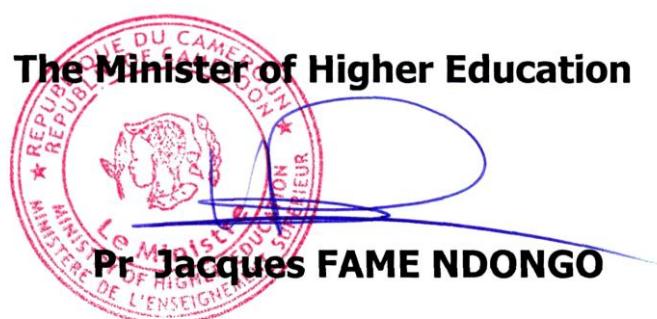
Volume 6 : Trainings of the Tertiary Sector (Continued) (572 pages) ;

Volume 7 : Trainings of the Quaternary Sector (246 pages).

The seven volumes put together make a total of three thousand five hundred and sixty (3560) pages, preceded by a statutory instrument to determine the system of studies and examinations of the Brevet de Technicien Supérieur.

All this arsenal is proof, if any were needed, that our educational and certification system is resolutely embarked on the quest for its effectiveness and social relevance. It is attentive to all innovations and adapts to the developments of our society.

Through this approach, we hope to meet the expectations of our partners and provide the nation with skills that it needs to achieve her emergence by 2035.



Order No. 18 - 00 86 6 /MINESUP/SG/DDES OF 102 NOV 2018 ESTABLISHING THE SYSTEM OF TRAINING, ASSESSMENTS AND SYLLABI FOR OBTAINING A HIGHER NATIONAL DIPLOMA (HND) IN THE REPUBLIC OF CAMEROON.

THE MINISTER OF HIGHER EDUCATION,

- Mindful of the Constitution.
- Mindful of law No. 2001/005 of April 16th, 2001 on the orientation of Higher Education.
- Mindful of decree No. 2011/408 of December 9th, 2011 to organize the government.
- Mindful of decree No. 2012/433 of October 1st, 2012 to organize the Ministry of Higher Education.
- Mindful of decree No. 93/026 of January 19th, 1993 to create Universities.
- Mindful of decree No. 93/027 of January 19th, 1993 laying down common provisions in state Universities modified and completed by decree No. 2005/345 of September 10th, 2005.
- Mindful of decree No. 2001/882/PM of September 10th, 2001 setting common rules applicable to the private institutions of Higher Education.
- Mindful of Order No. 99/005/ MINESUP/DDES OF November 16th, 1999 to give the general depositions applicable to the organization of studies and the evaluation of State Universities of Cameroon.
- Mindful of Order No. 00/0007/MINESUP/SG/DDES/CJ of February 2nd, 2000 to create the National commission of Organization of the Higher National Diploma (HND) Examination.
- Mindful of Order No. 01/0014/MINESUP/DDES of February 26th, 2001 organizing the study schemes and evaluations and setting the study programme fields of the HND in the Republic of Cameroon.

ORDERS:

SECTIONI: GENERAL PROVISIONS

Article 1: This Order deals with the organization of studies, assessments and syllabi of the Higher National Diploma, abbreviated "HND" in Cameroon.

Article 2:(1) The HND is a national certificate of higher education which certifies an academic and technical qualification in two years or four semesters of study after the acquisition of the Baccalaureate Certificate or General Certificate of Education, Advanced Level.

(2) It certifies that the graduate can hold a position of a senior technician and can use his / her knowledge and skills to improve upon himself / herself or pursue university studies in his/her field of study.

(3) The HND shall indicate the sector, the field and the professional specialty in accordance with the training pursued by its holder;

Article 3:(1) The HND is defined by a standard that is characteristic of the professional and cross-disciplinary skills required to obtain it.

(2) The standard referred to in paragraph (1) of this article is defined by domain and for each field by an order from the Minister of Higher Education. It lists the abilities that the diploma holders must have, specifies the knowledge and skills that must be acquired and indicates the requirements needed to obtain the certificate.

Article 4: Only public or private institutions of higher education duly authorized by the Minister of Higher Education can provide courses preparing candidates for the HND.

SECTION II: THE ORGANIZATION OF STUDY

Article 5:(1) Studies for the HND must last two (2) academic years or four (4) semesters after acquisition of the Baccalaureate certificate, the General Certificate of Education, Advanced Level or any diploma or certificate deemed equivalent pursuant to Article (2) above at the end of Secondary Education.

(2) However, some training programmes may require one year of preparation or upgrading, without any modification of the academic base set in Article (2) above.

(3) Where necessary, a specific text of the Minister of Higher Education shall specify the training programmes referred to in paragraph (2) of this article.

Article 6: (1) The academic year is subdivided into two (02) semesters. A semester consists of fourteen (14) to sixteen (16) weeks dedicated to teaching and assessment.

(2) Each semester ends with an examination session comprising a regular session and a resit session open to students who fail in the regular session under conditions set by regulatory texts.

Article 7: (1) Courses taught in Higher Education Institutions are organised following a structured programme.

(2) One semester has seven (7) Courses (C) with a total of 30 credits.

(3) A Course is an identifiable group of objectives and outcomes called Constituent Elements (CEs) that are scientifically coherent and specific. Each Course has a value defined in number of adjustable credits based on the pertinence of the Constituent Elements.

(4) The Constituent Elements of a CU (CECU) comprise several forms of teaching: Lectures (L), Practical work (P), Tutorials (T), Student's Personal Work (SPW); activities applied in the form of internships in companies, projects, (remove) or end-of-study projects.

Article 8: (1) Credit is a value or unit that is used to quantify the total workload required for the student to achieve the training objective of a CU. The number of credits allocated to each semester is thirty (30) for all the CUs of the semester. The number of hours to be taught for a credit is fifteen (15) hours spread weekly in one semester.

(2) The credits are only obtained after work has been carried out, after an appropriate assessment either during a semester, or during a year, or at the end of the course.

Article 9: (1) The courses are structured into compulsory Courses and Elective courses.

(2) The compulsory CUs are the set of CUs that students enrolled in an HND cycle must offer. They constitute (90%) of credits of all the CUs of the training and (100%) of credits of the

official program published by the Minister of Higher Education and required for the National Examination. They are divided into three categories:

- The compulsory CUs linked to the discipline or disciplines corresponding to the field, representing (30%) of the overall hours taught and credits allocated to the compulsory CUs.

- Professional CUs organized around technical and professional contents representing (60%) of the overall hours taught and credits allocated to the compulsory CUs.

-Cross-discipline CUs linked to complementary training in different domains, representing (10%) of the hours taught and compulsory CU credits.

(3) Elective CUs organised by each institution per its specificity, allowing the student to deepen his specialization or explore to other fields of knowledge.

Article 10: The Higher National Diploma cycle is done in four (04) semesters. The hours taught for a lecture credit is 15 hours, a total of 30 credits per semester consist of 450 hours of courses per semester. There is a total of 120 credits making 1800 hours of lectures for all the training in 2 years, distributed as follows per semester:

- a) Fundamental courses; 2 CU, 9 credits, 135 hours.
- b) Professional courses; 4 CU, 18 credits, 270 hours.
- c) Cross-discipline courses; 1 CU, 3 credits, 45 hours

Article 11: The teaching of French and English is compulsory throughout the training in accordance with the national decision on bilingualism. Likewise, the teaching of civics and ethical education is recommended throughout the training cycle.

Article 12: The student is enrolled in a specialisation that he/she keeps throughout his/her training. He /She takes the cross-disciplinary lessons in general including classical aspects of the training.

Article 13: Practical lessons constitutes a decisive phase and is an indispensable base of the training.

SECTION III: INTERNSHIP IN A PROFESSIONAL MILIEU

Article 14: Each specialisation includes practical internships in companies. All HND candidates must complete an internship in a professional setting in one or more companies in the sector corresponding to their training.

Article 15: The internship in a professional setting aims at complementing the training of the candidate through the experience of professional practices corresponding to the skills required. It also allows the student to acquire qualities of rationality, professional aptitude and behaviours, and to develop a sense of responsibility by gradually adapting to the requirements of the job.

Article 16: (1) Internship in a professional setting is organized throughout the training leading to the HND. It constitutes an important and essential part of the student's training.

(2) No special provision may exempt an HND candidate from the obligation of carrying out an internship in a professional setting, referred to in paragraph (1) of this Article.

Article 17: (1) The search for companies or establishments to receive trainee students and the negotiation of the contents of the internship are carried out jointly by the student and the persons in charge of his/her training institution.

(2) The student's training institution is responsible in its entirety for the organisation of internship periods, their monitoring and their educational content.

(3) At the end of the internship, the candidate must produce an internship report.

(4) The institution must take all steps to find an internship for the student when the latter reports with evidence that his/her attempts to find an internship were unsuccessful.

Article 18: Internship in a professional setting is a Professional Course whose objectives and outcomes are considered in the assessments.

SECTION IV: TRAINING PROGRAM

Article 19: - The training to obtain the HND is structured into Sectors, Domains, Fields, Specialities and Options:

- A Sector consists of Domains;
- A Domain consists of Fields;
- A Field consists of Specialities from the same work-related group.
- A Speciality is a grouping of subjects forming a job profile required by the labour market.
- A Speciality may consist of options.

Article 20: The different sectors are as follows:

- Primary sector;
- Secondary sector;
- Tertiary sector;
- Quaternary sector.

Article 21: These sectors consist of the following domains:

-The primary sector includes the agro-pastoral domain, and the Water and Environmental domain.

-The secondary sector includes Industry and Technology.

-The tertiary sector includes the domains of Commerce, Management, Law, Tourism, Hospitality, Social Sciences, and Health.

-The quaternary sector includes the domains of Information and Communication Technologies

Article 22: (1) The following specialities are open in the following domains:

PRIMARY SECTOR

DOMAIN: AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Field: Agricultural And Food

Sciences

Specialties

- 1- Agricultural Engineering
- 2- Food Technology
- 3- Animal Production Technology

- 4- Crop Production Technology
- 5- Fisheries Management
- 6- Agro-pastoral adviser
- 7- Agro pastoral Entrepreneurship
- 8- Agricultural Business Technics
- 9-Aquaculture
- 10-Agricultural Production Technology

Field : Environmental Sciences

Specialties

- 1-Agro-Forestry and Forest Management
- 2- Nature Management and Protection
- 3-Risk Management
- 4-Pollution Prevention and Remediation
- 5- Meteorology
- 6- Solid Waste Management
- 7- Wildlife Management
- 8-Environmental Impact Assessment
- 9-Forest Engineering

Field :Water Engineering And

Management

Specialties

- 1- Hydrology and Water Resources Management
- 2-Hydrogeology and Groundwater Management
- 3- Waste Water Management
- 4-Hydraulic Engineering and Water Infrastructure
- 5-Integrated Water Resource Management

SECONDARY SECTOR

DOMAIN: ENGINEERING AND TECHNOLOGY

Field: Civil Engineering

Specialties

- 1-Civil Engineering Technology
- 2- Topography
- 3-Urban Planning
- 4-Geotechnics
- 5-Sanitary Installation and Plumbing
- 6- Building Science and Technology
- 7- Wood Works
 - Options: 7-1-Carpentry
 - 7-2- Joinery And Cabinetmaking
- 8- Real Estate Maintenance

**Field:Mechanical
Engineering
Specialties**

9- Roads and Civil Engineering

- 1-Metal Construction
- 2-Mechanical Manufacturing
- 3-Mechanical Construction
- 4- Boiler making and Welding

**Field:Chemical
Engineering
Specialties**

- 1-Chemical Manufacturing
- 2-Chemical Process Technology
- 3-Chemical Laboratory Technology

**Field:Biological
engineering
Specialties**

- 1-Agricultural Biotechnology

**Field: Electrical and
Electronic Engineering
Specialties**

- 1-Electronics
- 2-Electrotechnics
- 3-Electrical Power System
- 4- Maintenance of Industrial system
- 5-Maintenance of Biomedical Equipment
- 6-Control Instrumentation and Regulation

**Field : Thermal and
Energy Engineering
Specialties**

- 1-Air conditioning and Refrigeration
- 2-Sustainability and Renewable energy
- 3-Maintenance and management of fluid system

**Field : Petroleum And
Mining Engineering
Specialties**

- 1-Applied Geology
- 2-Drilling Technology
- 3- Quarries Operations
- 4- Petroleum Systems and Exploitation
- 5-Petroleum Logistics

TERTIARY SECTOR

DOMAIN: MANAGEMENT, BUSINESS STUDIES AND LEGAL CAREERS

Field : Management

Specialties

- 1- Assistant Manager
 - 2-Operation of Air Transport
 - 3- Management of Non-Governmental Organization (NGO'S)
 - 4- Project Management
 - 5- Human Resource Management
 - 6- Quality Management
 - 7- Logistics and Transport Management
 - 8- Sport Management
 - 9- Information Systems Management
 - 10-Local Government Management
- Options:
- 10-1 Accounting and Finance
 - 10-2 Local Government Taxation
 - 10-3 Local Government Administration
- 11- Statistics
 - 12-Events Management
 - 13-Port Shipping Management

Field: Business and Finance

Specialties

- 1-Accountancy
- 2-Marketing- Trade-Sale
- 3- Banking and Finance
- 4- International Trade
- 5-Microfinance
- 6-Insurance

Field: Legal Careers

Specialties

- 1- Legal Assistant
- 2-Business Law
- 3- Land Law
- 4-Stock Market Career
- 5-Customs and Transit .
- 6-Tax Management

DOMAIN: HOME ECONOMICS, TOURISM AND HOTEL MANAGEMENT,

Field : Home Economics and Social Work

Specialties

- 1- Bakery and Food Processing
 - 2- Fashion, Clothing and Textiles
 - 3-Beauty-Esthetics
- Options:
- 3-1-Beauty care and Cosmetics
 - 3-2 -Hairdressing Professions

4- Social Work

Field: Tourism and Hotel Management
Specialties

- 1-Tourism and Travel Agency Management
- 2- Hotel Management And Catering

DOMAIN: ARTS AND CULTURE, EDUCATION AND COMMUNICATION

Field: Education
Specialties

- 1-Didactics, Curriculum Development and Teaching
- 2-Education Management and Administration
- 3-Special Education
- 4-Distance and Continuing Education
- 5-Vocational Guidance and Counseling
- 6-Andragogy

Field: Communication
Specialties

- 1-Journalism
- 2-Advertisingand Public Relations
- 3-Corporate Communication
- 4-Printing, Editing and Publishing
- 5-Media photography and Audio visual

Field: Arts And Culture
Specialties

- 1-Gastronomic Arts
- 2-Cinematography
- 3-Sculpture
- 4-Caricature, Illustration and Comic Arts
- 5-Cartoon
- 6- Art Design
 - Options 6-1-Product Design
 - 6-2-Graphic Design
 - 6-3-Fashion Design
 - 6-4-Interior Design
- 7-Performing Arts
- 8-Musicology
- 9- Painting

DOMAIN: HEALTH

Field : Medical and Biomedical Sciences

Specialties

- 1-Nursing
- 2-Medical Laboratory Sciences
- 3-Medical Imaging Technology
- 4-Pharmacy Technology
- 5- Dental Therapy
- 6-Dental Prostheses
- 7-Midwifery
- 8-Optician/Clinical Optometry
- 9-Physiotherapy
- 10-Nutrition and Dietetics
- 11-Health Care Management
- 12-Health Sanitary Inspector
- 13- Ophthalmic Technician
- 14- Ultrasonography
- 15- Prostheses and Orthotics

QUATERNARY SECTOR

DOMAIN: INFORMATION AND COMMUNICATION TECHNOLOGY

Field : Networks and Telecommunication

Specialties

- 1-Telecommunication
- 2-Network and Security

**Field: Computer Engineering
Specialties**

- 1-Computer Engineering
 - Options 1-1-Software Engineering
 - 1-2-Computer Science and Networks
 - 1-3-Data Base Management
- 2-Computer Maintenance
 - Option 2-1Hardware Maintenance
- 3-Industrial Computing and Automation
- 4-Computer Graphics and Web Design
- 5- E-commerce and Digital Marketing

(2) Other specialities and options may be created when the need arises, by Order of the Minister in charge of Higher Education.

SECTION V: ASSESSMENTS

Article 23 : (1) Courses are evaluated from 0 to 100.

(2) No one may be admitted to take a Course unless he has obtained an average score of at least 50 out of 100 for all the Constituent elements of the CU.

(3) Assessment is carried out per Course. The test may consist of several sections corresponding to the constituent elements of the CU.

Article 24: (1) Except for the professional internship CU, each CU is assessed as follows per level:

- Continuous assessment: 30% of the points
- Written examination: 70% of the points

(2) The continuous assessment mark includes marks for the following:

- Participation in tutorials and practical work;
- Written Tests
- Oral questions;
- Presentations;
- Projects.

(3) The professional internship Course includes at least two Constituent elements, one of which is dedicated to the company experience and the other to the end of training report and its defence.

Article 25: (1) Continuous Assessment marks are on the competence of each authorized teacher who teaches the corresponding course. At least one continuous assessment mark is required per course.

(2) The written examinations referred to in paragraph (1) of Article (24) above and all activities involved in evaluation per level are organized under the responsibility of the Management of each institution authorized to provide HND training and under the supervision of the Institution which ensures the academic supervision of the Institution concerned in accordance with the regulations in force.

(3) The transition from level 1 to level 2 is conditioned by a pass in all the CUs.

Article 26: (1) A National Examination taking place in a single annual session shall approve the completion of studies carried out in accordance with the provisions of this Order.

(2) The General Regulations of the National Examination for obtaining the Higher National Diploma are fixed when necessary by the Minister of Higher Education on the proposal of the National Commission for the Organization of National Examinations.

SECTION VI: TEACHING SYLLABUS

Article 27: The teaching syllabus of the training leading to the acquisition of the Higher National Diploma presented by sectors, domains, fields, specialities and possibly by options are annexed to this order.

Article 28: The effective opening of an HND training in an authorised public or private Institution for a field, a speciality or a given option, can occur only after a specific text of the Minister of Higher Education establishing teaching syllabuses of corresponding courses has been issued.

SECTION VII: FINAL PROVISIONS

Article 29: This order repeals all prior contrary provisions including Order No. 01/0014/MINESUP/DDES of 26 February 2001 organising the system of studies and assessments and setting the syllabus for HND courses in the Republic of Cameroon, as well as those of Order No. 05/0020/MINESUP of 12 January 2005 on the creation, system of studies, assessments and syllabi of the Higher Professional Diploma (HPD) of Higher Education Institutions of Cameroon.

Article 30: This order takes effect as of the 2018/2019 academic year.

Article 31: During the effective implementation of the new HND fields, the courses leading to HPD remain valid for a period of three (03) years.

Article 32: Heads of University Institutions, Heads of Authorized Institutions, the President of the National Commission for the Organization of National Examinations, the President of the National Commission for Private Higher Education and the Director of Development of Higher Education are responsible, in their respective spheres of competence for the implementation of this order which shall be registered and published in the official gazette in French and English.

THE MINISTER OF HIGHER EDUCATION,



Jacques Fame Ndongo

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DOMAIN

**INFORMATION AND COMMUNICATION
TECHNOLOGY**

Field : NETWORKS AND
TELECOMMUNICATIONS

Specialty :
TELECOMMUNICATIONS

Field:**NETWORKS AND TELECOMMUNICATIONS****Specialty:****Telecommunications**

1. The objective of the training

This specialty trains senior technicians to ensure the implementation, administration and the maintenance of network or telecommunications equipment. Their skills in the different transmission technologies as well as their extensive knowledge of the protocols of the different communication networks allow them to design, in a group, network architectures or complex telecommunications facilities and to optimize them.

2. Skills sought after

→ General skills

- Self-employed, work together as a team;
- Analyse, synthesize professional document (French, English);
- Oral and written business communication (French, English);
- Participate in /conduct an approach to the management of a project;
- Know and exploit professional and institutional networks in the computer sectors.

→ Specific skills

- Mastering telecommunications equipment;
- Apply exploitation procedures;
- Configure inverters, battery, solar panels and cables;
- Master the techniques of emission, transmission and reception of signals, images and sounds;
- Install and configure hardware and software of networks and telecommunications systems;
- Apply quality control;
- Apply exploitation procedures;
- Optimize the operation of network and the common protocols used;
- Implement and administer Networks;
- Participate in the development of specifications and to contribute to the specifications of a network topology or installation of a

telecommunications system, manage and control the evolution of such installation in choosing the equipment and the appropriate software;

- Coordinate the rehabilitation of an installation after the incidents such as fire.

3. Career opportunities

- Servicing companies and manufacturing networks equipment;
- Telecommunication operators and Internet service providers;
- Controller of the information system of an enterprise;
- Telephone installers;
- Servicing companies and Computer Engineering.

4. Organization of teachings

• FIRST SEMESTER

Field: Networks and Telecommunications		Specialty: Telecommunications					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
TEL111	Engineering Maths I	35	20	0	5	60	4
TEL112	Physics and Computer Science I	40	15	15	5	75	5
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
TEL113	Electronic circuits I	30	20	20	5	75	5
TEL114	Circuit Theory	20	10	10	5	45	3
TEL115	Telecommunication I	35	15	20	5	75	5
TEL116	Computer Networks	30	10	30	5	75	5
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
TEL117	English and general accounting	30	10	0	5	45	3
Total		230	105	80	35	450	30

• SECOND SEMESTER

Field: Networks and Telecommunications		Specialty: Telecommunications					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
TEL121	Engineering Maths II	35	20	0	5	60	4
TEL122	Physics and Computer Science II	40	15	15	5	75	5
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
TEL123	Electrical installation	30	15	10	5	60	4
TEL124	Telecommunications II	35	15	20	5	75	5
TEL125	Antenna and spatial telecommunication	30	15	10	5	60	4
TEL126	Electronic circuits II	40	20	10	5	75	5
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
TEL127	Economics and Enterprise Organisation (EEO) and French	30	10	0	5	45	3
Total		240	105	70	35	450	30

• **THIRD SEMESTER**

Field: Networks and Telecommunications		Specialty: Telecommunications					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
TEL231	Engineering Maths III	35	20	0	5	75	5
TEL232	Physics and Computer Science III	40	25	5	5	60	4
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
TEL233	Satellite and high frequency transmission	30	15	10	5	60	4
TEL234	High data rate transmission and computer networks II	40	20	10	5	75	5
TEL235	Signal Processing	30	15	10	5	60	4
TEL236	Electronic circuits III	40	20	10	5	75	5
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
TEL237	Enterprise creation and civics and moral education	30	10	0	5	45	3
Total		245	125	45	35	450	30

• **FOURTH SEMESTER**

Field: Networks and Telecommunications		Specialty: Telecommunications					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
TEL241	Engineering Maths IV	35	20	0	5	60	4
TEL242	Physics and Computer Science III	40	15	15	5	75	5
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
TEL243	Minor project	10	25	20	5	60	4
TEL244	Telecommunications III	25	15	15	5	60	4
TEL245	Electronic circuits IV and computer networks III	25	20	15	0	60	4
TEL246	Internship	0	0	60	30	90	6
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
TEL247	General economics and Law	30	10	0	5	45	3
Total		165	105	125	55	450	30

SPW: Students' personal work

5. Course contents

❖ TEL 111 : Engineering mathematics I

➤ Analysis I : 3 credits (45 hours); L, T, SPW

1. **Numerical functions of a real variable:**
 - Logarithmic and exponential functions
 - Reciprocal circular functions
 - Hyperbolic functions and their reciprocals.
2. **Several real variables functions**
 - 1st and 2nd order partial derivative
 - Schwarz theorem
 - Differential applications
 - Composite functions
 - Differential forms
 - Vector operators
3. **Taylor series and limits**
4. **Integration(simple and multiple)**
5. **Differential equations**

➤ Linear algebra I : 2 credits (30 hours); L, T, SPW

1. **Vector space of finite dimension $n \leq 4$**
2. **Matrices**

❖ TEL 112 : Physics and Computer science I

➤ Computer fundamentals: 3 credits (45 hours); L, T, SPW

1. Hardware
2. Networks and mobile devices
3. Software
4. Operating system
5. File management
6. Security ad maintenance
7. Cloud computing

➤ General physics: 2 credits (30 hours); L, T, SPW

1. **Electrostatics**

- Continuous distribution of charges: Field and electrostatic potential, Gauss theorem;
- Distribution of point charges: Electrostatic interaction energy;
- Electric dipole;
- Conductors at equilibrium: capacitors.

2. **Electrokinetics**

- Electric current and current density, ohm's law, conductors, resistance, power, and energy

❖ **TEL 113 : Electronic circuits I**

➤ **Analogue electronics I : 3 credits(45 hours); L, T, SPW**

1. Flashback on network theorems;
2. Theory on semiconductors and PN junction diodes
3. Diodes and diode circuits
4. Zener regulated power supply
5. Bipolar junction transistor and biasing circuits
6. BJT amplifier circuits(Eber Moll's and H – parameter)

➤ **Digital electronics I : 2 credits(30 hours); L, T, SPW**

1. **Number systems and codes**

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. **Combinational logic**

- Logic gates
- Boolean algebra
- Simplification of Boolean functions
- Applications of combinational logic

3. **Sequential logic**

- Flip flops
- Counters
- Registers

4. **Architecture of a computer**

- Von Neumann's architecture and Harvard's architecture

5. **Logic families**

❖ **TEL 114 : Circuit theory**

➤ **Electric circuit: 3 credits (45 hours); L, T, SPW**

1. Notion on current and voltage;
2. Linear electric dipoles and sources
3. Dependent sources
4. Kirchhoff's laws
5. Capacitors and inductors
6. Network theorems
7. Sinusoidal steady state circuits analysis

❖ **TEL 115 : Telecommunications I**

➤ **Signals and systems: 2 credits (30 hours); L, T, SPW**

1. General structure of a transmission system
2. Classification, properties and units of signals' measurements
3. Graphical representation of signals, spectral analysis
4. Linear time invariant (LTI) system.
5. Characteristics of a system: transfer function; type of liaison; type of transmission media: copper, fiber, wireless, etc.

➤ **Analogue transmission techniques: 3 credits (45 hours); L, T, SPW**

1. Structure of analogue transmission
2. Amplitude modulation and demodulation
3. Frequency modulation and demodulation
4. Analogue filters

❖ **TEL 116 : Computer Networks**

➤ **Networking fundamentals: 5 credits (45 hours); L, T , P, SPW**

1. Introduction to networking.

- Network types
- Local area Networks
- Wide Area Networks
- Wireless networks
- Network topologies

2. Network devices

- Understanding switches
- Understanding routers
- Understanding media types

3. Rules of Network

- Understanding the OSI model
- Understanding IPV4
- Understanding IPV6
- Understanding name resolution
- Understanding networking services
- Understanding TCP/IP

4. Networking practical

❖ TEL 117 : English and General Accounting

➤ English: 2 credits (30 hours); L, T

1. Vocabulary

- Technical and usual vocabulary of the specialty

2. Grammar

3. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

4. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

5. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. incidental expenses on buying and selling
8. packing supplies
9. Transport
10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

❖ **TEL 121 : Engineering mathematics II**

➤ **Analysis I: 2 credits (30 hours); L, T, SPW**

- 1. Numerical functions of a real variable:**
 - Logarithmic and exponential functions
 - Reciprocal circular functions
 - Hyperbolic functions and their reciprocals.
- 2. Several real variables functions**
 - 1st and 2nd order partial derivative
 - Schwarz theorem
 - Differential applications
 - Composite functions
 - Differential forms
 - Vector operators
- 3. Taylor series and limits**
- 4. Integration(simple and multiple)**
- 5. Differential equations**

➤ **Probability : 2 credits (30 hours); L, T, SPW**

Combinatory analysis

- 1. Calculation of probabilities**

- Kolmogorov axioms
- Conditional and independent probabilities.
- BAYES theorem and axiom on total probability

2. Random variables

- Definition;
- Moment of a random variable;
- Joint law and marginal laws of a pair
- Bienaymé-Tchebychev Inequality
- Basic laws on large numbers
- TCL

3. Probability laws

❖ TEL 122 : Physics and Computer science II

➤ Algorithms and programming: 3 credits (45hours); L, T, SPW

1. Algorithms

- General software development
- Computer storage and data types
- Other data structures
- Flow control, repetition and error handling
- Understanding classes and object

2. Programming

- Inherence, polymorphisms and encapsulation
- Web application development
- Desktop application development
- Working with databases

➤ Electromagnetism: 2 credits (30 hours); L, T, SPW

1. Field theory
2. Maxwell equations
3. Electromagnetic waves

❖ TEL 123 : Electrical installation

➤ Norms and standardization of electrical diagrams : 4 credits (60 hours); L, T, SPW

1. Normalized graphical symbols

- Switches

- Protective devices
 - Prime mover, lighting and signaling equipment
2. **Study of basic domestic installation diagrams**
 - Simple lighting
 - Double lighting
 - Two – way lighting
 - Teleruptor
 - Timer
 3. **Prime mover equipment(starting of motors)**
 4. **Prime mover equipment(braking of motors)**
 5. **Conception and reading of industrial electrical installation diagrams**

❖ **TEL 124 : Telecommunications II**

➤ **Digital transmission techniques: 2 credits(30 hours); L, T, SPW**

1. Structure of digital transmission
2. Amplitude shift keying(ASK)
3. Frequency shift keying(FSK)
4. Phase shift keying (PSK)
5. Digital filters

➤ **Telephony and switching: 3 credits(45 hours); L, T, P, SPW**

1. **Fixed telephone**
 - General principles of telephony
 - Architectures of public and private networks
 - Private network(switching, signaling, services, wiring norms)
 - Evolution of telephony
2. **Mobile telephone**
 - Mobile network operators: objectives, constraints, architecture
 - Access methods
 - Study of the different norms
 - Private mobile networks: configuration, test and measurements
 - Evolution

❖ **TEL 125 : Antennas and spatial telecommunication**

➤ **Antennas and spatial telecommunication: 4 credits (60 hours); L, T, P, SPW**

1. Antennas parameters

2. Basic antennas
3. filamental antenna
4. Antenna networks
5. Aperture antenna
6. Satellite link analysis
7. VSAT and applications

❖ **TEL 126 : Electronic circuits II**

➤ **Analogue electronics II: 3 credits (45 hours); L, T, P**

1. Bipolar transistor amplifier (Eber Moll and H – parameter)
2. Theory of Field Effect Transistor (FET) and biasing circuits
3. FET amplifiers
4. Power amplifiers
5. Difference amplifiers

➤ **Digital electronics II: 2 credits (30 hours); L, T, P**

1. Logic circuits technology
2. History
3. Presentation
4. Main logic families
5. Characteristic parameters
6. Comparison between TTL and CMOS
7. Interfacing logic families
8. Flip flops
9. Up counters
10. Down counters

❖ **TEL 127 : Economics and Enterprise Organization(EEO) and French**

➤ **Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P**

1. **Enterprise and typology of enterprises**
 - Definition of an enterprise
 - Analysis mode
 - Enterprise as a production unit
 - Enterprise as a distribution unit
 - Enterprise as a social center

- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
 - Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies
 - Production policy:
 - Production on command
 - Production in series
 - Continuous production
 - Processing policy
 - Studies and research office
 - Methods office

- Office of scheduling and launching
- Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
- Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
- Work organization and evolution
 - Taylorization
 - Fordism
 - The actual form of a work organization
 - Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
 - contribution of information as regards information system
 - Decision processing
 - Types of decision
 - Tools that helps in decision-making
 - ✓ Decision in unquestionable future
 - ✓ Decision in questionable future
 - Capacities and participation in the company
 - ✓ Delegation of authority
 - ✓ Decentralization of decision making

➤ **French: 1 credit (15 hour); L, T**

1. Vocabulaire

- Vocabulaire technique usuel

2. Grammaire

- Du verbe : Conjugaison aux temps communément utilisés – présent, passé composé ; imparfait, futur, conditionnel, et plus-que-parfait, l'impératif, l'infinitif, voix passive ;
- De l'adjectif : Qualificatif, possessifs, démonstratifs, interrogatifs, numéraux, indéfinis ;
- Du nom et son article: masculin/féminin ; singulier/pluriel ; dénombrable, et non-dénombrable ;
- Du pronom : personnel, possessif, interrogatif, démonstratif, relatif, indéfini ;
- De l'adverbe et de la locution adverbiale : pour dire comment, où, quand et pourquoi ;
- Des fonctions grammaticales.

3. Expression et communication

- Compréhension et interaction au cours d'une discussion technique ;
- Communication orale courante ;
- Communication orale interactive
- De la phrase : simple, complexe, composée ; interrogative, déclarative, exclamative et impérative ;
- Lecture rapide et compréhension de texte ;
- synthèse d'un long texte;
- Lecture des texts de nature diverses (littéraire, non littéraire, image fixe ou mobile, dessin de presse, caricature ect...)
- De la communication : rédaction de texte, d'instructions, de rapport, d'une correspondance, d'une lettre recommandation ou de motivation, d'une demande d'emploi, d'une demande d'explication, d'une réponse à une demande d'explication, d'un CV ;
- Réalisation d'un exposé, d'une interview...
- Gestion d'une table ronde/discussion : La prise de notes, la prise de parole
- Expressions figées

❖ TEL 231 : Engineering Mathematics III

➤ Statistics: 2 credits (30 hours); L, T, SPW

1. Graphical representation
2. Central tendency, dispersion,(mean, mode, median, variance, and standard deviation, deciles, interquatile range)
3. Covariance
4. Correlation coefficients and regression
5. Least square methods

6. Estimation of mean and standard deviation
7. Test of hypothesis
8. Descriptive statistics

➤ **Analysis III: 2 credits (30 hours); L, T, SPW**

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

❖ **TEL 232 : Physics and Computer science III**

➤ **Wave propagation: 2 credits (30 hours); L, T, SPW**

1. Definition of electromagnetic wave
2. Emission and reception of electromagnetic wave
3. Propagation in guided and free space, attenuation, dispersion
4. Transmission lines
5. Geometrical optics, reflections and refractions
6. Undulating optics

➤ **Database: 3 credits (45 hours); L, T, SPW**

1. Understanding core database concepts
2. Creating database objects
3. Manipulating data
4. Understanding data storage
5. Administering a database

❖ **TEL 233 : Satellite and high frequency transmission**

➤ **Satellite and high frequency transmission: 4 credits (60 hours); L, T, P, SPW**

1. Antennas: (AM, FM, UHF, ---) and satellite
2. Flashback on the following types of modulations: AM, FM, QPSK, QAM ----
3. Apparatus and reception: transponder, switches, amplifiers, equalizers, couplers, differentiators, and demodulators
4. Use of measuring instruments
5. Measurements: Attenuation, pass band, distortion, cross talk, signal to noise ratio, binary error rate

❖ **TEL 234 : High data rate transmission and networks**

➤ **Fiber Optic transmission: 2 credits (30 hours); L, T, P, SPW**

1. Fiber optic transmission principles

2. Mono – mode and multi – mode fiber
3. Components, functions and optical system
4. Interconnection lose
5. Optical amplification
6. Characteristics of optical transmission line
7. Different types of optical networks: long distance networks, local networks.

➤ **Wide Area Network WAN and IP technology: 3 credits (45 hours); L, T, P, SPW**

1. Architecture and protocol in WAN

- Access technology (local loop, ---)
- Switching technology (circuit, frames, cells, packets, ...)
- Transmission networks (SDH, PDH, WDH, ...)
- Signaling in WANs
- Architecture of wireless networks
- Mobility, mobile networks

2. Concepts and modeling

- Transport layer: TCP and UDP
- Dynamic routing: OSPF, RIP, BGP, EGP,
- Directed services network: DNS, DHCP,
- User directed services: VoIP, Web, messaging, directory, file exchange, multimedia,
- Network security: Filtering mechanisms and access control(proxy, firewall, NAT, ACL, ...), security service elements
- Network supervision elements

❖ **TEL 235 : Signal processing I**

➤ **Signal processing I: 4 credits (60 hours); L, T, P, SPW**

1. Introduction to signals
2. Frequency analysis of signals
3. Filters
4. Amplitude spectrum of signals
5. Phase spectrum

❖ **TEL 236 : Electronic circuits III**

➤ **Electronic functions: 3 credits (45 hours); L, T, SPW**

1. Voltage and current amplifiers, power amplifiers

2. Operational amplifier operating in the linear mode
3. Imperfections of operational amplifiers
4. Gain bandwidth Product, slew rate
5. Active filters: 1st and 2nd order

➤ **Telecom systems electronics: 2 credits (30 hours); L, T, SPW**

1. Amplitude modulation circuits
2. AM demodulator circuits
3. Frequency modulation circuits
4. FM demodulator circuits
5. Fourier transform
6. Filters

❖ **TEL 237 : Enterprise creation and Civics & Moral Education**

➤ **Enterprise creation: 2 credits(30 hours); L, T, SPW**

1. Characteristics of the entrepreneur
2. Opportunity recognition
3. Starting a business
4. Business operation

➤ **Civics and Moral education: 1 credit(15 hours); L, T, SPW**

1. The citizen
2. The nation
3. The state
4. Public goods – collective goods
5. Freedoms
6. Public services
7. Ethical problems
8. Ethics, rights and privileges
9. Management and ethics of the responsibility
10. Ethics and management

❖ **TEL 241 : Engineering Mathematics IV**

➤ **Analysis IV: 2 credits (30 hours); L, T, SPW**

Continuation of numerical series

1. Whole series and Fourier series

2. Fourier transform, Laplace transform and Z transform

➤ **Probability: 2 credits (30 hours); L, T, SPW**

Combinatory analysis

1. Calculation of probabilities

- Kolmogorov axioms
- Conditional and independent probabilities.
- BAYES theorem and axiom on total probability

2. Random variables

- Definition;
- Moment of a random variable;
- Joint law and marginal laws of a pair
- Bienaymé-Tchebychev Inequality
- Basic laws on large numbers
- TCL

3. Probability laws

❖ **TEL 242 : Physics and Computer science IV**

➤ **Programming using Python: 2 credits (30 hours); L, T, P, SPW**

1. Data structures
2. Evaluating data types
3. Convert and work with data types
4. Operators sequence, iteration and selection
5. Input and output operations
6. Code segments and functions
7. Analyze detects and fix errors
8. Solving problems with built – in modules

➤ **Services development and mobile applications: 3 credits (45 hours); L, T, P, SPW**

- 1. Introduction to mobile OS**
- 2. Introduction to mobile application development**
- 3. Mobile application development with JME(Java Mobile Edition)**
 - Presentation of the JAIN platform for JME applications
 - Introduction to JME
 - Practical in group work or single

4. Development of WAP application

- Introduction to WAP applications
- WAP application platform
- Practical in group work or single

5. Development of ANDROID mobile applications

- Presentation of the ANDROID platform for ANDROID applications
- Introduction to ANDROID
- Practical in group work or single

❖ TEL 243 : Minor project

➤ Installation and maintenance of telecommunication systems projects : 4 credits (60 hours); L, T, P, SPW

Implementation of the methods and tools to develop a project

1. Sound broadcasting
2. Remote transmission (Satellite, TNT)
3. VSAT
4. WIMAX
5. Enterprise telephony GSM, UMTS, LTE

❖ TEL 244 : Telecommunications III

➤ Telephony on IP: 2 credits (30 hours); L, T, P, SPW

1. Constraints and adaptation: delay, jitter, ...
2. Components of VOIP, CODEC
3. Architecture of telephone on IP networks
4. Standards and protocols
5. Specific aspects on routing
6. Security
7. Administration

➤ Signal processing II: 2 credits (30 hours); L, T, SPW

1. Notions on random signals
2. Discrete Fourier transform
3. Flashback on Z transform
4. Digital filters
5. Applications on compressing(audio, video)

❖ TEL 245 : Networks III and electronic circuits IV

➤ Mobile networks: 2 credits (30 hours); L, T, P, SPW

1. GSM networks

- History
- Framework of the policy, regulations and standards
- Introduction to GSM
- Cellular organization

2. Architecture of GSM

- General presentation
- Canonical architecture
- Functional equipment of a GSM network
- Network interfacing
- Sub networks and their equipment
- Mobile station

3. Engineering and cellular concept

- Block diagram of mobile radio link
- Emitting and receiving antennas: Basic parameters
- Brief flashback on models and propagation
- Coverage provision and link equilibrium
- Re-usage of bandwidth
- Cellular planning
- conclusion

4. Radio interface transmission

- Sharing of multiple access radio resources
- Duplexing
- Transmission link
- Speech encoding
- Error control
- Interleaving
- Burst format
- Digital modulation
- Performances
- Conclusion

5. Management of radio resources

- Standby state of mobile
- Physical management of radio link
- Management of dedicated channel
- Handover
- Management of roaming

6. Services in Public Land Mobile Network (PLMN)

- Definition of PLMN
- The terminals in GSM
- SIM card
- Classification of services
- Supports services
- Tele – services
- Data services
- Supplementary services
- Main circuits of security in GSM
- Commercialization of services

7. Evolution of mobile networks

- Operation of General Packet Radio Service (GPRS)
 - Introduction and presentation of services
 - General architecture
 - Management of routing and session
 - Exchange of data between users
 - Radio interface transmission
 - conclusion
- Principles of Enhanced Data rates for GSM Evolution (EDGE)
 - Modification of the physical layer
 - High data rates circuits (ECSD)
 - Packet mode (EGPRS)
 - EDGE compact – EDGE phase 2
 - Synthesis
 - UMTS – WIMAX
 - LTE

➤ **Electronic structure for optical telecommunication: 2 credits (30 hours); L, T, P, SPW**

1. Polarization of photo emitter and receiver
2. Dynamic command of photo emitters and receivers
3. Optical power adjustment
4. Wave division multiplexing

❖ TEL 246 : Internship

➤ Internship: 6 credits(90 hours); P

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content:

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning
 - Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
 - Report writing format (page setup, character format etc)
 - Defense

❖ TEL 247 : General Economics

➤ General Economics: 3 credits (45 hours); L, T, SPW

1. Introduction:

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

Field : NETWORKS AND
TELECOMMUNICATION

Specialty :

NETWORKS AND SECURITY

Field:**NETWORKS AND TELECOMMUNICATIONS****Specialty:****Networks and Security**

1. The objective of the training

This specialty trains senior technicians capable to:

- Identify the key issues for the realization of the LAN/WAN/MAN network architectures and the hybridized existing form in the business environment and enterprise.
- Link different network performance concepts and traffic issues for Quality of Service (QoS) in broadband communication as well as the network economics of the enterprise.
- Motivate the need for network security practices in organizational units.
Build foundations to assess contemporary security policies and security mechanisms within organizations and illustrate the balance of the managerial and technical aspects of network security.

2. Skills sought after

→ General skills

- Self-employed, work together as a team;
- Analyse, synthesize professional document (French, English);
- Oral and written business communication (French, English);
- Participate in /conduct an approach to the management of a project;
- Know and exploit professional and institutional networks in the computer sectors.

→ Specific skills

- Master telecommunications equipment;
- Configure inverters, battery, solar panels and cables;
- Master the techniques of emission, transmission and reception of signals, images and sounds;
- Install and configure hardware and software of networks and telecommunications systems,
- Apply the quality control;

- apply exploitation procedures;
- Optimize the operation of a network and the common protocols used;
- Implement and administer Networks;
- Participate in the development of specifications and to contribute to the specifications of a network topology or installation of a telecommunications system, manage and control the evolution of such installation in choosing the equipment and the appropriate software;
- Coordinate the rehabilitation of an installation after the incidents such as fire.

3. Career opportunities

- Servicing companies and manufacturing networks equipment;
- telecommunication operators and Internet service providers;
- Controller of the information system of an enterprise;
- Telephone installers;
- Servicing companies and Computer Engineering.

4. Organization of teachings

- First semester

Field: NETWORKS AND TELECOMMUNICATIONS		Specialty: Networks and Security					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
NWS111	Engineering Maths I	35	20	0	5	60	4
NWS112	Physics and Computer Science I	20	10	40	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
NWS113	Electronic circuits I	40	10	20	5	75	5
NWS114	Circuit theory	20	10	10	5	45	3
NWS115	Introduction to Networks (Cisco i)	40	10	20	5	75	5
NWS116	Telecommunication I	45	25	0	5	75	5
Transversal Courses 10% (1 UC) 3 credits 45 hours							
NWS117	Bilingual Training	30	10	0	5	45	3
Total		230	100	85	35	450	30

- Second semester

Field: NETWORKS AND TELECOMMUNICATIONS		Specialty: Networks and Security					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
NWS121	Engineering maths II	35	20	0	5	60	4
NWS122	Physics and computer science II	20	10	40	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
NWS123	Telecommunication II	20	10	10	5	45	3
NWS124	Electronic circuits II	40	10	20	5	75	5
NWS125	Interconnecting CISCO Networking Devices II (Cisco II)	40	10	20	5	75	5
NWS126	Network administration and security I	40	10	20	5	75	5
Transversal Courses 10% (1 UC) 3 credits 45 hours							
NWS127	Economics and Enterprise Organisation (EEO) and Law	30	10	0	5	45	3
Total		225	80	110	35	450	30

- **Third semester**

Field: NETWORKS AND TELECOMMUNICATIONS		Specialty: Networks and Security					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
NWS231	Engineering maths III	35	20	0	5	60	4
NWS232	Physics and computer science III	25	15	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
NWS233	Telephony	25	15	30	5	75	5
NWS234	Telecommunication III	15	10	30	5	60	4
NWS235	Scaling Networks (Cisco III)	10	5	55	5	75	5
NWS236	Network administration and security II	10	10	35	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
NWS237	Enterprise creation and civics and moral education	30	10	0	5	45	3
Total		150	85	180	35	450	30

- **Fourth semester**

Field: NETWORKS AND TELECOMMUNICATIONS		Specialty: Networks and Security					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
NWS241	Engineering maths IV	35	20	0	5	60	4
NWS242	Physics and computer science IV	25	15	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
NWS243	Telecommunication IV	35	15	20	5	70	5
NWS244	Mobil Network and Security	25	5	10	5	45	3
NWS245	Connecting networks (Cisco iv)	35	10	10	5	60	4
NWS246	Internship	0	0	60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
NWS247	General economics and General Accounting	30	10	0	5	45	3
Total		170	90	130	60	450	30

SPW: Students' personal work

5. Courses content

❖ NWS 111 : Engineering mathematics I

➤ Analysis I: 3 credits (45 hours); L, T, SPW

1. **Numerical functions of a real variable:**
 - Logarithmic and exponential functions
 - Reciprocal circular functions
 - Hyperbolic functions and their reciprocals.
2. **Several real variables functions**
 - 1st and 2nd order partial derivative
 - Schwarz theorem
 - Differential applications
 - Composite functions
 - Differential forms
 - Vector operators
3. **Taylor series and limits**
4. **Integration(simple and multiple)**
5. **Differential equations**

➤ Linear algebra I: 2 credits (30 hours); L, T, SPW

1. Vector space of finite dimension $n \leq 4$
2. Matrices

❖ NWS 112 : Physics and Computer Science I

➤ Digital literacy: 2 credits (30 hours); L, T, P, SPW

1. **Computer fundamentals**
 - Hardware
 - Networks and mobile devices
 - Software
 - Operating system
 - File management
 - Security and maintenance
 - Cloud computing

2. Key applications

- Apps and applications
- Using Microsoft word
- Using Microsoft Excel
- Database concepts
- Using Microsoft power point

3. Living online

- Looking at the Internet
- Managing media literacy
- Digital communication
- Understanding e – mail
- Contacts and calendaring
- Your life online

➤ General physics: 2 credits (30 hours); L, T, SPW

1. Electrostatics

- Continuous distribution of charges: Field and electrostatic potential, Gauss theorem;
- Distribution of point charges: Electrostatic interaction energy;
- Electric dipole;
- Conductors at equilibrium: capacitors.

2. Electrokinetics

- Electric current and current density, ohm's law, conductors, resistance, power, and energy

❖ NWS 113 : Electronic circuits I

➤ Analogue electronics I: 3 credits(45 hours); L, T, SPW

1. Flashback on network theorems;
2. Theory on semiconductors and PN junction diodes
3. Diodes and diode circuits
4. Zener regulated power supply
5. Bipolar junction transistor and biasing circuits
6. BJT amplifier circuits(Eber Moll's and H – parameter)

*

➤ **Digital electronics I: 2 credits(30 hours); L, T, SPW**

1. Number systems and codes

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. Combinational logic

- Logic gates
- Boolean algebra
- Simplification of Boolean functions
- Applications of combinational logic

3. Sequential logic

- Flip flops
- Counters
- Registers

4. Architecture of a computer

- Von Neumann's architecture and Harvard's architecture

5. Logic families

❖ **NWS 114 : Circuit theory**

➤ **Electric circuit: 3 credits (45 hours); L, T, SPW**

1. Notion on current and voltage;
2. Linear electric dipoles and sources
3. Dependent sources
4. Kirchhoff's laws
5. Capacitors and inductors
6. Network theorems
7. Sinusoidal steady state circuits analysis

❖ **NWS 115 : Introduction to Networks (Cisco I)**

➤ **CISCO I: 5 credits (75 hours); L, T, P, SPW**

1. Explore the Network
2. Configure a Network Operating System

3. Network Protocols and Communications
4. Network Access
5. Ethernet
6. Network Layer
7. IP Addressing
8. Subnetting IP Networks
9. Transport Layer
10. Application Layer
11. Build a Small Network

❖ **NWS 116 : Telecommunications I**

➤ **Signals and systems: 2 credits (30 hours); L, T, SPW**

1. General structure of a transmission system
2. Classification, properties and units of signals' measurements
3. Graphical representation of signals, spectral analysis
4. Linear time invariant (LTI) system.
5. Characteristics of a system: transfer function; type of liaison; type of transmission media: copper, fiber, wireless, etc.

➤ **Analogue transmission techniques: 3 credits (45 hours); L, T, SPW**

1. Structure of analogue transmission
2. Amplitude modulation and demodulation
3. Frequency modulation and demodulation
4. Analogue filters

❖ **NWS 117 : Bilingual training**

➤ **English: 1.5 credits (22 hours 30mn)**

- 1. Vocabulary**
 - Technical and usual vocabulary of the specialty
- 2. Grammar**
- 3. Bilingual expression**
 - Understanding in interaction in Technical Discussions

- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

4. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

5. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ French : 1.5 credits (22 hours 30mn)

1. Vocabulaire

- Vocabulaire technique usuel

2. Grammaire

- Du verbe : Conjugaison aux temps communément utilisés – présent, passé composé ; imparfait, futur, conditionnel, et plus-que-parfait, l'impératif, l'infinitif, voix passive ;
- De l'adjectif : Qualificatifs, possessifs, démonstratifs, interrogatifs, numéraux, indéfinis ;
- Du nom et son article: masculin/féminin ; singulier/pluriel ; dénombrable, et non-dénombrable ;
- Du pronom : personnel, possessif, interrogatif, démonstratif, relatif, indéfini ;
- De l'adverbe et de la locution adverbiale : pour dire comment, où, quand et pourquoi ;
- Des fonctions grammaticales.

3. Expression et communication

- Compréhension et interaction au cours d'une discussion technique ;
- Communication orale courante ;
- Communication orale interactive

- De la phrase : simple, complexe, composée ; interrogative, déclarative, exclamative et impérative ;
- Lecture rapide et compréhension de texte ;
- synthèse d'un long texte;
- Lecture des texts de nature diverses (litteraire, non littéraire, image fixe ou mobile, dessin de presse, caricature ect...)
- De la communication : rédaction de texte, d'instructions, de rapport, d'une correspondance, d'une lettre recommandation ou de motivation, d'une demande d'emploi, d'une demande d'explication, d'une réponse à une demande d'explication, d'un CV ;
- Réalisation d'un exposé, d'une interview...
- Gestion d'une table ronde/discussion : La prise de notes, la prise de parole
- Expressions figées

❖ NWS 121 : Engineering mathematics II

➤ Analysis I: 2 credits (30 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

3. Taylor series and limits

4. Integration(simple and multiple)

5. Differential equations

➤ Probability : 2 credits (30 hours); L, T, SPW

Combinatory analysis

1. Calculation of probabilities

- Kolmogorov axioms

- Conditional and independent probabilities.
- BAYES theorem and axiom on total probability

2. Random variables

- Definition;
- Moment of a random variable;
- Joint law and marginal laws of a pair
- Bienaymé-Tchebychev Inequality
- Basic laws on large numbers
- TCL

3. Probability laws

❖ NWS 122 : Physics and computer science II

➤ Algorithms and programming: 3 credits (45hours); L, T, SPW

1. Algorithms

- General software development
- Computer storage and data types
- Other data structures
- Flow control, repetition and error handling
- Understanding classes and object

2. Programming

- Inherence, polymorphisms and encapsulation
- Web application development
- Desktop application development
- Working with databases

➤ Electromagnetism: 2 credits (30 hours); L, T, SPW

1. Field theory;
2. Maxwell equations
3. Electromagnetic waves

❖ NWS 123 : Telecommunications II

➤ Digital transmission techniques: 2 credits(30 hours); L, T, SPW

1. Structure of digital transmission
2. Amplitude shift keying(ASK)
3. Frequency shift keying(FSK)

4. Phase shift keying (PSK)
5. Digital filters

➤ **Telephony and switching: 3 credits(45 hours); L, T, P, SPW**

1. Fixed telephone

- General principles of telephony
- Architectures of public and private networks
- Private network(switching, signaling, services, wiring norms)
- Evolution of telephony

2. Mobile telephone

- Mobile network operators: objectives, constraints, architecture
- Access methods
- Study of the different norms
- Private mobile networks: configuration, test and measurements
- Evolution

❖ **NWS 124 : Electronic circuits II**

➤ **Analogue electronics II: 3 credits (45 hours); L, T, P**

1. Bipolar transistor amplifier (Eber Moll and H – parameter)
2. Theory of Field Effect Transistor (FET) and biasing circuits
3. FET amplifiers
4. Power amplifiers
5. Difference amplifiers

➤ **Digital electronics II: 2 credits (30 hours); L, T, P**

1. Logic circuits technology
2. History
3. Presentation
4. Main logic families
5. Characteristic parameters
6. Comparison between TTL and CMOS
7. Interfacing logic families
8. Flip flops
9. Up counters
10. Down counters

❖ NWS 125 : Interconnecting CISCO Networking Devices II (Cisco II)

➤ CISCO II: 3 credits (45 hours); L, T, P, SPW

1. Routing Concepts
2. Static Routing
3. Dynamic Routing
4. Switched Networks
5. Switch Configuration
6. VLANs
7. Access Control Lists
8. DHCP
9. NAT for IPv4
10. Device Discovery, Management, and Maintenance

❖ NWS 126 : Network administration and security I

➤ Network administration: 3 credits (45 hours); L, T, P, SPW

1. Windows server administration fundamentals

- Installation of a Window server
- Identify application servers
- Understand web services
- Understand remote access
- Understand file and print services
- Understand server virtualization
- Management of groups infrastructure and policy
- Storage technologies and scenarios
- Troubleshooting methods

➤ Network security: 2 credits (30 hours); L, T, P, SPW

1. Review of Networking Fundamentals
2. Network Security Concepts
3. Attacks to Networks and Countermeasures
4. World Wide Web and Internet Security

❖ NWS 127 : Economics and Enterprise Organization(EEO) and Law

➤ Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
 - Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)

- Policy of the products
- Price policy
- Distribution policy
- Communication policy
- Production and processing policies
 - Production policy:
 - Production on command
 - Production in series
 - Continuous production
 - Processing policy
 - Studies and research office
 - Methods office
 - Office of scheduling and launching
 - Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
 - Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
 - Work organization and evolution
 - Taylorization
 - Fordism
 - The actual form of a work organization
 - Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank

- Database
- Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority
 - Decentralization of decision making

➤ **Law: 1 credit (15 hour); L, T**

1. Business Law
2. Labour Law

❖ **NWS 231 : Engineering Mathematics III**

➤ **Statistics: 2 credits (30 hours); L, T, SPW**

1. Graphical representation;
2. Central tendency, dispersion,(mean, mode, median, variance, and standard deviation, deciles, interquatile range);
3. Covariance;
4. Correlation coefficients and regression;
5. Least square methods;
6. Estimation of mean and standard deviation;
7. Test of hypothesis
 - Descriptive statistics;

➤ **Analysis III: 2 credits (30 hours); L, T, SPW**

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

❖ NWS 232 : Physics and computer science III

➤ Operating systems: 3 credits (45hours); L, T, P, SPW

1. Introduction and history of Operating systems, structure and operations; processes and files;
2. Processor management
3. Memory management
4. Deadlock
5. Device management
6. File management
7. UNIX and Linux operating systems as case studies
8. Time OS and case studies of Mobile OS

➤ Wave propagation: 2 credits (30 hours); L, T, SPW

1. Definition of electromagnetic wave
2. Emission and reception of electromagnetic wave
3. Propagation in guided and free space, attenuation, dispersion
4. Transmission lines
5. Geometrical optics, reflections and refractions
6. Undulating optics

❖ NWS 233 : Telephony

➤ Telephony (Switch Telephone Network/ISDN): 3 credits (45hours); L, T, P, SPW

1. General principles of telephony
2. Architectures of public and private networks
3. Private networks(switching, signaling, services, cabling norms)
4. Evolution of telephony

➤ Telephony on IP: 2 credits (30 hours); L, T, SPH, P

1. Constraints and adaptation: delay, jitter, ...
2. Components of VOIP, CODEC
3. Architecture of telephone on IP networks
4. Standards and protocols
5. Specific aspects on routing
6. Security
7. Administration

❖ NWS 234 : Telecommunications III

➤ Fiber Optic transmission: 2 credits (30 hours); L, T, SPH, P

1. Fiber optic transmission principles
2. Mono – mode and multi – mode fiber
3. Components, functions and optical system
4. Interconnection lose
5. Optical amplification
6. Characteristics of optical transmission line
7. Different types of optical networks: long distance networks, local networks.

➤ Digital modulations and notions on compression: 2 credits(30 hours); L, T, SPH

1. Source coding and channel coding
2. Digital modulation on carrier frequencies (PSK, FSK, QAM.....)
3. Introduction to multiple modulation(OFDM, DMT, ...)
4. Introduction to multiple access(CDMA)
5. Digital reception
6. Compression techniques (with and without loses, error occurrence,)

❖ NWS 235 : Scaling Networks (Cisco III)

➤ CISCO III: 5 credits (75 hours); L, T, P, SPW

1. LAN Design
2. Scaling VLANs
3. STP
4. Etherchannel and HSRP
5. Dynamic Routing
6. EIGRP
7. EIGRP Tuning and Troubleshooting
8. Single-Area OSPF
9. Multiarea OSPF
10. OSPF Tuning and Troubleshooting

❖ NWS 236 : Network administration and security II

➤ Linux network administration: 3 credits (45 hours); L, T, P, SPW

1. Linux system

- History
- Main characteristics

- System architecture
- Tree structure
- Users and group of users
- Connection/disconnection
- Data protection
- Syntax
- Main commands used
- Text editor
- Communication tool

2. System administration commands

➤ **Network security: 2 credits (30 hours); L, T, P, SPW**

1. Encryption Mechanisms for Network Operations.
2. Security Protocols
3. Intrusion Detection and Prevention Systems
4. Organizational Security Issues

❖ **NWS 237 : Enterprise creation and Civic Education and Ethics**

➤ **Enterprise creation: 1 credit (15 hours); L, T, SPW**

1. Characteristics of the entrepreneur
2. Opportunity recognition
3. Starting a business
4. Business operation

➤ **Civic Education and Ethics: 2 credits (30 hours); L, T, P, SPW**

The Concepts

- The citizen;
- The Nation;
- The State;
- Public Property unto collective property;
- The freedoms;
- The public service;
- Problem of ethics;
- Ethics, Law and reason;
- Management and ethics of responsibility;
- Ethics and management.
- Ethics

- Civics
- Deontology
- Moral consciousness
- The universal declaration of Human Rights
- Good governance in public services
- Explain the importance of civics to the life of the nation
- Functions of the state and its citizens
- Deontology, Professional ethics and professionalism
- Relationship between morality, law and ethics
- Codes of ethics

❖ NWS 241 : Engineering Mathematics IV

➤ Analysis IV: 2 credits (30 hours); L, T, SPW

Continuation of numerical series

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

➤ Probability: 2 credits (30 hours); L, T, SPW

Combinatory analysis

1. Calculation of probabilities
 - Kolmogorov axioms
 - Conditional and independent probabilities
 - BAYES theorem and axiom on total probability
2. Random variables
 - Definition
 - Moment of a random variable
 - Joint law and marginal laws of a pair
 - Bienaymé-Tchebychev Inequality
 - Basic laws on large numbers
 - TCL
3. Probability laws

❖ NWS 242 : Physics and computer science IV

➤ Database: 3 credits (45hours); L, T, P, SPW

1. Introduction to data base
2. Architecture of a database

3. Data models
4. Data schemas
5. Data independence
6. ER model
7. ER diagram representation
8. Generalization and specialization
9. CODD's rules
10. Relational data model
11. Relational algebra
12. ER model to relational model
13. SQL over view
14. Normalisation
15. Joints
16. Storage system
17. File structure and indexing

➤ **Optics: 2 credits (30 hours); L, T, SPW**

1. Introduction to optics
2. Refractive index; reflection and refraction at a plane boundary from Huygens' principle and Fermat's principle;
3. Snell's Law;
4. Total internal reflection.
5. Image formation by reflection at a spherical boundary; concave and convex mirrors. Real and virtual images. Magnification.
6. Image formation by refraction at a spherical boundary and by converging and diverging thin lenses. Derivation of the expression for the focal length of a thin lens.

❖ **NWS 243 : Telecommunication IV**

➤ **Analogue and digital signal processing: 2 credits (30 hours); L, T, P, SPW**

1. Analogue signal processing

- Linear systems;
- Differential equation models of linear circuits and systems;
- Laplace transform;
- convolution;
- stability;
- phasors;
- frequency response;

- Fourier series;
 - Fourier transform;
 - active filters
2. Digital signal processing
 - Notions on random signals
 - Discrete Fourier transform
 - Flashback on Z transform
 - Digital filters
 - Applications on compressing(audio, video)

➤ **Wireless LAN(WLAN): 3 credits (45 hours); L, T, P, SPW**

1. Introduction (History of Wireless Technologies, Applications, Advantages & disadvantages, Classifications and Limitations and Difficulties)
2. Transmission Fundamentals (Time & Frequency domain concepts, Data Communications terms, General Frequency Ranges and Multiplexing)
3. Antennas & Propagation (Types of antennas, Propagation Modes and Wireless Transmission impairments)
4. Signal encoding Techniques (Amplitude-shift Keying, Pulse Coding Techniques)
5. Multiple Access Controls (FDMA, TDMA)
6. Cellular Wireless Networks (WWAN, GSM, GPRS, EDGE, UMTS, HSPA and LTE)
7. WiMAX (802.16 Standards, IEEE 802.16 Protocol Architecture, 802.16.1 Service and WiMAX QoS)
8. Wireless LAN Technology (WLAN Applications, WLAN Configurations, WLAN Requirements, WLAN Categories, Spread Spectrum LAN, Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum)
9. IEEE 802.11 WLAN Standard (Protocol Architecture, LLC & MAC, MAC Frame Format, LLC Services, 802.11 Infrastructure mode , Ad-Hoc Mode,
10. Wireless Personal Area Networks (Bluetooth, Infrared, Zigbee, UWB, RFID, NCF)

❖ NWS 244 : Mobile networks and security

➤ Mobile networks: 2 credits (30 hours); L, T, P, SPW

1. GSM networks

- History
- Framework of the policy, regulations and standards
- Introduction to GSM
- Cellular organization

2. Architecture of GSM

- General presentation
- Canonical architecture
- Functional equipment of a GSM network
- Network interfacing
- Sub networks and their equipment
- Mobile station

3. Engineering and cellular concept

- Block diagram of mobile radio link
- Emitting and receiving antennas: Basic parameters
- Brief flashback on models and propagation
- Coverage provision and link equilibrium
- Re-use of bandwidth
- Cellular planning
- conclusion

4. Radio interface transmission

- Sharing of multiple access radio resources
- Duplexing
- Transmission link
- Speech encoding
- Error control
- Interleaving
- Burst format
- Digital modulation
- Performances
- Conclusion

5. Management of radio resources

- Standby state of mobile
- Physical management of radio link
- Management of dedicated channel

- Handover
- Management of roaming

6. Services in Public Land Mobile Network (PLMN)

- Definition of PLMN
- The terminals in GSM
- SIM card
- Classification of services
- Supports services
- Tele – services
- Data services
- Supplementary services
- Main circuits of security in GSM
- Commercialization of services

7. Evolution of mobile networks

- Operation of General Packet Radio Service (GPRS)
 - Introduction and presentation of services
 - General architecture
 - Management of routing and session
 - Exchange of data between users
 - Radio interface transmission
 - Conclusion
- Principles of Enhanced Data rates for GSM Evolution (EDGE)
 - Modification of the physical layer
 - High data rates circuits (ECSD)
 - Packet mode (EGPRS)
 - EDGE compact – EDGE phase 2
 - Synthesis
 - UMTS – WIMAX
 - LTE

➤ Network security: 1 credits (15 hours); L, T, P, SPW

1. Modeling network security and adversaries
2. Security of Internet infrastructure
3. Web security: TLS, HTTP authentication, XSS, CSRF and other exploits
4. Security of broadcast systems

❖ NWS 245 : Connecting Networks (Cisco IV)

➤ CISCO IV: 4 credits (60 hours); L, T, P, SPW

1. WAN Concepts
2. Point-to-Point Connections
3. Branch Connections
4. Access Control Lists
5. Network Security and Monitoring
6. Quality of Service
7. Network Evolution
8. Network Troubleshooting

❖ NWS 246 : Internship

➤ Internship : 6 credits (90 hours) ; L, T, P

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content :

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning
 - Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
 - Report writing format (page setup, character format etc)
 - Defense

❖ EDM 247 : General Economics

➤ General Economics: 3 credits (45 hours); L, T, SPW

1. Introduction

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits ;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

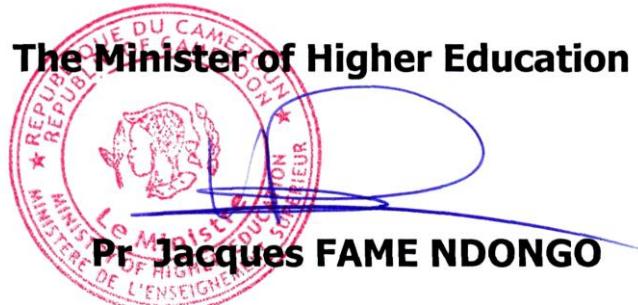
- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. incidental expenses on buying and selling
8. packing supplies
9. Transport
10. Classical accounting system



11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions



Field : COMPUTER ENGINEERING

Specialty : COMPUTER ENGINEERING

OPTION : SOFTWARE ENGINEERING

Speciality : **COMPUTER ENGINEERING**

Option: **Software Engineering**

1. The objective of the training

This specialty trains senior technicians who, with the help of their capability to study the needs of the society, can analyse (MERISE, UML), design and implement computer applications in various fields.

2. Expected skills

→ General skills

- Self-employed, work together as a team;
- Analyse, synthesize a professional document (French, English);
- Oral and written business communication (French, English);
- Participate in /conduct an approach to the management of a project;
- Know and exploit professional and institutional networks in the computer sectors.

→ Specific skills

- Design and develop computer applications;
- implement and ensure the maintenance of computer programs;
- Develop software or systems based on software by following professional standards adequately;
- Put in place and customize distributed applications;
- Diagnose the main faults affecting the computer system and replace defective parts; plan, monitor and control a computer project.

3. Career opportunities

- Head of IT project;
- Software Consultant;
- Developer of applications;
- System Administrator.

4. Organization of teachings

- FIRST SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Software Engineering					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
SWE111	Engineering Maths I	45	25	0	5	75	5
SWE112	Basic environment I	20	10	25	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
SWE113	Digital electronics	30	10	0	5	45	3
SWE114	Introduction to algorithms	40	30	0	5	75	5
SWE115	Introduction to software engineering	70	30	0	5	105	7
SWE116	Multi-media data processing	20	5	20	0	45	3
Transversal Courses 10% (1 UC) 3 credits 45 hours							
SWE117	English and general accounting	30	10	0	5	45	3
Total		225	120	45	30	450	30

- SECOND SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Software Engineering					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
SWE121	Engineering maths II	35	20	0	5	60	4
SWE122	Basic environment II	35	20	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
SWE123	Architecture	20	10	25	5	60	4
SWE124	Database and MERISE I	40	15	15	5	75	5
SWE125	Programming I	20	15	35	5	75	5
SWE126	Maintenance and legal regulations	25	15	15	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
SWE127	Economics and Enterprise Organisation (EEO) and French	30	10	0	5	45	3
Total		205	105	105	35	450	30

• **THIRD SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Software Engineering					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
SWE231	Engineering Maths III	45	25	0	5	75	5
SWE232	Basic environment III	40	20	0	0	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
SWE233	OOD UML	40	10	5	5	60	4
SWE234	Data structure and SQL language	40	25	5	5	75	5
SWE235	Programming II	15	15	40	5	75	5
SWE236	Systems and Networks	40	10	5	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
SWE237	Enterprise creation and civics and moral education	30	10	0	5	45	3
Total		250	115	55	30	450	30

• **FOURTH SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Software Engineering					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
SWE241	mobile terminals and application security	25	10	35	5	75	5
SWE242	Project management	30	10	15	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
SWE243	Network and system administration	30	10	15	5	60	4
SWE244	OOP and advanced database	25	5	25	5	60	4
SWE245	Data structure and HCI	30	10	15	5	60	4
SWE246	Internship			60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
SWE247	General economics and Law	30	10	0	5	45	3
Total		170	55	165	60	450	30

SPH: Students' personal work

5. Courses content

❖ SWE 111 : Engineering mathematics I

➤ Analysis I: 3 credits (45 hours); L, T, SPW

6. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

7. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

8. Taylor series and limits

9. Integration(simple and multiple)

10. Differential equations

➤ Linear algebra I: 2 credits (30 hours); L, T, SPW

1. Vector space of finite dimension $n \leq 4$
2. Matrices

❖ SWE 112 : Basic environment I

➤ Digital literacy: 2 credits (30 hours); L, T, P, SPW,

1. Computer fundamentals

- Hardware
- Networks and mobile devices
- Software
- Operating system
- File management
- Security and maintenance
- Cloud computing

2. Key applications

- Apps and applications
- Using Microsoft word
- Using Microsoft Excel
- Database concepts
- Using Microsoft power point

3. Living online

- Looking at the Internet
- Managing media literacy
- Digital communication
- Understanding e – mail
- Contacts and calendaring
- Your life online

❖ SWE 113 : Digital electronics

➤ **Digital electronics : 3 credits(45 hours); L, T, P, SPW**

1. Number systems and codes

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. Combinational logic

- Logic gates
- Boolean algebra
- Simplification of Boolean functions
- Applications of combinational logic

3. Sequential logic

- Flip flops
- Counters
- Registers

❖ SWE 114 : Introduction to algorithms

➤ Fundamentals of algorithms: 3 credits (45 hours); L, T

1. Introduction to algorithms
2. Algorithm approaches: greedy, dynamic programming, divide and conquer, branch and bound, introduction to complexity analysis and measures.
3. Algorithms: sorting and searching, merging, tree and graph traversals, shortest path, minimum spanning tree, order statistics, string matching.

❖ SWE 115 : Introduction to software engineering

➤ Introduction to information systems: 5 credits (75 hours); L, T, SPW

1. Specification languages of an information system.

- Data models(Entity relational models, relational models)
- Processing models(petri diagram, MERISE diagram, SADT diagram)
- Communication models
- Objects models

2. Analysis of the is – the system and opportunities offered

- Methods of studying an existing information system
- Data representation and processing of an existing information system in terms of the models studied above.
- Quality criteria of an information system
- Criticizing the is – the system
- Study of the opportunities
- Audit

3. Design

- Data conceptual diagrams
 - Construction of data conceptual diagram
 - Normalization
- Processing conceptual diagram
 - Processing architectural diagram
- Dynamic representation
- Conceptual diagram of a communication system
- Representing a communication system

- Determination of the elements of a communication system
- Object conceptual diagram

➤ **Introduction to software engineering: 2 credits (30 hours); L, T, SPW**

1. Software development life cycle (SDLC)
2. Quality
3. Specifications
4. Ergonomics
5. Tests
6. Management of requirements
7. Control of development
8. Writing of specifications
9. Methods of estimating the cost

❖ SWE 116 : Multimedia data processing

➤ **Computer graphics: 3 credits (45 hours); L, T, SPW**

1. Digital images

- Bitmap images
- Vector images
- Characteristics of bitmap images
- Image compression
- Final improvements of images
- Practicals on the creation buttons and images for the Web

2. Sound

- Definition of sound
- Characteristics of sound
- Digitalization of sound
- Mono and stereo sound
- Size of a sound file
- Sound compression

3. Video

- Definition of video
- Analogue video
- Digital video
- Compression of digital video (notion on Codec)

❖ SWE 117 : English and General Accounting

➤ English: 2 credits (30 hours); L, T

6. Vocabulary

- Technical and usual vocabulary of the specialty

7. Grammar

8. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

9. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

10. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. Incidental expenses on buying and selling
8. Packing supplies
9. Transport
10. Classical accounting system

11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

❖ SWE 121 : Engineering mathematics II

➤ **Analysis I : 2 credits (30 hours); L, T, SPW**

- 1. Numerical functions of a real variable:**
 - Logarithmic and exponential functions
 - Reciprocal circular functions
 - Hyperbolic functions and their reciprocals.
- 2. Several real variables functions**
 - 1st and 2nd order partial derivative
 - Schwarz theorem
 - Differential applications
 - Composite functions
 - Differential forms
 - Vector operators
- 3. Taylor series and limits**
- 4. Integration(simple and multiple)**
- 5. Differential equations**

➤ **Probability : 2 credits (30 hours); L, T, SPW**

Combinatory analysis

- 1. Calculation of probabilities**
 - Kolmogorov axioms
 - Conditional and independent probabilities
 - BAYES theorem and axiom on total probability
- 2. Random variables**
 - Definition
 - Moment of a random variable
 - Joint law and marginal laws of a pair
 - Bienaymé-Tchebychev Inequality

- Basic laws on large numbers
- TCL

3. Probability laws

❖ SWE 122 : Basic environment II

➤ **Operating system I: 2 credits (30 hours); L, T, P, SPW**

1. Background

- Overview of computer system and operating system
- History of operating systems
- Operating system structure
 - Processes, files, system call, the shell
 - The Kernel
 - Monolithic Kernels
 - Micro-kernels

2. Process Management

- Process description and control
- Process Interrupts
- Context Swapping
- Process scheduling:
 - First Come First Served
 - Round Robin Scheduling
 - Shortest Process Next
 - Shortest Remaining Time
 - Threads, Symmetric Multiprocessing

3. Inter-process Communication & Clock Synchronization

- Mutual exclusion and critical section
- Race Conditions
- Semaphores
- IPC Problems

➤ **Web programming I: 3 credits(45 hours); L, T, P, SPW**

1. Internet and its services
2. Operation of the Web
3. Addressing of Web documents

4. HTML
5. CSS
6. Java script

❖ SWE 123 : Architechture

➤ **Computer architecture: 3 credits (45 hours); L, T, SPW**

1. Internal architecture and operation of a microprocessor

- Program counter
- Registers
- Instruction registers
- Instruction decode
- Arithmetic and logic unit
- Accumulator
- Flag register
- Bus
- Opcode
- Operand
- Machine cycle
- Polling
- Interrupts
- etc

2. Computer Memory

- Types and technological structure
- Memory hierarchy
- Installing memory
- Organizational structure and uses

3. Assembly language

- Assembler
- Editors
- Instruction sets
- Addressing modes
- Control structures
- Sub routines
- Interrupts

4. Interfacing techniques

- Notion on communication
- Conversion of signals (ADC and DAC)
- Parallel interface
- Serial interface

5. Technology of peripherals

6. New technologies

❖ SWE 124 : Database and MERISE I

➤ Introduction to database: 3 credits (45 hours); L, T, P, SPW

1. Fundamental objectives of a database

- Less redundancy
- Consistency
- ACID Properties
- Multiuser and Concurrent Access
- Multiple views
- Confidentiality/integrity

2. Flashback on data models

- Entity-Relationship Model
- Relational Model

3. Normalization(1NF, 2NF, 3NF)

4. Relational algebra

- Relational Algebra
- Relational Calculus

5. Practicals on MS access and or Mysql

➤ Information system II(MERISE): 3 credits (45 hours); L, T, SPW

1. From conceptual to logical level

- Human – Computer Interface (HCI): Explain what Human computer interaction is and why it is needed
- Ergonomic elements
- Data organization
- Conception of files or database
- Coding
- Control

- Process organization
 - Determination of the nature of processing
- 2. From logical to physical level**
- Programming, test
 - Documentation
 - Maintenance
- 3. Methodology and software tools**
- General presentation of the different methodologies
 - Detail analysis of at least one of the methodologies(MERISE, SADT etc).
 - Evaluation of the cost of the detail study and development
 - Usage of software tools in conceiving and developing the software.

❖ **SWE 125 : Programming I**

➤ **Structured programming: 2 credits (30 hours); L, T, P, SPW,**

1. Introduction
2. Data types, Variables, Constants, C operators, types conversions in expression, input and output and expression statements.
3. Branching and looping, arrays and string, functions, pointers, structures, unions, linked list and file management

➤ **Factual programming: 2 credits (30 hours); L, T, P, SPW**

1. Introduction to visual basic and .NET
2. Visual studio development environment
3. Syntax of VB.NET
 - Form and control elements
 - Control structures
 - Procedures
 - Identification and elimination of errors

❖ **SWE 126 : Maintenance and legal regulations**

➤ **Installation and maintenance of hardware and software: 2 credits (30 hours); L, T, P, SPW**

1. **Electronic circuits**
 - Circuit laws and theorems

- Introduction to semiconductors
- Technology of electronic components:
 - Resistors
 - Capacitors
 - Inductors
 - transformer
 - Diodes
 - Transistors
- Linear regulated power supply
 - Transformer regulated power supply
 - Transformerless regulated power supply
 - Switch mode power supply
- Amplifiers
 - Transistor amplifiers
 - Operational amplifiers

2. Computer maintenance

- Hardware maintenance
- Software maintenance
- Computer assembly

➤ **Legal regulations: 2 credits (30 hours); L, T, P, SPW**

1. The intervenors

- General regulations:
 - Copyright and related laws
- Types of intervenors
 - The supplier
 - The client
 - Adviser
 - Jurist

2. Market research

- Market demand
 - Mastery of the market
 - Market trends
- Market offer

- Study of the needs
- Customer prospection techniques
- Copyright laws on software
 - Standard software
 - Specific software
 - Protecting programs and database

❖ SWE 127 : Economics and Enterprise Organization(EEO) and French

➤ **Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P**

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
 - Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies
 - Production policy:
 - Production on command
 - Production in series
 - Continuous production
 - Processing policy
 - Studies and research office
 - Methods office
 - Office of scheduling and launching
 - Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
 - Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
 - Work organization and evolution
 - Taylorization
 - Fordism

- The actual form of a work organization
- Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority
 - Decentralization of decision making

➤ **French: 1 credit (15 hour); L, T**

1. Etude des situations de communication

- Identification des facteurs de la situation de communication (émetteur, récepteur, code, canal, message, contexte) ;
- Situation de communication et interactions verbales ;
- Etude des éléments para verbaux (kinésique, proxémiques, mimogestuels, etc.) ;
- Identification et manipulation des figures d'expression et de pensée (métaphores, ironie, satire, parodie, etc.).

2. Typologie des textes et recherche documentaire

- Lecture des textes de natures diverses (littéraires/non littéraires, image fixe/image mobile, dessin de presse, caricature, etc.) ;

- Analyse des textes publicitaires et des discours (scientifiques, politiques, littéraires, etc.) ;
- Constitution et exploitation d'une documentation et montage des dossiers ;
- Lecture des textes cultivant les valeurs morales et civiques.

3. Communication orale

- Réalisation d'un exposé ;
- Réalisation d'une interview ;
- Réponse à une interview ;
- Présentation d'un compte-rendu oral ;
- Résumé de texte ;
- Réalisation d'un jeu de rôles ou d'une simulation ;
- Initiation au leadership et à la dynamique des groupes ;
- Ecoute et lecture attentive de documents sonores et/ou graphiques ;
- Lecture méthodique à l'oral.

❖ SWE 231 : Engineering Mathematics III

➤ Statistics: 2 credits (30 hours); L, T, SPW

1. Graphical representation;
2. Central tendency, dispersion,(mean, mode, median, variance, and standard deviation, deciles, interquatile range);
3. Covariance;
4. Correlation coefficients and regression;
5. Least square methods;
6. Estimation of mean and standard deviation;
7. Test of hypothesis
8. Descriptive statistics;

➤ Analysis III: 2 credits (30 hours); L, T, SPW

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

❖ SWE 232 : Basic environment III

➤ **Operating system II:** 2 credits (30 hours); L, T, P, SPW

1. Memory Management

- Partitioning, paging and segmentation
- Virtual memory
- Page Faults
- Address translation and page fault handling
- Memory management hardware: page table and Translation
- Memory management algorithms: fetch policy, replacement policy

2. Input / Output Management and Disk Scheduling

- I/O devices
- Organization of I/O function
- I/O buffering
- Disk scheduling, RAID

3. File Management

- File systems
 - File systems interface
 - File system structures
- Organization: files and directories
- Secondary storage management, file systems: FAT and NTFS
- File protection & Security

4. Deadlocks

- Conditions for deadlocks
- Deadlock avoidance
- Deadlock prevention
- Research on deadlocks

5. Multi processor systems

- Multicomputers
- Virtualization
- Distributed systems

6. Operating system security

- Cryptography
- Authentication
- Malware etc.

7. Operating system designs

- Case studies
 - Linux
 - Windows Vista
 - Symbian OS

➤ **Web programming II: 2 credits(30 hours); L, T, P, SPW,**

1. Define Web
2. Installation and configuration of a Web server(wamp server/Easy PHP)
3. Notions on intranet, Internet and extranet
4. Presentation of web development tools
5. Apache projects
6. Basic concepts on Mysql
7. PHP language

❖ SWE 233 : OOM UML

➤ **Introduction to object modeling: 4 credits (60 hours); L, T, P, SPW**

1. Basic techniques of modeling computer systems
2. Overview of Prominent Object-oriented Methodologies
3. Introduction to UML (Unified Modeling Language)
4. Overview of the development process
5. Study of the various UML diagrams (structural and behavioral diagrams)
6. Class Diagram (attributes, association, aggregation, composition, generalization, parameterized classes)
7. Use Case diagram.
8. Interaction diagrams (sequence diagram, collaboration diagram).
9. State Diagram and Activity Diagram.
10. Introduction to object-oriented design (inheritance, encapsulation, polymorphism, abstract interfaces, parameterized types).
11. Design patterns in object-oriented design modeling of the source code.
Modeling executable versions.
12. Workshop on object oriented software engineering

❖ SWE 233 : Data structure and SQL language

➤ **Database and SQL:** 2 credits (30 hours); L, T, P, SPW

1. Relational database conception principles

- Functional dependence
- Algorithms and normalization
- Normal forms
- Integrity constraints (static, dynamic, etc)

2. SQL language

3. Database administration

- Physical implementation of the data
- Structure of the file and index
- Control of concurrent access
- Breakdown resistance
- Security and protection of data
- Parameter setting, start, stop, save, restoration
- Distributed database, distributed processing
- Auditing, optimization

➤ **Advanced data structure I:** 3 credits (45 hours); L, T, P, SPW

1. Function and procedures
2. Notion on recursiveness
3. Search techniques(sequential, sequential with guard, dichotomy)
4. Sorting techniques(insertion, selection, bubbles)
5. Practical on one of the programming languages(C, C++)

❖ SWE 234 : Programming II

➤ **Factual programming and Human Computer Interface :** 3 credits (45 hours); L, T, P, SPW

1. Concepts on object oriented programming(OOP)
2. Practice of OOP
3. Windows applications, Web application
4. To distribute the application(setup)
5. Introduction to database programming with ADO.NET

❖ SWE 236 : Systems and Networks

➤ Computer networks I: 5 credits (75 hours); L, T, P, SPW

1. Transmission problems encountered in a network
2. Computer networking basics: hardware and software
 - Transmission of information
 - Media
 - Topology
 - Coding
 - Access techniques
 - subnetting
 - Hardware: MODEMs repeaters, communication controllers
 - Management of communication in a network
 - Synchronization
 - Errors control
 - Flow control
 - Routing
 - Addressing
 - Switching
 - Architecture:
 - Concept of layers
 - Concept of service
 - Protocols
 - OSI model
 - Other standards
 - Services intended for inter operation of the systems
 - Data representation
 - Calls of remote procedures
 - Criteria used to choose a network(characteristics, organization, services offered etc)
 - LAN: Ethernet, Token ring
 - Public networks (PSTN etc)
 - High data rate networks

❖ SWE 237 : Enterprise creation and Civics & Moral Education

➤ Enterprise creation: 2 credits(30 hours); L, T, SPW

1. Characteristics of the entrepreneur
2. Opportunity recognition
3. Starting a business
4. Business operation

➤ Civics and Moral education: 1 credit(15 hours); L, T, SPW

1. The citizen
2. The nation
3. The state
4. Public goods – collective goods
5. Freedoms
6. Public services
7. Ethical problems
8. Ethics, rights and privileges
9. Management and ethics of the responsibility
10. Ethics and management

❖ SWE 241: Mobile terminals and application security

➤ Programming of mobile terminals: 2 credits (30 hours); L, T, P, SPW

1. Generalities
2. Android operating system
3. Some elements on the embarked programming
4. Generalities on the development environment of iOS applications
5. Identify the different types of mobile terminals
6. Web applications for mobile platforms
7. Java scripts
8. Cordova
9. AngularJS

➤ Application security: 2 credits (30 hours); L, T, P, SPW

1. Security requirement

2. Security architecture
3. Secure coding practices
4. Vulnerability assessment
5. Security patch up date

❖ SWE 242: Project management

➤ **Management of computer projects: 4 credits (60 hours); L, T, SPW**

1. Project Management Overview
2. Projects in the business environment
3. Projects Definition
4. Estimates
5. Project Planning
6. Project Execution
7. Project Monitoring & Control
8. Project Quality
9. Leadership in Projects
10. Projects' success & failure
11. Project Closure & Audit
12. Conclusions & Presentations

❖ SWE 243: Network and system administration

➤ **Computer networks II: 3 credits (45 hours); L, T, P, SPW**

1. Interconnection of networks
2. Specifications of a network
3. Installation and configuration of a network
4. Splitting of a network
5. Networks in industries and enterprises
6. Usage of network applications: messaging, transfer of files etc
7. Services of network administration
8. Surveillance and security of a network

➤ **Windows server administration fundamentals:**

1. Installation of a Window server
2. Identify application servers
3. Understand web services
4. Understand remote access

5. Understand file and print services
6. Understand server virtualization
7. Management of groups infrastructure and policy
8. Storage technologies and scenarios
9. Troubleshooting methods

➤ **Linux network administration: 1 credit (15 hours); L, T, P, SPW**

3. Linux system

- History
- Main characteristics
- System architecture
- Tree structure
- Users and group of users
- Connection/disconnection
- Data protection
- Syntax
- Main commands used
- Text editor
- Communication tool

4. System administration commands

❖ **SWE 244: OOP and Advanced database**

➤ **Object oriented programming: 2 credits (30 hours); L, T, P, SPW**

1. Introduction to object oriented programming
2. Objects and class
3. Encapsulation and masking of information
4. Aggregation and decomposition
5. Generalization and specialization
6. Inheritance
7. Polymorphism and dynamic links
8. Examples of OOP: C++, Java

➤ **Database administration: 2 credits (30 hours); L, T, P, SPW**

1. **Introduction**
2. **Presentation of Mysql**

3. Mysql architecture

4. Mysql server

5. Configuration of Mysql server

- Running and Shutting down MySQL Server
- Setting Up a MySQL User Account
- Administrative MySQL Command

6. Mysql client

- Presentation of client administration
- Mysql customer program calls
- Usage of mysql client
- Mysql client administration

7. Presentation of data types

8. Metadata

9. Storage engine

10. Partitioning

- Presentation and advantages of partitioning
- Creating a partition table
- Collecting information on partition
- Modification and suppression of partition

11. Mysql transactions

12. Management of users and security

- Security risks
- Security measures
- Privileges
- Access level, particularly:1- users account, 2- database, 3- tables, 4- column, 5- routine storage
- Management of user account
- Client access control
- Usage of secured connection

13. Maintenance of tables

14. Exporting and importing data

❖ SWE 245: Data structure and Human Computer Interface(HCI)

➤ Advanced data structure II: 2 credits (30 hours); L, T, P, SPW

1. Files
2. Single and double linked list
3. Stacks
4. Tables
5. Practical using one of the programming languages(C, C++)

➤ Database and human Computer Interface(HCI): 2 credits (30 hours); L, T, P, SPW

1. Principles on how to create Human Computer Interface
2. Factual programming
3. Data access methodology(ADO, ODBC, OLE DB,)
4. Practicals on Visual basic, .NET, ou developer.

❖ SWE 246: Internship

➤ Internship : 6 credits (90 hours) ; L, T, P

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content :

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning

- Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
- Report writing format (page setup, character format etc)
- Defense

❖ SWE 247 : General Economics and Law

➤ **General Economics: 3 credits (45 hours); L, T, SPW**

1. **Introduction**

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits ;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. **Consumption**

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. **Production**

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. **Growth and development**

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. **The payment of the international exchanges**

- The exchange

- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ **LAW : 1 credit (15 hours)**

Business Law

Labour Law

Specialty : COMPUTER ENGINEERING

Option:

COMPUTER SCIENCE AND NETWORKS

Specialty : COMPUTER ENGINEERING

Option: COMPUTER SCIENCE AND NETWORKS

1. The objective of the training

The Computer science and networks programme is designed to produce computer personnel capable of applying the use of computer in most areas of data analysis.

2. Expected skills

→ General skills

- Self-employed, work together as a team;
- Analyse, synthesize professional document (French, English);
- Oral and written business communication (French, English);
- Participate in /conduct an approach to the management of a project;
- Know and exploit professional and institutional networks in the computer sectors.

→ Specific skills

- Install and manage a Computer system.
- Design and run efficient programmes in a wide spectrum of fields, and in various languages.
- Advise on the installation and management of Computer facilities.
- Detect technical faults in a Computer installation.
- Carry out routine (preventive) maintenance of Computer facilities
- Install and configure hardware and software of networks

3. Career opportunities

- Technician in design office;
- Application developer;
- System and network integrator
- Computer Systems installer
- Computer park manager
- Hot liner
- Computer system administrator
- Local network administrator

4. Organisation of Courses units

FIRST SEMESTER

Field of study: Computer Engineering		Specialty: Computer Engineering Option: Computer Science and Network					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
CSN 111	Engineering Maths I	45	25	0	5	75	5
CSN 112	Basic environment I	20	10	25	5	60	4
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
CSN 113	Digital electronics	30	10	0	5	45	3
CSN 114	Database design I	40	30	0	5	75	5
CSN 115	Introduction to software engineering	70	30	0	5	105	7
CSN 116	Introduction to algorithms	20	5	20	0	45	3
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
CSN 117	Bilingual training	30	10	0	5	45	3
Total		225	120	45	30	450	30

SECOND SEMESTER

Field of study: Computer Engineering		Specialty: Computer Engineering Option: Computer Science and Network					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
CSN 121	Engineering maths II	35	20	0	5	60	4
CSN 122	Basic environment II	35	20	15	5	75	5
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
CSN 123	Computer architecture	20	10	25	5	60	4
CSN 124	Database design II	40	15	15	5	75	5
CSN 125	Programming I	20	15	35	5	75	5
CSN 126	Data communication and networking I	25	15	15	5`	60	4
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
CSN 127	Economics and Enterprise Organisation (EEO) and Law	30	10	0	5	45	3
Total		205	105	105	35	450	30

THIRD SEMESTER

Field of study: Computer Engineering		Specialty: Computer Engineering Option: Computer Science and Network					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
CSN 231	Engineering Maths III	45	25	0	5	75	5
CSN 232	Basic environment III	40	20	0	0	60	4
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
CSN 233	Computer contruction	40	10	5	5	60	4
CSN 234	Data communication and networks II	40	25	5	5	75	5
CSN 235	Computer graphics and animation	15	15	40	5	75	5
CSN 236	Introduction to Human Computer Interface (HCI)	40	10	5	5	60	4
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
CSN 237	Enterprise creation and Civic education and Ethics	30	10	0	5	45	3
Total		250	115	55	30	450	30

SECOND YEAR: FOURTH SEMESTER

Field of study: Computer Engineering		Specialty: Computer Engineering Option: Computer Science and Network					
Course code	Course title	Number of Hours					Number of credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 Credits 135 hours							
CSN 241	Engineering maths IV	25	10	35	5	75	5
CSN 242	Introduction to artificial intelligence and expert systems	30	10	15	5	60	4
Professional Courses 60% (4 UC) 18 Crédits 270 hours							
CSN 243	Assembly language programming	30	10	15	5	60	4
CSN 244	Programming II	25	5	25	5	60	4
CSN 245	Computer network administration and security	30	10	15	5	60	4
CSN 246	Internship			60	30	90	6
Transversal Courses 10% (1 UC) 3 Credits 45 hours							
CSN 247	General economics and General accounting	30	10	0	5	45	3
Total		170	55	165	60	450	30

SPW: Students' Personal Work

5. Course contents

❖ CSN111: Engineering mathematics I

➤ Analysis I: 3 credits (45 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

3. Taylor series and limits

4. Integration (simple and multiple)

5. Differential equations

➤ Linear algebra I: 2 credits (30 hours); L, T, SPW

1. Vector space of finite dimension $n \leq 4$

2. Matrices

❖ CSN112: Basic environment I

➤ Digital literacy: 2 credits (30 hours); L, T, P, SPW

1. Computer fundamentals

- Hardware
- Networks and mobile devices
- Software
- Operating system
- File management
- Security and maintenance
- Cloud computing

2. Key applications

- Apps and applications

- Using Microsoft word
- Using Microsoft Excel
- Database concepts
- Using Microsoft power point

3. Living online

- Looking at the Internet
- Managing media literacy
- Digital communication
- Understanding e – mail
- Contacts and calendaring
- Your life online

❖ CSN113: Digital electronics

➤ **Digital electronics : 3 credits (45 hours); L, T, P, SPW**

1. Number systems and codes

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. Combinational logic

- Logic gates
- Boolean algebra
- Simplification of Boolean functions
- Applications of combinational logic

3. Sequential logic

- Flip flops
- Counters
- Registers

❖ CSN114: Database design I

➤ **Database design I: 5 credits (75 hours); L, T, P, SPW**

1. Fundamental objectives of a database

- Less redundancy
- Consistency

- ACID Properties
 - Multiuser and Concurrent Access
 - Multiple views
 - Confidentiality/integrity
2. Flashback on data models
 - Entity-Relationship Model
 - Relational Model
 3. Relational database design
 4. Structured query language (SQL)
 5. Database system architecture
 6. Practicals on MS access and or Mysql

❖ CSN115: Introduction to software engineering

➤ **Introduction to information systems: 7 credits (105 hours); L, T, SPW**

1. Specification languages of an information system.

- Data models(Entity relational models, relational models)
- Processing models(petri diagram, MERISE diagram, SADT diagram)
- Communication models
- Objects models

2. Analysis of the is – the system and opportunities offered

- Methods of studying an existing information system
- Data representation and processing of an existing information system in terms of the models studied above.
- Quality criteria of an information system
- Criticizing the is – the system
- Study of the opportunities
- Audit

3. Design

- Data conceptual diagrams
 - Construction of data conceptual diagram
 - Normalization
- Processing conceptual diagram

- Processing architectural diagram
-
- Dynamic representation
- Conceptual diagram of a communication system
- Representing a communication system
- Determination of the elements of a communication system
- Object conceptual diagram

➤ **Introduction to software engineering: 2 credits (30 hours); L, T, SPW**

1. Software development life cycle (SDLC)
2. Quality
3. Specifications
4. Ergonomics
5. Tests
6. Management of requirements
7. Control of development
8. Writing of specifications
9. Methods of estimating the cost

❖ **CSN116: Introduction to algorithms**

➤ **Fundamentals of algorithms: 3 credits (45 hours); L, T**

1. Introduction to algorithms
2. Algorithm approaches: greedy, dynamic programming, divide and conquer, branch and bound, introduction to complexity analysis and measures.
3. Algorithms: sorting and searching, merging, tree and graph traversals, shortest path, minimum spanning tree, order statistics, string matching.

❖ **CSN117: English and General Accounting**

➤ **English: 1.5 credits (22 hours 30mn)**

1. Vocabulary

- Technical and usual vocabulary of the specialty

2. Grammar

3. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

4. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

5. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ French : 1.5 credits (22 hours 30mn)

1. Vocabulaire

- Vocabulaire technique usuel

1. Grammaire

- Du verbe : Conjugaison aux temps communément utilisés – présent, passé composé ; imparfait, futur, conditionnel, et plus-que-parfait, l'impératif, l'infinitif, voix passive ;
- De l'adjectif : Qualificatif, possessifs, démonstratifs, interrogatifs, numéraux, indéfinis ;
- Du nom et son article: masculin/féminin ; singulier/pluriel ; dénombrable, et non-dénombrable ;
- Du pronom : personnel, possessif, interrogatif, démonstratif, relatif, indéfini ;
- De l'adverbe et de la locution adverbiale : pour dire comment, où, quand et pourquoi ;
- Des fonctions grammaticales.

3. Expression et communication

- Compréhension et interaction au cours d'une discussion technique ;
- Communication orale courante ;
- Communication orale interactive
- De la phrase : simple, complexe, composée ; interrogative, déclarative, exclamative et impérative ;
- Lecture rapide et compréhension de texte ;

- synthèse d'un long texte;
- Lecture des texts de nature diverses (litteraire, non litteraire, image fixe ou mobile, dessin de presse, caricature ect...)
- De la communication : rédaction de texte, d'instructions, de rapport, d'une correspondance, d'une lettre recommandation ou de motivation, d'une demande d'emploi, d'une demande d'explication, d'une réponse à une demande d'explication, d'un CV ;
- Réalisation d'un exposé, d'une interview...
- Gestion d'une table ronde/discussion : La prise de notes, la prise de parole
- Expressions figées

❖ CSN121: Engineering mathematics II

➤ Analysis I: 2 credits (30 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

3. Taylor series and limits

4. Integration(simple and multiple)

5. Differential equations

➤ Probability : 2 credits (30 hours); L, T, SPW

Combinatory analysis

4. Calculation of probabilities

- Kolmogorov axioms
- Conditional and independent probabilities.
- BAYES theorem and axiom on total probability

5. Random variables

- Definition;

- Moment of a random variable;
- Joint law and marginal laws of a pair
- Bienaym -Tchebychev Inequality
- Basic laws on large numbers
- TCL

6. Probability laws

❖ CSN122: Basic environment II

➤ Operating system I: 2 credits (30 hours); L, T, P,SPW

1. Background

- Overview of computer system and operating system
- History of operating systems
- Operating system structure
 - Processes, files, system call, the shell
 - The Kernel
 - Monolithic Kernels
 - Micro-kernels

2. Process Management

- Process description and control
- Process Interrupts
- Context Swapping
- Process scheduling:
 - First Come First Served
 - Round Robin Scheduling
 - Shortest Process Next
 - Shortest Remaining Time
 - Threads, Symmetric Multiprocessing

3. Inter-process Communication & Clock Synchronization

- Mutual exclusion and critical section
- Race Conditions
- Semaphores
- IPC Problems

➤ **Web programming I: 3 credits(45 hours); L, T, P, SPW**

1. Internet and its services
2. Operation of the Web
3. Addressing of Web documents
4. HTML
5. CSS
6. Java script

❖ **CSN123: Computer architecture**

➤ **Computer architecture: 4 credits (60 hours); L, T, SPW**

1. Internal architecture and operation of a microprocessor

- Program counter
- Registers
- Instruction registers
- Instruction decode
- Arithmetic and logic unit
- Accumulator
- Flag register
- Bus
- Opcode
- Operand
- Machine cycle
- Polling
- Interrupts
- etc

2. Computer Memory

- Types and technological structure
- Memory hierarchy
- Installing memory
- Organizational structure and uses

3. Mother board

- Form factor
- components

4. Interfacing techniques

- Notion on communication
- Conversion of signals (ADC and DAC)
- Parallel interface
- Serial interface

5. Troubles hooting of computer system

❖ CSN124: database design II

➤ SQL & Query optimization: 5 credits (75 hours); L, T, P, SPW

1. Object oriented data mode and object oriented languages.
2. Design of object-oriented databases.
3. File structure and physical storage
4. Concept of indexing and hashing.
5. Query processing
6. Concept of transactions and concurrency control
7. Recovery systems
8. DBMS applications

❖ CSN125: Programming I

➤ Structured programming: 2 credits (30 hours); L, T, P, SPW

4. Introduction
5. Data types, Variables, Constants, C operators, types conversions in expression, input and output and expression statements.
6. Branching and looping, arrays and string, functions, pointers, structures, unions, linked list and file management

➤ Factual programming: 2 credits (30 hours); L, T, P, SPW

4. Introduction to visual basic and .NET
5. Visual studio development environment
6. Syntax of VB.NET
 - Form and control elements
 - Control structures
 - Procedures
 - identification and elimination of errors

❖ CSN126: Data communication and networking I

➤ Data communication and networking I: 4 credits (60 hours); L, T, P, SPW

3. Transmission problems encountered in a network
4. Computer networking basics: hardware and software
 - Transmission of information
 - Media
 - Topology
 - Coding
 - Access techniques
 - subnetting
 - Hardware: MODEMs repeaters, communication controllers
 - Management of communication in a network
 - Synchronization
 - Errors control
 - Flow control
 - Routing
 - Addressing
 - Switching
 - Architecture:
 - Concept of layers
 - Concept of service
 - Protocols
 - OSI model
 - Other standards
 - Services intended for inter operation of the systems
 - Data representation
 - Calls of remote procedures
 - Criteria used to choose a network(characteristics, organization, services offered etc)
 - LAN: Ethernet, Token ring
 - Public networks (PSTN etc)
 - High data rate networks

❖ CSN127: Economics and Enterprise Organization(EEO) and French

➤ **Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P**

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - ✓ According to economic activities
 - ✓ According to dimension
 - ✓ According to judicial criteria

2. Organizational structure of an enterprise

▪ Distribution of tasks and power hierarchy

- ✓ Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
- ✓ Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy

▪ Coordination and relationships in the enterprise

- ✓ Coordination of tasks in the enterprise
- ✓ Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship

- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- **Commercial policies (the 4p)**

- Policy of the products
- Price policy
- Distribution policy
- Communication policy

- **Production and processing policies**

✓ Production policy:

- Production on command
- Production in series
- Continuous production

✓ Processing policy

- Studies and research office
- Methods office
- Office of scheduling and launching

✓ Various production methods(influence of technology on production)

- Mechanization, automation and computer assisted production (CAP)

✓ Quality policies (Production control)

- At the level of production factors
- At the level of work advancement
- At the level of quality

✓ Work organization and evolution

- Taylorization
- Fordism
- The actual form of a work organization
- Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker

- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority
 - Decentralization of decision making

➤ **Initiation to the Law 1 credit (15 hours)**

Business Law

Labour Law

❖ **TEL231: Engineering Mathematics III**

➤ **Statistics: 2 credits (30 hours); L, T, SPW**

- Graphical representation;
- Central tendency, dispersion,(mean, mode, median, variance, and standard deviation, deciles, interquatile range);
- Covariance;
- Correlation coefficients and regression;
- Least square methods;
- Estimation of mean and standard deviation;
- Test of hypothesis
- Descriptive statistics;

➤ **Analysis III: 2 credits (30 hours); L, T, SPW**

- Whole series and Fourier series
- Fourier transform, Laplace transform and Z transform

❖ **CSN232: Basic environment III**

➤ **Operating system II: 2 credits (30 hours); L, T, P, SPW**

1. Memory Management

- Partitioning, paging and segmentation
- Virtual memory
- Page Faults
- Address translation and page fault handling
- Memory management hardware: page table and Translation
- Memory management algorithms: fetch policy, replacement policy

2. Input / Output Management and Disk Scheduling

- I/O devices
- Organization of I/O function
- I/O buffering
- Disk scheduling, RAID

3. File Management

- File systems
 - File systems interface
 - File system structures
- Organization: files and directories
- Secondary storage management, file systems: FAT and NTFS
- File protection & Security

4. Deadlocks

- Conditions for deadlocks
- Deadlock avoidance
- Deadlock prevention
- Research on deadlocks

5. Multi processor systems

- Multicomputers

- Virtualization
- Distributed systems

6. Operating system security

- Cryptography
- Authentication
- Malware etc.

7. Operating system designs

- Case studies
 - Linux
 - Windows Vista
 - Symbian OS

➤ Web programming II: 2 credits(30 hours); L, T,P, SPW

1. Define Web
2. Installation and configuration of a Web server(wamp server/Easy PHP)
3. Notions on intranet, Internet and extranet
4. Presentation of web development tools
5. Apache projects
6. Basic concepts on Mysql
7. PHP language

❖ CSN233: Compiler construction

➤ Compiler construction: 4 credits (60 hours); L, T, P, SPW

1. Differentiate among a compiler, assembler and an interpreter
2. The compilation process.
3. Concepts of grammar and languages.
4. Functions of a scanner
5. Functions of recognizers.
6. Run time storage allocation.
7. Function of error routine at each phase of compilation.
8. Code generation

❖ CSN234: Data communication and networks II

➤ Data communication and networks II: 5 credits (75 hours); L, T, P, SPW

1. Interconnection of networks
2. Specifications of a network

3. Installation and configuration of a network
4. Splitting of a network
5. Networks in industries and enterprises
6. Usage of network applications: messaging, transfer of files etc
7. Services of network administration
8. Surveillance and security of a network

❖ CSN235: Computer graphics and animation

➤ **Computer graphics and animation: 5 credits (75 hours); L, T, P, SPW**

1. Basic concept of computer graphics.
2. Concept of interactive graphics.
3. Mathematics for two-dimensional computer graphics.
4. Concept of raster graphics.
5. Two-dimensional transformations.
6. Graphics input/output.
7. Available graphics facilities.
8. Graphic packages.

❖ CSN236: Introduction to Human Computer Interface (HCI)

➤ **Introduction to Human computer Interface (HCI): 4 credits (60 hours); L, T, P, SPW**

1. Introduction to HCI
2. Conceptualize interaction.
3. Principles and application of user centered design
4. Designs for collaboration and communication.
5. Effects of interfaces on users.
6. Process of interaction process.
7. Test and model users.

❖ CSN237: Enterprise creation and Civics & Moral Education

➤ **Enterprise creation: 1 credit(15 hours); L, T, SPW**

1. Characteristics of the entrepreneur
2. Opportunity recognition

3. Starting a business
4. Business operation

➤ **Civics and Moral education: 2 credits (30 hours); L, T, SPW**

The Concepts

- The citizen;
- The Nation;
- The State;
- Public Property unto collective property;
- The freedoms;
- The public service;
- Problem of ethics;
- Ethics, Law and reason;
- Management and ethics of responsibility;
- Ethics and management.
- Ethics
- Civics
- Deontology
- Moral consciousness
- The universal declaration of Human Rights
- Good governance in public services
- Explain the importance of civics to the life of the nation
- Functions of the state and its citizens
- Deontology, Professional ethics and professionalism
- Relationship between morality, law and ethics
- Codes of ethics

❖ **CSN241: Engineering Mathematics IV**

➤ **Analysis IV: 2 credits (30 hours); L, T, SPW**

Continuation of numerical series

- Whole series and Fourier series
- Fourier transform, Laplace transform and Z transform

➤ **Probability: 2 credits (30 hours); L, T, SPW**

Combinatory analysis

1. Calculation of probabilities

- Kolmogorov axioms
- Conditional and independent probabilities.
- BAYES theorem and axiom on total probability

2. Random variables

- Definition;
- Moment of a random variable;
- Joint law and marginal laws of a pair
- Bienaym -Tchebychev Inequality
- Basic laws on large numbers
- TCL

3. Probability laws

❖ DBM242: Introduction to artificial intelligence and expert systems

➤ Introduction to artificial intelligence and expert systems : 4 credits (60 hours); L, T, P, SPW

1. Concept of artificial intelligence.

2. Problems and search

Searching strategies- Uninformed Search- breadth first search, depth first search, uniform cost seart, depth limited search, iterative deepening search, bidirectional search - Informed Search Best first search ,Greedy Best first search , A* search – Constraint satisfaction problem , Local searching strategies.

3. Reasoning

Symbolic Reasoning Under Uncertainty- Statistical Reasoning - Weak Slot-And-Filler-Structure -Semantic nets – Frames- Strong Slot-And-Filler Structure-Conceptual Dependency-Scripts- CYC.

4. Knowledge representation

Knowledge Representation - Knowledge representation issues - Using predicate logic -Representing Knowledge Using Rules. Syntactic- Semantic of Representation – Logic & slot and filler - Game Playing – Minimal search- Alpha beta cutoffs –Iteratic deepening planning – component of planning system – Goal stack planning.

5. Natural language processing

Natural Language Processing –Syntactic processing, semantic analysis-Parallel and Distributed AI-Psychological modeling- parallelism and distributed in reasoning systems – Learning -Connectionist Models – Hopfield networks, neural networks

6. Expert systems

Common Sense –qualitative physics, commonsense ontologies- memory organization –Expert systems –Expert system shells- explanation – Knowledge acquisition -Perception and Action – Real time search- robot architecture.

❖ **CSN243: Assembly language programming**

➤ **Internal architecture and operation of a processor: 2 credits (30 hours); L, T, SPW**

- Program counter
- Registers
- Instruction registers
- Instruction decode
- Arithmetic and logic unit
- Accumulator
- Flag register
- Bus
- Opcode
- Operand
- Machine cycle
- Polling
- Interrupts
- Interfacing microprocessor to memory
- etc

➤ **Internal architecture and programming of 8085: 2 credits (30 hours); L, T, SPW**

- Pin configuration of 8085
- Internal architecture of 8085
- Addressing modes
- Instruction set
- Programming techniques
- Interrupts
- Programming in assembly
- 8085 interfacing techniques

❖ CSN244: Programming II

➤ Factual programming and Human Computer Interface : 4 credits (60 hours); L, T, P, SPW

1. Concepts on object oriented programming(OOP)
2. Practice of OOP
3. Windows applications, Web application
4. To distribute the application(setup)
5. Introduction to database programming with ADO.NET

❖ CSN245: Network administration and security

➤ Network administration: 2 credits (30 hours); L, T, P, SPW

1. Windows server administration fundamentals

- Installation of a Window server
- Identify application servers
- Understand web services
- Understand remote access
- Understand file and print services
- Understand server virtualization
- Management of groups infrastructure and policy
- Storage technologies and scenarios
- Troubleshooting methods

➤ Network security: 2 credits (30 hours); L, T, P, SPW

1. Review of Networking Fundamentals
2. Network Security Concepts
3. Attacks to Networks and Countermeasures
4. World Wide Web and Internet Security

❖ CSN246: Internship

➤ Internship: 6 credits (90 hours); L, T, P

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills

through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content:

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning
 - Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
 - Report writing format (page setup, character format etc)
 - Defense

❖ CSN247: General Economics and General accounting

➤ General Economics: 3 credits (45 hours); L, T, SPW

1. Introduction:

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. incidental expenses on buying and selling
8. packing supplies
9. Transport
10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

Specialty : COMPUTER ENGINEERING

Option :

DATABASE MANAGEMENT

1. The objective of the training

This specialty trains senior technicians who, with the help of their capability to study the needs of the society, can analyse (MERISE, UML), design and implement database of all types.

2. Expected skills

→ **General skills**

- Self-employed, work together as a team;
- Analyse, synthesize a professional document (French, English);
- Oral and written business communication (French, English);
- Participate in /conduct an approach to the management of a project;
- Know and exploit professional and institutional networks in the computer sectors.

→ **Specific skills**

- Design and develop computer applications;
- Implement and ensure the maintenance of computer programs;
- Develop software or systems based on software by following professional standards adequately;
- Put in place and customize distributed applications;
- Diagnose the main faults affecting the computer system and replace defective parts; plan, monitor and control a computer project.

3. Career opportunities

- Head of IT project;
- Software Consultant;
- Developer of applications;
- System Administrator.

4. Organization of teachings

- FIRST SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Database Management					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
DBM111	Engineering Maths I	45	25	0	5	75	4
DBM112	Statistics I	20	10	25	5	60	5
Professional courses 60% (4 UC) 18 credits 270 hours							
DBM113	Database design I	40	20	10	5	75	5
DBM114	DBMS architecture	40	20	10	5	75	5
DBM115	Data modeling	20	10	10	5	45	3
DBM116	Database languages and interface	30	10	30	5	75	5
Transversal Courses 10% (1 UC) 3 credits 45 hours							
DBM117	English and general accounting	30	10	0	5	45	3
Total		225	120	45	30	450	30

- SECOND SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Database Management					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
DBM121	Statistics II	35	20	0	5	60	4
DBM122	Introduction to software engineering I	35	20	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
DBM123	Other database functions	20	10	10	5	45	3
DBM124	Database design II	35	15	20	5	75	5
DBM125	Data communication and networks I	35	20	15	5	75	5
DBM126	Roles and functions in database management	30	20	20	5	75	5
Transversal Courses 10% (1 UC) 3 credits 45 hours							
DBM127	Economics and Enterprise Organisation (EEO) and French	30	10	0	5	45	3
Total		205	105	105	35	450	30

• **THIRD SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Database Management					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
DBM231	Introduction to Human Computer Interface (HCI)	45	25	0	5	75	5
DBM232	Introduction to software engineering II	40	20	0	0	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
DBM233	OOM UML	40	10	5	5	60	4
DBM234	Data communication and networks II	35	15	10	5	75	5
DBM235	Database development and scripting	30	15	25	5	75	5
DBM236	Digital electronics	40	10	5	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
DBM237	Enterprise creation and civic education and Ethics	30	10	0	5	45	3
Total		250	115	55	30	450	30

• **FOURTH SEMESTER**

Field: Computer Engineering		Specialty: Computer Engineering Option: Database Management					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
DBM241	Engineering Maths II	35	20	0	5	60	4
DBM242	Introduction to artificial intelligence and expert systems	40	15	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
DBM243	Assembly language programming	30	10	15	5	60	4
DBM244	Trends in database technology	25	5	25	5	60	4
DBM245	Datsbase administration and security	30	10	15	5	60	4
DBM246	Internship			60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
DBM247	General economics and Law	30	10	0	5	45	3
Total		170	55	165	60	450	30

SPH: Students' private hours

5. Courses content

❖ DBM 111 : Engineering mathematics I

➤ **Analysis I: 3 credits (45 hours); L, T, SPW**

11. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

12. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

13. Taylor series and limits

14. Integration(simple and multiple)

15. Differential equations

➤ **Linear algebra I: 2 credits (30 hours); L, T, SPW**

3. Vector space of finite dimension $n \leq 4$
4. Matrices

❖ DBM 112 : Statistics I

➤ **Statistics I: 5 credits (75 hours); L, T, SPW**

❖ DBM 113 : Database design I

➤ **Database design I: 5 credits(75 hours); L, T, P, SPW**

1. Fundamental objectives of a database

- Less redundancy
- Consistency
- ACID Properties

- Multiuser and Concurrent Access
 - Multiple views
 - Confidentiality/integrity
- 2. Flashback on data models**
 - Entity-Relationship Model
 - Relational Model
 - 3. Relational database design**
 - 4. Structured query language (SQL)**
 - 5. Database system architecture**
 - 6. Practicals on MS access and or Mysql**

❖ DBM 114 : DBMS architecture

➤ **DBMS architectures: 5 credits (75 hours); L, T, SPW**

1. Centralized and Client-Server Systems
2. Server System Architectures
3. Parallel Systems architectures
4. Distributed Systems architectures
5. Network Types architectures

❖ DBM 115 : Data modeling

➤ **Data models: 3 credits (60 hours); L, T, SPW**

- 1. Introduction to Data, and Data Modelling Concepts**
- 2. Conceptual Modelling**
 - E-R Model
 - How to convert business requirements to E-R Diagrams
 - Entities, Relationships, Identifiers, PKs, Cardinality, FKs
- 3. Relational Database Management Principles**
- 4. Logical Modelling**
 - Converting a conceptual model to logical model
 - Integrity constraints
 - Normalization
- 5. Physical Modelling**

- SQL practices
- 6. **Transaction Management Concepts**
 - Consistency issues
- 7. **Databases for Decision Support**
 - Data warehousing Concepts
 - Architectures

❖ DBM 116 : Database languages and interface

➤ Database languages: 3 credits (45 hours); L, T, P, SPW

1. Data definition language (DDL)
2. Storage definition language (SDL)
3. View definition language (VDL)
4. Data manipulation language (DML)
 - Allows retrieval, insertion, deletion, modification
 - Low-level or procedural DML
 - Must be embedded in a general-purpose programming language
 - Record-at-a-time
 - High-level or non-procedural DML
 - Can be used on its own to specify complex database operations concisely
 - Set-at-a-time or set-oriented

➤ Database interface: 2 credits (30 hours); L, T, SPH, P

1. Menu-based interfaces for Web clients or browsing
2. Forms-based interfaces
3. Graphical user interfaces
4. Natural language interfaces
5. Speech input and output
6. Interfaces for parametric users
7. Interfaces for the DBA

❖ DBM 117 : English and General Accounting

➤ English: 2 credits (30 hours); L, T

1. Vocabulary

- Technical and usual vocabulary of the specialty

2. Grammar

3. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

4. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

5. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. Incidental expenses on buying and selling
8. Packing supplies
9. Transport

10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

❖ **DBM 121 : Statistics II**

➤ **Statistics II: 4 credits (60 hours); L, T, SPW**

❖ **DBM 122 : Introduction to software engineering I**

➤ **Introduction to software engineering: 5 credits (75 hours); L, T, P, SPW**

1. Specification languages of an information system.

- Data models(Entity relational models, relational models)
- Processing models(petri diagram, MERISE diagram, SADT diagram)
- Communication models
- Objects models

2. Analysis of the is – the system and opportunities offered

- Methods of studying an existing information system
- Data representation and processing of an existing information system in terms of the models studied above.
- Quality criteria of an information system
- Criticizing the is – the system
- Study of the opportunities
- Audit

3. Design

- Data conceptual diagrams
 - Construction of data conceptual diagram
 - Normalization
- Processing conceptual diagram
 - Processing architectural diagram
- Dynamic representation

- Conceptual diagram of a communication system
- Representing a communication system
- Determination of the elements of a communication system
- Object conceptual diagram

❖ DBM 123 : DBMS functions

➤ Database functions: 3 credits (45 hours); L, T, SPW

1. Data dictionary management
2. Data storage management.
3. Data transformation and presentation.
4. Security management.
5. Multiuser access control.
6. Backup and recovery management.
7. Data integrity management.
8. Database access languages and application programming interfaces.
9. Database communication interfaces.

❖ DBM 124 : Database design II

➤ Database design II: 5 credits (75 hours); L, T, P, SPW

1. Object oriented data mode and object oriented languages.
2. Design of object-oriented databases.
3. File structure and physical storage
4. Concept of indexing and hashing.
5. Query processing
6. Concept of transactions and concurrency control
7. Recovery systems
8. DBMS applications

❖ DBM 125 : Data communication and network I

➤ Data communication and network I: 5 credits (75 hours); L, T, P, SPW

1. Transmission problems encountered in a network
2. Computer networking basics: hardware and software

- Transmission of information
 - Media
 - Topology
 - Coding
 - Access techniques
 - subnetting
 - Hardware: MODEMs repeaters, communication controllers
- Management of communication in a network
 - Synchronization
 - Errors control
 - Flow control
 - Routing
 - Addressing
 - Switching
- Architecture
 - Concept of layers
 - Concept of service
 - Protocols
 - OSI model
 - Other standards
 - Services intended for inter operation of the systems
 - Data representation
 - Calls of remote procedures
- Criteria used to choose a network(characteristics, organization, services offered etc)
- LAN: Ethernet, Token ring
- Public networks (PSTN etc)
- High data rate networks

❖ DBM 126 : Rules and functions in database management

➤ Rules and functions in database management: 5 credits (75 hours); L, T, P, SPW

1. Indexing
2. Views

3. Security
4. Integrity
5. Concurrency
6. Backup/recovery
7. Design
8. Documentation
9. Update/Query

❖ DBM 127 : Economics and Enterprise Organization(EEO) and French

➤ Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - o Organizational structure
 - o Departmental structure
 - o Site location
 - o Practical structure
 - Power hierarchy
 - o Functional hierarchy
 - o Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies
 - Production policy:
 - Production on command
 - Production in series
 - Continuous production
 - Processing policy
 - Studies and research office
 - Methods office
 - Office of scheduling and launching
 - Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
 - Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
 - Work organization and evolution
 - Taylorization
 - Fordism

- The actual form of a work organization
- Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority
 - Decentralization of decision making

➤ French: 1 credit (15 hour); L, T

1. Etude des situations de communication

- Identification des facteurs de la situation de communication (émetteur, récepteur, code, canal, message, contexte) ;
- Situation de communication et interactions verbales ;
- Etude des éléments para verbaux (kinésique, proxémiques, mimogestuels, etc.) ;
- Identification et manipulation des figures d'expression et de pensée (métaphores, ironie, satire, parodie, etc.).

2. Typologie des textes et recherche documentaire

- Lecture des textes de natures diverses (littéraires/non littéraires, image fixe/image mobile, dessin de presse, caricature, etc.) ;

- Analyse des textes publicitaires et des discours (scientifiques, politiques, littéraires, etc.) ;
- Constitution et exploitation d'une documentation et montage des dossiers ;
- Lecture des textes cultivant les valeurs morales et civiques.

3. Communication orale

- Réalisation d'un exposé ;
- Réalisation d'une interview ;
- Réponse à une interview ;
- Présentation d'un compte-rendu oral ;
- Résumé de texte ;
- Réalisation d'un jeu de rôles ou d'une simulation ;
- Initiation au leadership et à la dynamique des groupes ;
- Ecoute et lecture attentive de documents sonores et/ou graphiques ;
- Lecture méthodique à l'oral.

❖ DBM 231 : Introduction to Human Computer Interface (HCI)

➤ Introduction to Human Computer Interface (HCI): 5 credits (75 hours); L, T, P, SPW

1. Introduction to HCI
2. Conceptualize interaction
3. Principles and application of user centered design
4. Designs for collaboration and communication
5. Effects of interfaces on users
6. Process of interaction process
7. Test and model users

❖ DBM 232 : Introduction to software engineering II

➤ Introduction to software engineering II: 4 credits (60 hours); L, T, P, SPW

1. Software development life cycle (SDLC)
2. Quality
3. Specifications
4. Ergonomics
5. Tests

6. Management of requirements
7. Control of development
8. Writing of specifications
9. Methods of estimating the cost

❖ **DBM 233 : OOM UML**

➤ **OOM UML: 4 credits (60 hours); L, T, P, SPW**

1. Basic techniques of modeling computer systems
2. Overview of Prominent Object-oriented Methodologies.
3. Introduction to UML (Unified Modeling Language)
4. Overview of the development process
5. Study of the various UML diagrams (structural and behavioral diagrams).
6. Class Diagram (attributes, association, aggregation, composition, generalization, parameterized classes)
7. Use Case diagram
8. Interaction diagrams (sequence diagram, collaboration diagram)
9. State Diagram and Activity Diagram
10. Introduction to object-oriented design (inheritance, encapsulation, polymorphism, abstract interfaces, parameterized types)
11. Design patterns in object-oriented design modeling of the source code.
Modeling executable versions
12. Workshop on object oriented software engineering

❖ **DBM 234 : Data communication and network II**

➤ **Data communication and network II: 5 credits (75 hours); L, T, SPH, P**

1. Interconnection of networks
2. Specifications of a network
3. Installation and configuration of a network
4. Splitting of a network
5. Networks in industries and enterprises
6. Usage of network applications: messaging, transfer of files etc
7. Services of network administration
8. Surveillance and security of a network

❖ DBM 235 : Database development and scripting

➤ Database development and scripting: 5 credits (75 hours); L, T, SPH, P

1. Understanding the MySQL database server
2. Creating and querying databases, the basic concepts
3. Identifying database anomalies, normal forms and other database basics
4. Building MySQL tables with the Structured Query Language
5. Extracting database information with MySQL selects and functions
6. Working with multiple tables using joins and unions
7. PHP server-side scripting language
8. Working with PHP variables, operators, control structures, and functions
9. Writing readable, maintainable PHP code
10. Using object-oriented techniques in PHP
11. Performing simple and advanced database operations with PHP scripting
12. Using PHP built-in functions
13. Creating user-defined functions in PHP
14. Implementing simple MySQL/PHP applications: e.g., a guestbook and a survey
15. Developing more sophisticated MySQL/PHP applications: e.g., a catalog, a content manager, a threaded discussion, a problem tracking system, and a shopping cart
16. Creating HTML forms

❖ DBM 236 : Digital electronics

➤ Digital electronics : 4 credits(60 hours); L, T, SPH, P

1. Number systems and codes

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. Combinational logic

- Logic gates
- Boolean algebra

- Simplification of Boolean functions
- Applications of combinational logic

3. Sequential logic

- Flip flops
- Counters
- Registers

❖ DBM 237 : Enterprise creation and Civics & Moral Education

➤ Enterprise creation: 2 credits(30 hours); L, T, SPW

1. Characteristics of the entrepreneur
2. Opportunity recognition
3. Starting a business
4. Business operation

➤ Civics and Moral education: 1 credit(15 hours); L, T, SPH

1. The citizen

2. The nation

- The state
- Public goods – collective goods
- Freedoms
- Public services
- Ethical problems
- Ethics, rights and privileges
- Management and ethics of the responsibility
- Ethics and management

❖ DBM 241 : Engineering mathematics II

➤ Analysis I: 2 credits (30 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative

- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

3. **Taylor series and limits**
4. **Integration(simple and multiple)**
5. **Differential equations**

➤ **Probability : 2 credits (30 hours); L, T, SPW**

Combinatory analysis

1. Calculation of probabilities

- Kolmogorov axioms
- Conditional and independent probabilities.
- BAYES theorem and axiom on total probability

2. Random variables

- Definition;
- Moment of a random variable;
- Joint law and marginal laws of a pair
- Bienaymé-Tchebychev Inequality
- Basic laws on large numbers
- TCL

3. Probability laws

❖ DBM 242 : Introduction to Artificial intelligence and expert system

➤ **Artificial intelligence and expert system: 5 credits (75 hours); L, T, SPW**

1. Concept of artificial intelligence.

2. Problems and search

- Searching strategies
 - Uninformed Search,
 - Breadth first search,
 - Depth first search,
 - Uniform cost search,
 - Depth limited search,

- Iterative deepening search,
- Bidirectional search
- Informed Search Best first search ,
- Greedy Best first search,
- A* search
- Constraint satisfaction problem
- Local searching strategies

3. Reasoning

- Symbolic Reasoning Under Uncertainty
- Statistical Reasoning
- Weak Slot and Filler Structure
- Semantic nets
- Frames
- Strong Slot and Filler Structure
- Conceptual Dependency
- Scripts
- CYC

4. Knowledge representation

- Knowledge Representation
- Knowledge representation issues
- Using predicate logic
- Representing Knowledge Using Rules
- Syntactic
- Semantic of Representation
- Logic & slot and filler
- Game Playing
- Minimal search
- Alpha beta cutoffs
- Iterative deepening planning
- Component of planning system
- Goal stack planning

5. Natural language processing

- Natural Language Processing
- Syntactic processing

- Semantic analysis
- Parallel and Distributed AI-Psychological modeling
- Parallelism and distributed in reasoning systems
- Learning
- Connectionist Models
- Hopfield networks
- Neural networks

6. Expert systems

- Common Sense
- Qualitative physics
- Commonsense ontologies
- Memory organization
- Expert systems
- Expert system shells
- Explanation
- Knowledge acquisition
- Perception and Action
- Real time search
- Robot architecture

❖ DBM 243 : Assembly language programming

➤ **Internal architecture and operation of a processor: 2 credits (30 hours); L, T, SPH**

1. Program counter
2. Registers
3. Instruction registers
4. Instruction decode
5. Arithmetic and logic unit
6. Accumulator
7. Flag register
8. Bus
9. Opcode
10. Operand
11. Machine cycle

12. Polling
13. Interrupts
14. Interfacing microprocessor to memory
15. etc

➤ **Internal architecture and programming of 8085: 2 credits (30 hours); L, T, SPH**

1. Pin configuration of 8085
2. Internal architecture of 8085
3. Addressing modes
4. Instruction set
5. Programming techniques
6. Interrupts
7. Programming in assembly
8. 8085 interfacing techniques

❖ **DBM 244 : Trends in database technology**

➤ **Trends in database technology : 4 credits (60 hours); L, T, SPH, P**

1. Physical storage media, Magnetic Disks
2. RAID, Tertiary Storage
3. File Organization, organization of records in files
4. Static hashing, Dynamic hashing
5. Ordered Indices- Primary, Secondary and clustered indices.
6. B+ - Tree Index files and B-Tree Index files
7. Introduction to Distributed Databases, Client server technology
8. Multidimensional and Parallel databases

❖ **DBM 245 : Database administration and security**

➤ **Database administration : 3 credits (45 hours); L, T, SPH, P**

1. Installing and Configuring SQL Server 2008
2. SQL Server Management Studio and other tools
3. Monitoring the Database Server
4. Database and Index Maintenance
5. Securing SQL Server 2008
6. SQL Server Backup & Recovery

7. Oracle Database Architecture
8. Installing and Configuring oracle

➤ **Database security : 3 credits (45 hours); L, T, SPH, P**

1. Databases and Security
2. MySQL Database Security
3. SQL Server Database Security
4. Oracle Database Security
5. Database security testing

❖ **DBM 246 : Internship**

➤ **Internship : 6 credits (90 hours) ; L, T, P**

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content :

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning
 - Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
 - Report writing format (page setup, character format etc)
 - Defense

❖ DBM 247 : General Economics and Law

➤ General Economics: 2 credits (30 hours); L, T, SPW

1. Introduction

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits ;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ Law: 1 credit (15 hours)

Business Law

Labour Law

Specialty : COMPUTER MAINTENANCE

Option :

HARDWARE MAINTENANCE

Specialty : COMPUTER MAINTENANCE

Option: Hardware Maintenance

1. Objective of the training

This specialty trains senior technicians capable of maintaining and repairing computer equipment. They can also install new equipment or provide training for users.

2. Expected skills

→ General skills

- Work independently, collaborate in a team;
- Analyze, synthesize a professional document (French, English);
- Communicate orally, in writing, in company or outside (French, English);
- Participate in / lead a project management process;
- Know and exploit the professional and institutional networks of the IT sectors.

→ Specific skills

- Diagnose remotely a computer hardware or software malfunction; Identify the resources needed to resolve the malfunction and refer the call if necessary (on-site maintenance, specialized technician ...);
- Guiding the user to resolve the malfunction or take control at a distance;
- Identify the phases of intervention from the information of the help desk diagnosis, the hot line, the manufacturer's files;
- Change or repair a defective item or assembly;
- Configure the workstation as needed by the user and perform functional tests;
- Perform cleaning and adjustment operations on materials and equipment.

3. Career opportunities

- IT Project Manager ;
- IT Developer ;
- Automatic distribution maintenance technician.

4. Organization of teachings

- FIRST SEMESTER**

Field: Computer Engineering		Specialty: Computer maintenance Option: Hardware maintenance					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
HWM111	Engineering maths I	35	20	0	5	60	4
HWM112	Circuit theory and Digital electronics	20	10	40	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
HWM113	Maintenance methodology	40	10	20	5	75	5
HWM114	Networking	30	10	15	5	60	4
HWM115	Electronic circuit I	30	15	10	5	60	4
HWM116	Basic environment	45	25	0	5	75	5
Transversal Courses 10% (1 UC) 3 credits 45 hours							
HWM117	English and general accounting	30	10	0	5	45	3
Total		230	100	85	35	450	30

- SECOND SEMESTER**

Field: Computer Engineering		Specialty: Computer maintenance Option: Hardware maintenance					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
HWM121	Engineering maths II	35	20	0	5	60	4
HWM122	Programming	20	10	40	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
HWM123	electronic circuit II	40	10	20	5	75	5
HWM124	Digital electronics II	40	10	20	5	75	5
HWM125	Networks, Design and conception of maintenance methodology	40	10	20	5	75	5
HWM126	Microprocessor	20	10	10	5	45	3
Transversal Courses 10% (1 UC) 3 credits 45 hours							
HWM127	Economics and Enterprise Organisation (EEO) and French	30	10	0	5	45	3
Total		225	80	110	35	450	30

• **THIRD SEMESTER**

Field: Computer Engineering		Specialty: Computer maintenance Option: Hardware maintenance					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
HWM231	Engineering maths III	35	20	0	5	60	4
HWM232	Operating system and database I	25	15	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
HWM233	electronic III	25	15	30	5	75	5
HWM234	Control and networks	10	5	55	5	75	5
HWM235	Assembly language programming	15	10	30	5	60	4
HWM236	Programming I	10	10	35	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
HWM237	Enterprise creation and civics and moral education	30	10	0	5	45	3
Total		150	85	180	35	450	30

• **FOURTH SEMESTER**

Field: Computer Engineering		Specialty: Computer maintenance Option: Hardware maintenance					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
HWM241	Engineering maths IV	35	20	0	5	60	4
HWM242	Operating system and database II	25	15	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
HWM243	Programming II	20	15	20	5	60	4
HWM244	Computer assembly and peripherals	35	15	20	5	75	5
HWM245	Regulation and installation /Administration	25	15	0	5	45	3
HWM246	professional internship	0	0	60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
HWM247	General economy an Law	30	10	0	5	45	3
Total		170	90	130	60	450	30

5. Course contents

❖ HWM 111 : Engineering mathematics I

➤ Analysis I: 3 credits (45 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

3. Taylor series and limits

4. Integration(simple and multiple)

5. Differential equations

➤ Linear algebra I: 2 credits (30 hours); L, T, SPW

3. Vector space of finite dimension $n \leq 4$
4. Matrices

❖ HWM 112 : Circuit Theory and Digital Electronics I

➤ Digital Electronics : 3 credits (45 hours)

1. Number systems and codes

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. Combinational logic

- Logic gates
- Boolean algebra

- Simplification of Boolean functions
- Applications of combinational logic

3. Architecture of a computer

- Von Neumann's architecture and Harvard's architecture

➤ **Circuits theory: 2 credits (30 hours)**

1. Notion on current and voltage;
2. Linear electric dipoles and sources
3. Dependent sources
4. Kirchhoff's laws
5. Capacitors and inductors

❖ **HWM 113 : Maintenance Methodology**

➤ **Concepts on Maintenance Methodology : 5 credits (75 hours)**

1. **Maintenance Organisation**
2. **Cost related to maintenance**
3. **The documentation function (Technical documentation)**
4. **Preparation of Maintenance actions**
 - Preparation for corrective maintenance
 - Preparation for preventive and predictive maintenance
 - General methodology of maintenance implementation
 - Systematic preventive maintenance

❖ **HWM 114 : Networking**

➤ **Networking I : 4 credits (60 hours)**

1. **Transmission problems encountered in a network**
2. **Computer networking basics: hardware and software**
 - Transmission of information
 - Media
 - Topology
 - Coding
 - Access techniques

- subnetting
- Hardware: MODEMs repeaters, communication controllers
- Management of communication in a network
 - Synchronization
 - Errors control
 - Flow control
 - Routing
 - Addressing
 - Switching
- Architecture:
 - Concept of layers
 - Concept of service
 - Protocols
 - OSI model
 - Other standards
 - Services intended for inter operation of the systems
 - Data representation
 - Calls of remote procedures
- Criteria used to choose a network(characteristics, organization, services offered etc)
- LAN: Ethernet, Token ring
- Public networks (PSTN etc)
- High data rate networks

❖ HWM 115 : Electronic circuit I

➤ **Analogue Electronics I : 2 credits (30 hours)**

1. Flashback on network theorems;
2. Theory on semiconductors and PN junction diodes
3. Diodes and diode circuits
4. Zener regulated power supply
5. Bipolar junction transistor and biasing circuits
6. BJT amplifier circuits(Eber Moll's and H – parameter)

➤ **Power Electronics I : 2 credits (30 hours)**

1. General introduction

- Definition
- Classification of static converter
- Applications

2. Power Semiconductors

- Power diodes
- Power control with thyristors and tracs
- Bipolar power transistotr
- Power MOSFET transistor
- Cooling Calculation

3. Uncontrolled rectifier

- Half wave rectification
- Full wave recrification
 - Two diodes
 - Four diodes

4. Controlled rectification

- Principles of phase control
- Simple controlled rectifier
- Double thyristor rectifier
- Mixed rectifier

5. AC – AC Converter

- Single phase and three phase ac – ac converters
- Single phase and three phase cyclo converters

❖ **HWM 116 : Basic environment**

➤ **Algorithm : 2 credits (30 hours)**

1. Introduction to Algorithm
2. Variables
3. Read and Write instructions
4. Logic Tests
5. Still Logic
6. Loops

7. Arrays
8. Multidimensional Arrays
9. Predefined Functions
10. Files
11. Procedures and Functions

➤ **Computer Architecture I : 3 credits (45 hours)**

1. Complex Circuits

- ALU
 - Adders
 - Adders / Subtractor
 - ALU
- RAM
 - SRAM
 - DRAM
 - Increase in storage capacity (Use of many circuits)

2. Structure and Overall functioning of a processor

- Structure and functioning:
 - Simplified structure
 - Functioning:
 - Instruction Execution
 - Program execution
- Architecture and performances:
 - Execution time
 - Access time
 - Improvement
 - Execution Model and reduction in execution time

3. Structure and functioning of the Processing Unit

- Structure and functioning of the Processing Unit
- Structure and functioning of the Processing Unit SPARC

4. SPARC's Instruction

- Registers and data types
- Instruction Format types and instruction's format addressing modes
- Transfer instruction register (CU → Memory)
- Arithmetic instructions, Logical and translation (Shift)
- Control transfer instruction
 - Procedure call
 - Procedure return

- Examples of use
- Other instructions

❖ HWM 117 : English and General Accounting

➤ English : 2 credits (30 hours); L, T

6. Vocabulary

- Technical and usual vocabulary of the specialty

7. Grammar

8. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

9. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

10. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. incidental expenses on buying and selling

8. packing supplies
9. Transport
10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

❖ HWM 121 : Engineering mathematics II

➤ Analysis I : 2 credits (30 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions
- Differential forms
- Vector operators

3. Taylor series and limits

4. Integration(simple and multiple)

5. Differential equations

➤ Probability : 2 credits (30 hours); L, T, SPW

Combinatory analysis

1. Calculation of probabilities

- Kolmogorov axioms
- Conditional and independent probabilities
- BAYES theorem and axiom on total probability

2. Random variables

- Definition

- Moment of a random variable
- Joint law and marginal laws of a pair
- Bienaym -Tchebychev Inequality
- Basic laws on large numbers
- TCL

3. Probability laws

❖ HWM 122 : Programming

➤ Structured programming : 3 credits (45 hours); L, T, P, SPW,

1. Introduction
2. Data types, Variables, Constants, C operators, types conversions in expression, input and output and expression statements.
3. Branching and looping, arrays and string, functions, pointers, structures, unions, linked list and file management

➤ Computer Architecture II : 2 credits (30 hours)

1. Processors and Coiprocessors
2. Bus
3. Main Memory
4. Input / Output
5. Communication with peripherals devices, polling, Interrupt
6. DMA (Direct Memory Access)
7. Computer Interfaces

❖ HWM 123 : Electronic circuits II

➤ Analog Electronics II : 3 credits (45 hours)

1. Bipolar Transistor in dynamic mode
2. Amplifier or power amplifier
3. Fiel Effect Transistor

➤ Power Electronics II : 2 credits (30 hours)

1. AC – to – AC Converter

- Study of Dimmers (Single – phase and three – phase)

- Study of cyclo converter (Single – phase and three – phase)

2. DC – to – DC converter

- Step down choppers
- Choppers with resistive and inductive loads
- Series motor chopper drive
- Step up choppers

3. DC – to – AC converter

- Inverters– Types – voltage source and current source
- inverters – single phase bridge inverters – three phase bridge inverters – PWM inverters - Series inverter control of AC output voltage – Harmonic reduction- AC Voltage regulator- Step up and step down cycloconverter -three phase to single phase and three phase to three phase cycloconverter

❖ HWM 124 : Digital electronics and circuit theory II

➤ Digital Electronics II : 3 credits (45 hours)

1. Logical Circuit technology
2. History
3. Presentation
4. Main logic functions
5. Characteristic parameters
6. Comparison between TTL – CMOS
7. Logical Integrated Circuit interface
8. Sequential logic
 - Flip flops
 - Counters
 - Registers

➤ Circuits Theory II : 2 credits (30 hours)

1. Network theorems
2. Sinusoidal steady state circuits analysis
3. Circuit transient(1st and 2nd order)

❖ HWM 125 : Digital electronics and circuit theory II

➤ Network II : 3 credits (45 hours)

1. Network concepts
2. Network communication
3. Network connectivity
4. Internet technologies

➤ Design and conception of Maintenance Methodology II : 2 credits (30 hours)

1. Preparation of Maintenance action

- Conditional preventive maintenance
- Vibration Monitoring
- Oil analysis
- Infrared thermography

2. Safe operation

- Operational availability
- Availability analysis
- Reliability study

3. Create network connections

4. Install and configure web browsers

5. Maintain and troubleshoot network connections

❖ HWM 126 : Microprocessor

➤ Microprocessor and Microcontroller : 3 credits (45 hours)

1. Introduction to microprocessor systems
2. Basic architecture of a microprocessor system

- Processor
- Central Memory
- Input / Output interfaces
- Bus
- Von Neumann
- Harvard architecture

- Address decoding

3. Memories

- Internal organization
- Characteristics
- Types of memories
- Interfacing between microprocessor and memory

❖ HWM 127 : Economics and Enterprise Organization(EEO) and French

➤ **Economics and Enterprise Organization(EEO) : 2 credits (30 hours); L, T, P**

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
 - Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies
 - Production policy:
 - Production on command
 - Production in series
 - Continuous production
 - Processing policy
 - Studies and research office
 - Methods office
 - Office of scheduling and launching
 - Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
 - Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
 - Work organization and evolution
 - Taylorization
 - Fordism

- The actual form of a work organization
- Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority
 - Decentralization of decision making

➤ **French: 1 credit (15 hour); L, T**

1. Etude des situations de communication

- Identification des facteurs de la situation de communication (émetteur, récepteur, code, canal, message, contexte) ;
- Situation de communication et interactions verbales ;
- Etude des éléments para verbaux (kinésique, proxémiques, mimogestuels, etc.) ;
- Identification et manipulation des figures d'expression et de pensée (métaphores, ironie, satire, parodie, etc.).

2. Typologie des textes et recherche documentaire

- Lecture des textes de natures diverses (littéraires/non littéraires, image fixe/image mobile, dessin de presse, caricature, etc.) ;

- Analyse des textes publicitaires et des discours (scientifiques, politiques, littéraires, etc.) ;
- Constitution et exploitation d'une documentation et montage des dossiers ;
- Lecture des textes cultivant les valeurs morales et civiques.

3. Communication orale

- Réalisation d'un exposé ;
- Réalisation d'une interview ;
- Réponse à une interview ;
- Présentation d'un compte-rendu oral ;
- Résumé de texte ;
- Réalisation d'un jeu de rôles ou d'une simulation ;
- Initiation au leadership et à la dynamique des groupes ;
- Ecoute et lecture attentive de documents sonores et/ou graphiques ;
- Lecture méthodique à l'oral.

❖ HWM 231 : Engineering Mathematics III

➤ Statistics : 2 credits (30 hours); L, T, SPW

1. Graphical representation
2. Central tendency, dispersion,(mean, mode, median, variance, and standard deviation, deciles, interquatile range)
3. Covariance
4. Correlation coefficients and regression
5. Least square methods
6. Estimation of mean and standard deviation
7. Test of hypothesis
8. Descriptive statistics

➤ Analysis III : 2 credits (30 hours); L, T, SPW

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

❖ HWM 232 : Operating systems and database I

➤ Operating system I : 3 credits (45 hours)

1. Types, Characteristics of Operating system

- History
- Essential functions
- Single or Multi user system
- Mono and multi process : internal representation, resources, process management

2. Cooperation and competition between processes

- Shared resources
- Critical resources
- Sequential or parallel execution
- Blocking and dead lock
- Synchronisation
- Critical section
- Synchronisation tools
- Internal representation
- Operations on files
- Access Methods
- Disque storage management

3. Administration of computer systems

- System configuration
- Operation evaluation
- Protection
- Security
- Systems classification

➤ Database I : 2 credits (30 hours)

1. Basic objectives of a database

- Independence
- No redundancy / Coherence
- Easy access to data
- Flexibility / Shareability
- Confidentiality / Integrity

- Main functions of DBMS

2. Revision on Data Modeling

- Representation Model (Conceptual, external, Logical and physical)
- Relational Model
- Entity / Relation Model
- Other Models

3. Formal query languages associated with relational model

- Algebraic language
- Predicative language (Relational calculus)
- Data description and manipulation language

4. Associated with relational model

- SQL language
- Interactive use
- SQL embedded in a programming language
- 4th generation language
- Application generator

❖ HWM 233 : Electronics circuits III

➤ **Analogue Electronics III : 3 credits (45 hours)**

1. Frequency response of amplifiers
2. Operational amplifiers
3. Active filter
4. Sinusoidal oscillators

➤ **Static and dynamic machines : 2 credits (30 hours)**

1. Study of single – phase transformers
2. Study of DC machines
3. Study of 3 – phase transforms
4. Study of 3 – phase asynchronous motors
5. Study of synchronous motors

❖ HWM 234 : Controls and Networks

➤ **Control I : 2 credits (30 hours)**

1. General Information on servos

- Concept of system

- Characteristics of systems
- Quality of a control system
- Structure of a loop system
- Functional organization

2. Laplace Transform and transfer function

- Definition
- Usual functions transformed
- Properties
- Applications
- Inverse transform

3. Transfer function and block diagram

- Transfer function
- System response
- Application
- Block diagram algebra

4. Frequency response

- Generalities
- Bode representation
- Nyquist curve

➤ Network Practical : 3 credits (45 hours)

1. Study of cable network equipments and wiremelss (Cable, switch, hub, router ...)
2. Wiring plan
3. Cabling path laying
4. Cabling (crimping straight cable, cross cable crimping)
5. Networking and subnetwork setting

❖ HWM 235 : Assembly language programming

➤ Assembly language programming : 4 credits (60 hours) ; L, T, P, SPW

1. Introduction to Assembly Language + Instruction format
2. Number & Character representations
3. (Signed & unsigned representations), ASCII codes

4. Instruction Types + 8086 register sets
5. (Mov, Sub, Add) +Data definition instructions
6. Flag register + Overflow detection
7. Addressing modes
8. Debugger + Assembler
9. Data transfer Instructions (Mov, Xchg, Lea, Stack operations)
10. Stack Operations
11. Arithmetic Instructions (Add, Sub, Inc, Dec, Neg, Mul, Div)
12. Arithmetic Instructions
13. Writing Arithmetic Expressions
14. Boolean Instructions (And, Or, Not, Xor, Shl, Shr, Rol, Ror, Test,Cmp)
15. Boolean Instructions
16. Unconditional/Conditional Jumps and Loops (Loop, Jmp, Jxx)
17. Program examples
18. Interrupts / I/O instructions (Int, In, Out)
19. Interrupts / I/O instructions

❖ HWM 236 : Programming I

➤ Object oriented programming: 4 credits (60 hours); L, T, P, SPW

1. Introduction to object oriented programming
2. Objects and class
3. Encapsulation and masking of information
4. Aggregation and decomposition
5. Generalization and specialization
6. Inheritance
7. Polymorphism and dynamic links
8. Examples of OOP: C++, Java

❖ HWM 237 : Enterprise creation and Civics & Moral Education

➤ Enterprise creation: 2 credits (30 hours); L, T, SPW

1. Characteristics of the entrepreneur
2. Opportunity recognition

3. Starting a business
4. Business operation

➤ **Civics and Moral education: 1 credit(15 hours); L, T, SPW**

1. The citizen
2. The nation
3. The state
4. Public goods – collective goods
5. Freedoms
6. Public services
7. Ethical problems
8. Ethics, rights and privileges
9. Management and ethics of the responsibility
10. Ethics and management

❖ **HWM 241 : Engineering Mathematics IV**

➤ **Analysis IV: 2 credits (30 hours); L, T, SPW**

Continuation of numerical series

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

➤ **Probability: 2 credits (30 hours); L, T, SPW**

Combinatory analysis

- 1. Calculation of probabilities**
 - Kolmogorov axioms
 - Conditional and independent probabilities.
 - BAYES theorem and axiom on total probability
- 2. Random variables**
 - Definition;
 - Moment of a random variable;
 - Joint law and marginal laws of a pair
 - Bienaymé-Tchebychev Inequality
 - Basic laws on large numbers
 - TCL
- 3. Probability laws**

❖ HWM 242 : Operating system and Database II

➤ Operating System II : 2 credits (30 hours)

1. Memory Management

- Memory hierarchy
- Virtual memory
- Paging
- Segmentation
- Allocation strategies

2. Input / Output

- Peripheral types
- DMA
- Channels
- Device drivers and peripherals
- Input / Output buffer

➤ Database II : 3 credits (45 hours)

1. Principles of Database design

- Functional dependence
- Standardisation algorithm
- Normal form
- Integrity constraint (Static, Dynamic, Link to the transaction)

2. Database Administration

- Physical implementation
- File structure and index
- Control of competing access
- Fault resistance
- Data protection and security
- Setting, Booting, Stopping, Restoring
- Shared database
- Shared processing
- Audit, Optimisation

❖ HWM 243 : Programming II

➤ Web Programming : 4 credits (60 hours)

1. Introduction to web programming
2. HTML
3. CSS
4. Java script
5. Php
6. Web services

❖ HWM 244 : Computer Assembly and Peripherals

➤ Assembly and Repair : 3 credits (45 hours)

1. Diagnostic principles
2. Procedure for repairing a personal computer
3. Data saving and data restoring tools
4. Antivirus
5. RAID system
6. Calls system

➤ Input / Output peripherals : 2 credits (30 hours)

1. Interfacing to Input / output devices
2. Input output interfacing techniques
3. Peripheral types
4. Media control interface (Multimedia channels)

❖ HWM 245 : Controls and Installation / Administration

➤ Control II : 2 credits (30 hours)

1. First order system

- Definition
- Impulse response
- Step response
- Speed response
- Harmonic response
- Bode
- Nyquist

2. Second order system

- Generalities / Basic concepts

- Impulse response
- Index response
- Stability study
- Stability
- Precision
- Speed
- Gain Margin - Phase Margin
- Controllers (P, PI, PD, PID)

➤ **Practical in Installation and Configuration : 1 credit (15 hours)**

1. Introduction to LAN
2. Transmission
3. Frame structure, Interchange protocol
4. Autonomus exchange module
5. Specialised Bus (IEE 488, I2C, SCSI)
6. Cabling and Physical layer
7. Access method
8. Communication card
9. Modem
10. Routing
11. Installation and Configuration of a Linux system
12. Users management and access rights

➤ **Network Administration 3 credit (45 hours)**

1. Installation and configuration of servers and client computers
2. Deployment of computers
3. Users' Management
4. Files' Management (sharing, Access right, Saving ...)
5. Supervision tools
6. Audit strategies

❖ **HWM 246 : Profesional Internship**

1. Spend a minimum of 30 days on the job in any private or public establishment
2. Diagnose and identify practical bottleneck
3. Apply possible solution or suggest one
4. Write report according to prescribed HND format and defend in public

❖ **HWM 247 : General Economics**

➤ **General Economics: 2 credits (30 hours); L, T, SPW**

1. Introduction

- Classification of economic actors
- Economic operators

- Relationship between economic agents: economic circuits;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ **LAW: 1 credit (15 hours)**

Business 
Labour Law

Field : COMPUTER ENGINEERING

Specialty :

**INDUSTRIAL COMPUTING AND
AUTOMATION**

Field:**COMPUTER ENGINEERING****Specialty:****Industrial computing and automation**

1. The Objective of the training

This specialty trains senior technicians who, with the help of a project head, can analyse, design and implement a whole or part of an automated system which ensures supervision of an industrial plant.

2. Expected skills

→ **General skills**

- Self-employed, work together as a team;
- Analyse or design specifications for a system
- Develop or choose technical solutions (hardware and software) and the products by integrating reliability and quality aspects
- Supervise average projects
- Install, develop, maintain and troubleshoot equipment
- Lead a project group
- Present his/her enterprise to clients

→ **Specific skills**

- Participate in developing computer software which will be used in driving machines, controlling robots in the production chain;
- Optimize the functioning of a production chain
- Ensures that all the elements in the production chain communicate with one another and operates well.
- Collaborate directly with the project head and engineers
- Participate in analysing end users' needs and the development of software
- Develop and exploit applications and computer systems, connected in a network or not, which are production procedures for goods from equipment and technical service.
- Choose hardware and programming languages

- Control computer aided production and ensure dialogue between the designer and the operating parts
- Master the equipment.

3. Career opportunities

- Work in production chain industries
- Enterprises which are specialised in installing and maintaining automatic equipment.
- Servicing companies and Computer Engineering.

4. Organization of teachings

- FIRST SEMESTER**

Field: Computer Engineering		Specialty: Industrial computing and automation					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
ICA111	Engineering Maths I	35	20	0	5	60	4
ICA112	Algorithms and physical science	40	15	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
ICA113	Circuit Theory	30	20	20	5	75	5
ICA114	Electronic circuits I	30	20	20	5	75	5
ICA115	networks and data communication	25	15	15	5	60	4
ICA116	Home automation I	25	15	15	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
ICA117	Bilingual training	30	10	0	5	45	3
Total		215	115	85	35	450	30

- SECOND SEMESTER**

Field: Computer Engineering		Specialty: Industrial computing and automation					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
ICA121	Engineering Maths II	35	20	0	5	60	4
ICA122	Physics and Basic computing I	40	15	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
ICA123	Electrical installation	30	20	20	5	60	4
ICA124	Electronic circuits II	30	20	20	5	75	5
ICA125	Telecommunications	25	15	0	5	75	5
ICA126	Measurements and instrumentation	30	20	20	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
ICA127	Enterprise organization and Law	30	10	0	5	45	3
Total		220	120	75	35	450	30

• **THIRD SEMESTER**

Field: Computer Engineering		Specialty: Industrial computing and automation					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
ICA231	Engineering Maths III	35	20	0	5	60	4
ICA232	Physics and basic computing II	40	15	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
ICA233	Electrical machines and control	40	20	10	5	75	5
ICA234	Electronic circuits III	40	20	10	5	75	5
ICA235	Automation and power electronics	40	20	10	5	75	5
ICA236	Industrial process control I	25	15	0	5	45	3
Transversal Courses 10% (1 UC) 3 credits 45 hours							
ICA237	Creation of enterprise and civics and moral Education	30	10	0	5	45	3
Total		250	120	45	35	450	30

• **FOURTH SEMESTER**

Field: Computer Engineering		Specialty: Industrial computing and automation					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
ICA241	Engineering Maths IV	35	20	0	5	60	4
ICA242	Physics and basic computing IV	40	15	15	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
ICA243	House automation and installation	20	10	25	5	60	4
ICA244	Microprocessors and peripherals	20	15	5	5	45	3
ICA245	Automation and controls	45	20	10	0	75	5
ICA246	Internship	0	0	60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
ICA247	General economics and General Accounting	30	10	0	5	45	3
Total		190	90	115	55	450	30

SPH: Students' private hours

5. Course contents

❖ ICA 111 : Engineering mathematics I

➤ Analysis I: 3 credits (45 hours); L, T, SPW

- 1. Numerical functions of a real variables:**
 - Logarithmic and exponential functions
 - Reciprocal circular functions
 - Hyperbolic functions and their reciprocals.
- 2. Several real variables functions**
 - 1st and 2nd order partial derivative
 - Schwarz theorem
 - Differential applications
 - Composite functions
 - Differential forms
 - Vector operators
- 3. Taylor series and limits**
- 4. Integration(simple and multiple)**
- 5. Differential equations**

➤ Linear algebra I: 2 credits (30 hours); L, T, SPW

1. Vector space of finite dimension $n \leq 4$
2. Matrices

❖ ICA 112 : Algorithms and Physical science

➤ Algorithms and programming: 1.5 credits (22.5hours); L, T, SPW

1. Algorithms
2. Structured programming
3. Data types, Variables, Constants, C operators, types conversions in expression, input and output and expression statements.
4. Branching and looping, arrays and string, functions, pointers, structures, unions, linked list and file management

➤ **General physics: 2 credits (30 hours); L, T, SPH**

1. Magneto static
2. Phenomenon of electromagnetic induction; Farady law
3. Dynamics of charges particles in an electromagnetic field.

❖ **ICA 113 : Circuit theory**

➤ **Electric circuit: 3 credits (45 hours); L, T, SPW.**

1. Notion on current and voltage;
2. Linear electric dipoles and sources
3. Dependent sources
4. Kirchhoff's laws
5. Capacitors and inductors
6. Network theorems
7. Sinusoidal steady state circuits analysis

❖ **ICA 114 : Electronic circuits I**

➤ **Analogue electronics I: 3 credits(45 hours); L, T, SPW**

1. Flashback on network theorems;
2. Theory on semiconductors and PN junction diodes
3. Diodes and diode circuits
4. Zener regulated power supply
5. Bipolar junction transistor and biasing circuits
6. BJT amplifier circuits(Eber Moll's and H – parameter)

➤ **Digital electronics I: 2 credits(30 hours); L, T, SPW**

1. Number systems and codes

- Binary, octal and hexadecimal number systems
- Conversion from one number system to the other
- Binary codes: BCD, gray, excess – 3, 8:4:2:1; 2:4:2:1 etc
- Alpha numeric code: ASCII

2. Combinational logic

- Logic gates
- Boolean algebra
- Simplification of Boolean functions
- Applications of combinational logic

3. Sequential logic

- Flip flops
- Counters
- Registers

4. Architecture of a computer

- Von Neumann's architecture and Harvard's architecture

5. Logic families

❖ ICA 115 : Network and data communication

➤ Network and data communication: 4 credits(60 hours); L, T, P, SPW

1. Transmission media and data transmission
2. Switching principles (PABX)
3. OSI model
4. Types of network
5. Network protocols and access methods
6. Multiplexing
7. Network topology
8. Transmission networks
9. Interconnection of networks and access methods
10. Wireless networks
11. Realizing a LAN
12. Tele services

❖ ICA 116 : Home automation I

➤ Home automation: 4 credits (60 hours); L, T, P, SPW

❖ ICA 117 : Bilingual training

➤ English: 1.5 credits (22 hours 30mn)

11. Vocabulary

- Technical and usual vocabulary of the specialty

12. Grammar

13. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

14. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

15. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ French : 1.5 credits (22 hours 30mn)

4. Vocabulaire

- Vocabulaire technique usuel

5. Grammaire

- Du verbe : Conjugaison aux temps communément utilisés – présent, passé composé ; imparfait, futur, conditionnel, et plus-que-parfait, l'impératif, l'infinitif, voix passive ;
- De l'adjectif : Qualificatifs, possessifs, démonstratifs, interrogatifs, numéraux, indéfinis ;
- Du nom et son article: masculin/féminin ; singulier/pluriel ; dénombrable, et non-dénombrable ;

- Du pronom : personnel, possessif, interrogatif, démonstratif, relatif, indéfini ;
- De l'adverbe et de la locution adverbiale : pour dire comment, où, quand et pourquoi ;
- Des fonctions grammaticales.

6. Expression et communication

- Compréhension et interaction au cours d'une discussion technique ;
- Communication orale courante ;
- Communication orale interactive
- De la phrase : simple, complexe, composée ; interrogative, déclarative, exclamative et impérative ;
- Lecture rapide et compréhension de texte ;
- synthèse d'un long texte;
- Lecture des texts de nature diverses (litteraire, non littéraire, image fixe ou mobile, dessin de presse, caricature ect...)
- De la communication : rédaction de texte, d'instructions, de rapport, d'une correspondance, d'une lettre recommandation ou de motivation, d'une demande d'emploi, d'une demande d'explication, d'une réponse à une demande d'explication, d'un CV ;
- Réalisation d'un exposé, d'une interview...
- Gestion d'une table ronde/discussion : La prise de notes, la prise de parole
- Expressions figées

❖ ICA 121 : Engineering mathematics II

➤ Analysis I: 2 credits (30 hours); L, T, SPW

1. Numerical functions of a real variable:

- Logarithmic and exponential functions
- Reciprocal circular functions
- Hyperbolic functions and their reciprocals.

2. Several real variables functions

- 1st and 2nd order partial derivative
- Schwarz theorem
- Differential applications
- Composite functions

- Differential forms
 - Vector operators
3. **Taylor series and limits**
 4. **Integration(simple and multiple)**
 5. **Differential equations**

➤ **Probability : 2 credits (30 hours); L, T, SPW**

Combinatory analysis

1. **Calculation of probabilities**
 - Kolmogorov axioms
 - Conditional and independent probabilities.
 - BAYES theorem and axiom on total probability
2. **Random variables**
 - Definition;
 - Moment of a random variable;
 - Joint law and marginal laws of a pair
 - Bienaymé-Tchebychev Inequality
 - Basic laws on large numbers
 - TCL
3. **Probability laws**

❖ ICA 122 : Physics and Basic computing I

➤ **General physics: 2 credits (30 hours); L, T, SPW**

1. **Electrostatics**
 - Continuous distribution of charges: Field and electrostatic potential, Gauss theorem;
 - Distribution of point charges: Electrostatic interaction energy;
 - Electric dipole;
 - Conductors at equilibrium: capacitors.
2. **Electrokinetics**
 - Electric current and current density, ohm's law, conductors, resistance, power, and energy

➤ **Digital literacy: 3 credits (45 hours); L, T, SPW**

1. Computer fundamentals

- Hardware
- Networks and mobile devices
- Software
- Operating system
- File management
- Security and maintenance
- Cloud computing

2. Key applications

- Apps and applications
- Using Microsoft word
- Using Microsoft Excel
- Database concepts
- Using Microsoft power point

3. Living online

- Looking at the Internet
- Managing media literacy
- Digital communication
- Understanding e – mail
- Contacts and calendaring
- Your life online

❖ **ICA 123 : Electrical Installation**

➤ **Norms and standardization of electrical diagrams: 4 credits (60 hours); L, T, P, SPW**

1. Normalized graphical symbols

- Switches
- Protective devices
- Prime mover, lighting and signaling equipment

2. Study of basic domestic installation diagrams

- Simple lighting

- Double lighting
 - Two – way lighting
 - Teleruptor
 - Timer
3. **Prime mover equipment(starting of motors)**
 4. **Prime mover equipment(braking of motors)**
 5. **Conception and reading of industrial electrical installation diagrams**

❖ ICA 124 : Electronic Circuits II

➤ Analogue electronics II: 2credits (45 hours); L, T, P

1. Bipolar transistor amplifier (Eber Moll and H – parameter)
2. Theory of Field Effect Transistor (FET) and biasing circuits
3. FET amplifiers
4. Power amplifiers
5. Difference amplifiers

➤ Digital electronics II: 2 credits (30 hours); L, T, P

1. Logic circuits technology
2. History
3. Presentation
4. Main logic families
5. Characteristic parameters
6. Comparison between TTL and CMOS
7. Interfacing logic families
8. Flip flops
9. Up counters
10. Down counters

➤ Power electronics I: 1credit (15 hours); L, T, P

1. Power electronic devices

- Construction,
- Principle of operation - Static and dynamic characteristics of Power diodes, SCR, TRIAC, GTO, power BJT, power MOSFET and IGBT – Safe operating Area – protection circuits – series and parallel connections.

2. AC to DC converters

- Single phase and three phase uncontrolled and controlled rectifiers(half and full converters) with R, RL and RLE load –Estimation of RMS load voltage, RMS load current and input power factor - effect of source inductance and firing circuits – Single phase and three phase dual converters.

❖ ICA 125 : Telecommunication

➤ **Telecommunication: 3 credits (45 hours); L, T, P**

1. Transmission lines

- Characteristics of transmission lines
- Guided medium(Coaxial, twin pair, fiber optic, etc)
- Unguided medium

2. Analogue Modulation and demodulation

- AM modulation and demodulation
- FM modulation and demodulation
- Phase modulation and demodulation

3. Digital modulation and demodulation

- Digital carrier and analogue modulating signal: PAM, PDM, PPM, MIC, Delta etc
- Analogue carrier and digital modulating signal: FSK, ASK, PSK

❖ ICA 126 : Measurements and instrumentation

➤ **Metrology: 2 credits (30 hours); L, T, P, SPW**

1. Theory on measurement and instrumentation

2. Theory elements on electronic measurement and instrument

- Definition of key terms relating to measurements
- Physical quantities to be measured and errors
- Basic concepts on measuring instruments

3. Modeling measurement system

- Measurement and instrumentation system
- Role and operating principles of measuring instrument
- Universal model of a measuring instrument

4. Placement of measuring equipment

- Methods used to carry out measurements
- Characteristics of measuring instruments and its accessories

5. Exploiting measured values

- Measurement errors
- Principles and methods used to calculate errors
- Calculation of errors of a measured value
- Statistical analysis and quality of a measuring instrument
- Notions on quality and normalization, norms, international organization
- Systems of unit

6. Resources of electronic instruments

- Sensors
 - Definition and characteristics
 - Operating principles
 - Conditioning of sensors
- Types of sensors
 - Temperature
 - Pressure
 - Humidity
 - Position
- Temperature measurement
- Measuring instruments
 - Analysis of signal generation instruments
 - Analysis of oscilloscope
 - Data acquisition system

❖ ICA 127 : Enterprise organization and Law

➤ **Enterprise organisation: 3 credits (45hours); L, T, SPW**

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit

- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
 - Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies

- Production policy:
 - Production on command
 - Production in series
 - Continuous production
- Processing policy
 - Studies and research office
 - Methods office
 - Office of scheduling and launching
- Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
- Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
- Work organization and evolution
 - Taylorization
 - Fordism
 - The actual form of a work organization
 - Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
 - contribution of information as regards information system
 - Decision processing

- Types of decision
- Tools that helps in decision-making
 - ✓ Decision in unquestionable future
 - ✓ Decision in questionable future
- Capacities and participation in the company
 - ✓ Delegation of authority
 - ✓ Decentralization of decision making

➤ **Law: 1 credit (15 hour); L, T**

1. Business Law
2. Labour Law

❖ **ICA 231 : Engineering Mathematics III**

➤ **Statistics: 2 credits (30 hours); L, T, SPW**

1. Graphical representation;
2. Central tendency, dispersion,(mean, mode, median, variance, and standard deviation, deciles, interquatile range);
3. Covariance;
4. Correlation coefficients and regression;
5. Least square methods;
6. Estimation of mean and standard deviation;
7. Test of hypothesis
8. Descriptive statistics;

➤ **Analysis III: 2 credits (30 hours); L, T, SPW**

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

❖ **ICA 232 : Physics and basic computing II**

➤ **Operating systems: 3 credits (45hours); L, T, P, SPW**

1. Introduction and history of Operating systems, structure and operations; processes and files;

2. Processor management
3. Memory management
4. Deadlock
5. Device management
6. File management
7. UNIX and Linux operating systems as case studies
8. Time OS and case studies of Mobile OS

➤ **Physics of sensors: 2 credits (30 hours); L, T, P, SPW**

1. Definition and characteristics;
2. Operating principles of sensors
3. Conditioning of sensors
4. Types of sensors
 - Humidity
 - Pressure
 - Temperature
 - Position
 - Etc

❖ **ICA 233 : Electrical machines and control**

➤ **Electrical machines: 2 credits(30 hours); L, T, P, SPW**

1. Three phase asynchronous motor;

- Operating principles
- Construction
- Production of rotating field
- Electromechanical characteristics
- Study of operation and assessment of power
 - Stator
 - Rotor

2. Synchronous motors

- Construction and operating principles
- Models and characteristics

- Reversibility of synchronous motors
- Single and three phase alternators
 - E.M.F
 - Linear models
 - Saturation models(Behn-Eschumberg)
- Three phase synchronous motors
 - Characteristics at constant power
 - Characteristics at constant voltage

➤ **Control Engineering I: 3 credits(45 hours); L, T, SPW**

1. Generalities on controls
2. Notion on system
3. Characteristics of systems
4. Quality of control systems
5. Structure of control system
6. Laplace transform and transfer function
 - Definition
 - Laplace transforms of common signals
 - Properties of Laplace transform
 - Applications of Laplace transform
 - Inverse Laplace transform
 - Transfer function of block diagrams
 - System responses
 - Applications
7. Block diagram algebra
8. Frequency responses
 - Generalities
 - Bode diagram
 - Nyquist and black diagrams

❖ **ICA 234 : Electronic circuits III**

➤ **Electronic functions: 3 credits (45 hours); L, T, SPW**

1. Voltage and current amplifiers, power amplifiers

2. Operational amplifier operating in the linear mode
3. Imperfections of operational amplifiers
4. Gain bandwidth Product, slew rate
5. Active filters: 1st and 2nd order

➤ **Microprocessor I: 3 credits (45 hours); L, T, SPW**

1. Microprocessor based system

- Von Neumann's architecture
 - Processor
 - Main memory
 - Input/output interface
 - The buses
- Harvard architecture
- Address decoding

2. Memory

- Memory terminologies
- Structure of a memory chip
- Characteristics of memory
- Types of memory
- Interfacing microprocessor to memory
- Memory map

❖ **ICA 235 : Automation and Power electronics**

➤ **Industrial automation I: 3 credits (45 hours); L, T, P, SPW**

1. Structure of automated system

- Introduction
- Objective for automating a system
- Classification of automated system
- Structure of automated systems

2. Components of automated systems

- Generalities
- Sensors
- Pre – actuators

- Actuators(electrical, pneumatic and hydraulic)
 - Processing unit
- 3. Driving force equipment (starting and breaking of motors)**
- 4. Pneumatic equipment**
- 5. Sequential function chart (GRAFCET)**
- Generalities
 - Steps, transition and action
 - GRAFCET evolution rules
 - Types of GRAFCET (Level I and II)
 - Deriving the equation of a GRAFCET

➤ **Power electronics II: 2 credits(30 hours); L, T, SPW**

- 1. AC – AC converters**
 - Single phase and three phase ac – ac converters
 - Single phase and three phase cyclo converters
- 2. DC to DC Choppers**
 - Step down choppers
 - Choppers with resistive and inductive loads
 - Series motor chopper drive
 - Step up choppers
- 3. Inverters**
 - Inverters– Types – voltage source and current source
 - inverters – single phase bridge inverters – three phase bridge inverters – PWM inverters - Series inverter control of AC output voltage – Harmonic reduction- AC Voltage regulator- Step up and step down cycloconverter -three phase to single phase and three phase to three phase cycloconverter

❖ **ICA 236 : Industrial Process control I**

➤ **Industrial process control I: 3 credits (45 hours); L, T, P, SPW**

- 1. Study of control interfaces**
 - Electromagnetic relay interfaces
 - SCR interfaces
 - Buffer and multiplexing
 - Applications

2. Data exchange

- Input/Output interfaces
- Data exchange techniques
- Types of interfaces

3. PC ports used in computer aided control

- LPT port
 - Presentation of the port
 - Characteristics of the port
- COM port
 - Presentation of the port
 - Characteristics of the port

4. C language programming of the ports

❖ ICA 237: Enterprise creation and Civic Education and Ethics

➤ Enterprise creation: 2 credits(30 hours); L, T, SPW

1. Characteristics of the entrepreneur
2. Opportunity recognition
3. Starting a business
4. Business operation

➤ Civic Education and Ethics: 2 credits (30 hours); L, T, P, SPW

The Concepts

- The citizen;
- The Nation;
- The State;
- Public Property unto collective property;
- The freedoms;
- The public service;
- Problem of ethics;
- Ethics, Law and reason;
- Management and ethics of responsibility;
- Ethics and management.
- Ethics

- Civics
- Deontology
- Moral consciousness
- The universal declaration of Human Rights
- Good governance in public services
- Explain the importance of civics to the life of the nation
- Functions of the state and its citizens
- Deontology, Professional ethics and professionalism
- Relationship between morality, law and ethics
- Codes of ethics

❖ ICA 241: Engineering Mathematics IV

➤ Analysis IV: 2 credits (30 hours); L, T, SPW

Continuation of numerical series

1. Whole series and Fourier series
2. Fourier transform, Laplace transform and Z transform

➤ Probability: 2 credits (30 hours); L, T, SPW

Combinatory analysis

1. **Calculation of probabilities**
 - Kolmogorov axioms
 - Conditional and independent probabilities.
 - BAYES theorem and axiom on total probability
2. **Random variables**
 - Definition;
 - Moment of a random variable;
 - Joint law and marginal laws of a pair
 - Bienaymé-Tchebychev Inequality
 - Basic laws on large numbers
 - TCL
3. **Probability laws**

❖ ICA 242: Physics and Basic Computing IV

➤ Data base: 2 credits (30 hours); L, T, SPW

1. Introduction to data base
2. Architecture of a database
3. Data models
4. Data schemas
5. Data independence
6. ER model
7. ER diagram representation
8. Generalization and specialization
9. CODD's rules
10. Relational data model
11. Relational algebra
12. ER model to relational model
13. SQL over view
14. Normalisation
15. Joints
16. Storage system
17. File structure and indexing

➤ Instrumentation: 2 credits (30 hours); L, T, SPW

- 1. Theory on measurement and instrumentation**
- 2. Theory elements on electronic measurement and instrument**
 - Definition of key terms relating to measurements
 - Physical quantities to be measured and errors
 - Basic concepts on measuring instruments
- 3. Modeling measurement system**
 - Measurement and instrumentation system
 - Role and operating principles of measuring instrument
 - Universal model of a measuring instrument
- 4. Placement of measuring equipment**
 - Methods used to carry out measurements

- Characteristics of measuring instruments and its accessories

5. Exploiting measured values

- Measurement errors
- Principles and methods used to calculate errors
- Calculation of errors of a measured value
- Statistical analysis and quality of a measuring instrument
- Notions on quality and normalization, norms, international organization
- Systems of unit

6. Resources of electronic instruments

- Sensors
 - Definition and characteristics
 - Operating principles
 - Conditioning of sensors
- Types of sensors
 - Temperature
 - Pressure
 - Humidity
 - Position
- Temperature measurement
- Measuring instruments
 - Analysis of signal generation instruments
 - Analysis of oscilloscope
 - Data acquisition system

❖ ICA 243: House automation and installation

➤ Installation and configuration: 2 credits (30 hours); L, T, SPW

1. Introduction to LAN
2. Transmission
3. Structure of a packet and types of protocols
4. Autonomous exchange modules, exchange memory
5. Special buses (IEEE488, I2C, SCSI)
6. Wiring and physical layers

7. Access methods
8. Communication cards
9. MODEM
10. Installation and configuration of Linus system
11. Mother board
12. Recording of data
13. Input/output interfaces
14. Configuring and connecting PC

➤ **House automation: 2 credits (30 hours); L, T, SPW**

❖ **ICA 244: Microprocessors and peripherals**

➤ **Input/output peripherals: 1 credit (15 hours); L, T, SPW**

1. Input/output couplers
2. Types of peripherals
3. Multimedia systems

➤ **Microprocessor II: 2 credits (30 hours); L, T, SPW**

1. Microprocessor architecture

- Structure of a microprocessor(functional diagram, control unit and execution unit, registers etc)
- Operation of a microprocessor
- RISC and CISC architecture

2. Programming an 8 bit microprocessor

- Architecture of the microprocessor
- Instruction set
- Addressing modes
- Programming techniques
- Programming in assembly

3. Control of physical processes using the ports

- Role of the input/output ports
- Structure of the input/output ports
- Types of peripherals

- Interfacing with peripherals (LEDs, relay, push buttons etc)
- Communication modes(polling, DMA, interrupts)

❖ ICA 245: Automation and controls

➤ Industrial automation II: 2 credits (30 hours); L, T, SPW

1. Cycle of a GRAFCET
2. Linear GRAFCET
3. Skip of a stage
4. Resumption of sequences
5. Shunting in OR
6. Structural parallelism
7. Architecture of an Industrial Automated Process (IAP)
8. Technological and functional organization of an IAP
9. Programming of IAP
10. Programming languages, method of programming(PL71 – 2)
11. Wiring of an automat

➤ Control of Industrial processes II: 2 credits (30 hours); L, T, SPW

1. Functions
2. Function without passage of argument and returning nothing into the program.
3. Function without passage of argument and returning a value into the program
4. Function with passage of argument
5. Minor projects
6. Flashing of LEDs
7. Control of 220V lamps
8. Control of the PIA 8255 card
9. Programming of GRAFCET
10. Traffic light control
11. Control of asynchronous motors

➤ **Control engineering II: 1 credit (15 hours); L, T, SPW**

1. 1st order systems

- Definition
- Impulse response
- Step response
- Ramp response
- Bode plots
- Nyquist diagram

2. 2nd order systems

- Definition
- Impulse response
- Step response
- Stability
- Gain and phase margin

❖ **ICA 246: Internship**

➤ **Internship : 6 credits (90 hours) ; L, T, P**

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content :

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning

- Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
- Report writing format (page setup, character format etc)
- Defense

❖ ICA 247: General economics and General Accounting

➤ General Economics: 3 credits (45 hours); L, T, SPW

1. Introduction

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits ;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange

- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ **General Accounting: 1 credit (15 hours); L, T**

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. incidental expenses on buying and selling
8. packing supplies
9. Transport
10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

Field : COMPUTER ENGINEERING

Specialty :

COMPUTER GRAPHIC AND WEB DESIGN

Field:**COMPUTER ENGINEERING****Specialty:****Computer graphics and web design**

1. The objective of the training

This specialty train senior technicians mastering the various aspects of the web design and that can develop a creativity in web design by using the CMS and the framework of the most requested in the companies for the creation of dynamic websites and responsifs (adaptive tablet/smartphone). They are also able to manipulate the scripts and modules to add interactivity in the Achievements (slideshows, slides...) and master the techniques of strengthening natural.

2. Expected skills

→ **General skills**

- Work in autonomy, work together as a team;
- Analyze, synthesize, professional document (French, English);
- Communicate to the oral, written, in business or outside (French, English);
- Participate in /conduct an approach to the management of the project;
- Know and exploit the professional networks and institutional sectors of the informatics.

→ **Specific skills**

- Identify the needs of client and analyze its request;
- Master the sketches and the techniques of storyboard;
- Master the software for graphic design and animation (DTP, 2D, 3D, After Effect, Photoshop...);
- Design and make models mobile web and applications;
- Master the techniques of web design, the development of zoning and the dressing of pages;
- Understanding the challenges of the technological watch;
- enhance the spirit of analysis;
- Understanding the stakes of the customer relationship.

3. Career opportunities

- Graphic designer;
- Graphic designer;
- Webdesigner;
- Motion designer;
- Wizard studio creation;

4. Organization of teachings

- FIRST SEMESTER

Field: Computer Engineering		Specialty: Computer graphic and web design					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
CWD111	Computer graphics basic tools	40	30	0	5	75	5
CWD112	algorithms and information systems	25	30	0	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
CWD113	multimedia	15	20	35	5	75	5
CWD114	Computer graphic design I	20	10	25	5	60	4
CWD115	pictures and animations	20	20	30	5	75	5
CWD116	photography and web programming I	20	10	25	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
CWD117	English and general accounting	30	10	0	5	45	3
Total		170	130	115	35	450	30

- SECOND SEMESTER

Field: Computer Engineering		Specialty: Computer graphic and web design					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
CWD121	Computer systems	35	20	0	5	60	4
CWD122	photography and photography II	20	20	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
CWD123	Drawing I	20	10	25	5	60	4
CWD124	Graphics animations	15	20	35	5	75	5
CWD125	Web integration and special effects	20	20	30	5	75	5
CWD126	Video editing	20	15	20	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
CWD127	Economics and Enterprise Organisation (EEO) and French	30	10	0	5	45	3
Total		160	115	140	35	450	30

• **THIRD SEMESTER**

Field: Computer Engineering		Specialty: Computer graphic and web design					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
CWD231	Physical science and streaming	25	15	15	5	60	4
CWD232	Programming and project	25	15	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
CWD233	Graphics animation II	15	20	35	5	75	5
CWD234	Programming II	25	10	35	5	75	5
CWD235	Computer graphic design II	20	15	20	5	60	4
CWD236	Computer Aided Presentation	20	15	20	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
CWD 237	Enterprise creation and civics and moral education	30	10	0	5	45	3
Total		160	100	155	35	450	30

• **FOURTH SEMESTER**

Field: Computer Engineering		Specialty: Computer graphic and web design					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
CWD241	Entrepreneurship	25	10	35	5	75	5
CWD242	Computer Systems II	20	10	25	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
CWD243	Drawing II and graphics animation III	25	20	25	5	75	5
CWD244	Video editing and graphic design	25	20	25	5	75	5
CWD245	programming and administration of a web site	10	5	25	5	45	3
CWD246	Internship			60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
CWD247	General economics and Law	30	10	0	5	45	3
Total		160	100	155	35	450	30

SPW: Students' Personal Work

5. Courses content

❖ CWD 111 : Computer graphics basic tools

➤ History of art : 1 credit (15 hours); L, T, SPW

This lesson shall concentrate on the history of art as a whole (music, painting, sculpture, drawing, etc)

➤ Physical science: 2 credits (15 hours); L, T, P, SPW

1. The camera

- Presentation of the instrument
- Constitution and role of the different parts(diaphragm, sensor, etc)
- Formation of images
- Lenses
- Photographic objectives
- Exposure
- Number of openings, exposure time, brightness index IL or EV, histogram.
- CCD/CMOS sensor: height, definition, sensitivity.
- Depth of field

2. Colour

- Colour perception
 - Light
 - Additive synthesis
 - Structure of the eye, role of the retina and the brain
 - Concepts on resolving power of the eye and retina persistence
 - Lighting and metamerism: Influence of light on the perceived colour, differences on the returned colours
- Colour measurement
 - Sources of natural and artificial light(incandescent lamp, fluorescent lamp, discharged lamps, LEDs, etc)
 - Transmission spectrum, and colour temperature, apparent brightness,
 - Colorimeter
 - Colorimetric spaces
- Management of colour in a graphic chain

- Subtractive synthesis: reproduction of images by ink jet printers, press offset
- Concept on colorimetric profile
- Calibration of the monitor

➤ **Image processing I: 2 credits (15 hours); L, T, P, SPW**

1. Image matrix, vector metrix

2. Colour

- Level of gray
- Colour
- True colour
- Indexed colour

3. Image reproduction modes

- Matrix coding
- Vector coding
- Curve fractal

4. Compression and compaction

5. Formats and standards

- Matrix image format
- Vector image format
- Web adapt format

❖ **CWD 112 : Algorithms and information system**

➤ **Fundamental of algorithms: 2 credits (30 hours); L, T, P, SPW**

1. Introduction to algorithms

2. Algorithm approaches

- Greedy
- Dynamic programming
- Divide and conquer
- Branch and bound
- Introduction to complexity analysis and measures

3. Algorithms

- Sorting and searching
- Merging
- Tree and graph traversals

- Shortest path
- Minimum spanning tree
- Order statistics
- String matching

➤ **Information systems: 2 credits (30 hours); L, T, P, SPW**

1. Concepts of a system
2. Information systems concepts
3. types and components of an information system
4. Information systems within organisations
5. Modeling a system (McD, MOT and MLT)

❖ **CWD113 : Multimedia**

➤ **TGA I: 2 credits (30 hours); L, T, SPW**

1. Generalities on artistic and graphical techniques

- History
- Utility of the graphic art
- Objective of graphic art
- Different types of graphical drawing
- Types of representation of graphical art
- Scale of the graphic art
- Necessary materials for drawing

2. Standard permanent graphic elements

- Preparation of a drawing sheet(format, reference, etc)
- Title box
- Line(nature of the lines and layout)
- Penmanship (character size and form)
- 2D or 3D drawing pagination

3. Basic tools for art drawing

- Lines drawing techniques
- Straight lines drawing techniques
- Circle, arc, and eclipse drawing techniques
- Square, rectangle, triangle drawing techniques

4. Selection of the medium

- Graphite
- Charcoal
- Blood
- Colour pencils
- felt-tipped with colour
- The Indian ink

5. Drawing of contours for a simple object

- Naming of views (front, left side, right side, top, bottom, back)
- Selection of views
- Relative position of views
- Particular representation
- Sections

6. Drawing of a simple object in prospect

- Techniques of realizing in prospect (Axonometric, isometric, etc)
- Techniques of representing a simple object that has been defined by its views and prospect
- Techniques of representing a simple piece in oblique cut section

7. Drawing of a proportioned object

- Setting in situation
- Techniques of representing symmetrical objects
- Techniques in representing a supposed transparent object

8. Drawing of the views

- Representing a view
- Representing the different views
- Techniques of developing the face view
- Common types of views

➤ Multi-media assembly: 3 credits (45 hours); L, T, P, SPW

1. Introduction to editing
2. Types of media and their parameters
3. Concepts on editing
4. Principles on editing
5. The decision of the editor

6. From physical representation to production
7. Case study

❖ **CWD114 : Computer graphic design I**

➤ **Computer graphic design I: 4 credits (60 hours); L, T, P, SPW**

1. Bitmap and vector file format
2. Document and print – out format
3. The Design Process
4. Introduction to Adobe Illustrator
5. Elements & Principles of Design
6. Typography
7. Color Theory & Use
8. Creating images for print & web

❖ **CWD115 : Pictures and animations**

➤ **Computer animation I: 3 credits (45 hours); L, T, P, SPW**

1. Introduction to adobe flash pro
2. Study of the flash interface
3. Creation of flash project and parameter setting
4. Importation of multimedia files

➤ **Image processing II: 2 credits (30 hours); L, T, P, SPW**

1. Photoshop workspace
2. Images, colours, copies
3. Improve and transform the images
4. Filters and effects, text
5. Vector drawing in photoshop
6. Saving, exportation and printing
7. RAW camera
8. Photoshop innovations

❖ CWD116 : Photography and web programming I

➤ Photo studio I: 2 credits (30 hours); L, T, P, SPW

1. Presentation and usage of digital photo equipment
2. Different types of digital photo equipment

➤ Web programming I: 2 credits (30 hours); L, T, P, SPW

1. Introduction to Web programming
2. HTML
3. CSS
4. Javascript
5. Web services

❖ CWD117 : English and General Accounting

➤ English: 2 credits (30 hours); L, T

16. Vocabulary

- Technical and usual vocabulary of the specialty

17. Grammar

18. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

19. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;
- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

20. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ **General Accounting: 1 credit (15 hours); L, T**

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. Incidental expenses on buying and selling
8. packing supplies
9. Transport
10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

❖ **CWD121 : Computer systems**

➤ **Computer architecture I: 2 credits (30 hours); L, T, P, SPW**

1. Computer fundamentals

- Hardware
- Networks and mobile devices
- Software
- Operating system
- File management
- Security and maintenance
- Cloud computing

2. Key applications

- Apps and applications
- Using Microsoft word
- Using Microsoft Excel
- Database concepts
- Using Microsoft power point

➤ **Database and SQL: 2 credits (30 hours); L, T, P, SPW**

1. Introduction to database
2. Usage of some RDBMS(Access, Mysql, etc)
3. SQL queries
4. Formulars
5. States

❖ **CWD122 : Photography and photography II**

➤ **Structured programming: 3 credits (45 hours); L, T, P, SPW**

1. Introduction
2. Data types, Variables, Constants, C operators, types conversions in expression, input and output and expression statements.
3. Branching and looping, arrays and string, functions, pointers, structures, unions, linked list and file management

➤ **Photo studio II: 2 credits (30 hours); L, T, , P, SPW**

1. Presentation and usage of camera equipment
2. Different types of camera

❖ **CWD123 : Drawing I**

➤ **Drawing I: 4 credits (60 hours); L, T, P, SPW**

1. Representation of a simple object in orthogonal projection

- Presentation of technical and artistic drawing materials
- Usage of drawing materials
- Representation of the different views of a real technical object
- Representation of the intersections of the geometrical forms in orthogonal projection (plan – plan, cylinder – plan, cylinder – cylinder, cylinder – cone, cone – plan)
- Representation of a particular or moved views of a part in orthogonal projection.

2. Representation of a simple object in oblique projection

- Representation of an object in oblique projection (propekt)
- Representation of a simple object defined by its views in propekt.
- Representation of a simpl piece in oblique cut section

3. Drawing of a proportioned object

- Setting in situation
- Techniques of representing symmetrical objects
- Techniques in representing a supposed transparent object

4. Drawing of the views

- Represing a view
- Representing the different views
- Techniques of developing the face view
- Common types of views

5. Reproduction of a portrait or a landscape

- Setting in situation
- Preparation of models to be reproduced
- Preparation of a drawing sheet and the detail grid
- Reproduction of the portrait of the landscape

❖ CWD124 : Graphics animations

➤ Graphics animations II: 2 credits (30 hours); L, T, P, SPW

1. Introduction to adobe flash pro
2. Study of the flash interface
3. Creation of flash project and parameter setting
4. Importation of multimedia files
5. Basic concepts, creation of objects, object modeling, lighting, animation, and exportation

➤ Graphics design II: 2 credits (30 hours); L, T, P, SPW

1. Computer graphics software interface
2. Lines creation
3. Selection and manipulation of lines
4. Pallet

❖ CWD125 : Web integration and special effects

➤ Special effects techniques: 2 credits (30 hours); L, T, P, SPW

1. Some definitions
2. Types of special effects

3. Presentation and usage of software tools adapted to realize special effects
4. Case study
5. After effect workspace
6. Creation of a composition
7. Import a video file
8. Predefined after effects
9. Bridge and after effect
10. Tutorials: realizing a key chroma, creat its clone, isolate the colour, run at the speed of light.
11. Write a report

➤ **Web integration: 3 credits (45 hours); L, T, P, SPW**

1. HTM5
2. CSS3
3. CMS
4. Action or visual effects with javascript or Jquery

❖ **CWD126 : Video editing**

➤ **Editing of test models: 4 credits (60 hours); L, T, P, SPW**

1. Study of the creation of the character types
2. Different types of character types
3. Relizing the editing of test models
4. History of penmanship art

❖ **CWD127 : Economics and Enterprise Organization(EEO) and French**

➤ **Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P**

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities

- According to dimension
- According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - o Organizational structure
 - o Departmental structure
 - o Site location
 - o Practical structure
 - Power hierarchy
 - o Functional hierarchy
 - o Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise
 - Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies
 - Production policy:
 - o Production on command
 - o Production in series
 - o Continuous production
 - Processing policy

- Studies and research office
- Methods office
- Office of scheduling and launching
- Various production methods(influence of technology on production)
 - Mechanization, automation and computer assisted production (CAP)
- Quality policies (Production control)
 - At the level of production factors
 - At the level of work advancement
 - At the level of quality
- Work organization and evolution
 - Taylorization
 - Fordism
 - The actual form of a work organization
 - Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority

- Decentralization of decision making

➤ **French : 1 credit (15 hour) ; L, T**

1. Etude des situations de communication

- Identification des facteurs de la situation de communication (émetteur, récepteur, code, canal, message, contexte) ;
- Situation de communication et interactions verbales ;
- Etude des éléments para verbaux (kinésique, proxémiques, mimogestuels, etc.) ;
- Identification et manipulation des figures d'expression et de pensée (métaphores, ironie, satire, parodie, etc.).

2. Typologie des textes et recherche documentaire

- Lecture des textes de natures diverses (littéraires/non littéraires, image fixe/image mobile, dessin de presse, caricature, etc.) ;
- Analyse des textes publicitaires et des discours (scientifiques, politiques, littéraires, etc.) ;
- Constitution et exploitation d'une documentation et montage des dossiers ;
- Lecture des textes cultivant les valeurs morales et civiques.

3. Communication orale

- Réalisation d'un exposé ;
- Réalisation d'une interview ;
- Réponse à une interview ;
- Présentation d'un compte-rendu oral ;
- Résumé de texte ;
- Réalisation d'un jeu de rôles ou d'une simulation ;
- Initiation au leadership et à la dynamique des groupes ;
- Ecoute et lecture attentive de documents sonores et/ou graphiques ;
- Lecture méthodique à l'oral.

❖ **CWD231 : Physical science and streaming**

➤ **Streaming: 2 credits (30 hours); L, T, P, SPW**

1. Introduction to streaming
2. Realizing streaming
3. Efficient and adapted methods used in importing web elements
4. Adopted tools

➤ **Physical science II: 2 credits (30 hours); L, T, P, SPW**

1. File format of sound and image:

- Image
 - Concepts on compression with lose and without lose
 - Selection of the format as a function of the media
- Sound
 - Nature of sound
 - Sound characteristic parameters (height, intensity, sound level)
 - Complex sound characteristic parameters (notion on fundamental frequency, set of harmonics)
 - Audible frequency domain
 - Conversion of analogue signal into digital: sampling, quantification, compression (summary explanation of MP3 format)
 - Sound files format
- Video
 - Presentation of some video formats common in digital photographic equipment.

❖ CWD232 : Programming and project

➤ Factual programming I: 2 credits (30 hours); L, T, P, SPW

1. Introduction to visual basic (VB)
2. Manipulation and role of the objects
3. Creation of interfaces
4. Variables
5. Control structures, iterations

➤ Project I: 3 credits (45 hours); L, T, P, SPW

1. Realize a project that falls within the HND curriculum

❖ CWD233 : Graphics animation II

➤ TGA II: 2 credits (30 hours); L, T, P, SPW

1. Drawing of an artistic expression

- Interpretation of an artistic expression (object, portrait, landscape)
- Preparation of materials to be used

- Study of artistic art
- Execution techniques of an artistic expression

2. Drop shadow and light tools in artistic drawing

- Utility of drop shadow and light of an artistic drawing
- Valorization techniques
- Presentation of the drop shadow and light
- Sinking of artistic drawing

3. Construction of figurine

- Figurine proportions
- Different parts of a figurine
- Construction techniques of figurines movement
- Construction techniques of the hands and arms of a figurine
- Construction techniques of the legs and feet of a figurine
- Construction techniques of the sketch and attitudinal of a figurine

4. Usage techniques of gouache

- Presentation of the gouache
- Constitution of gouache
- Selection of materials for gouache
- Composition techniques for gouache
- Execution techniques of text

5. Give artistic expressions using a graphic software(Artweater, Art rage, Illustrator or Inkscape)

- Presentation of the software interface
- Software explorer tools
- Exploration of the files of the menu
- Exploration of format control
- Exploration of posting orders
- Exploration of the tracing
- Exploration of objects(properties and transformation)
- Exploration of the routes of the graphic software
- Exploration of the menu effects
- Exploration of the work orders with the nodes and the objects
- Representation of the objects, animals, landscape, or the persons with artistic software

➤ Animation III: 3 credits (45 hours); L, T, P, SPW

1. Workshop on enterprise creation and products
2. Conception and implementation of a typical logo

3. Design of address card and calendar
4. Project promotion campaign
5. Advertisement display, tracing techniques
6. Presentation of the software interface
7. Design a video clip

❖ CWD234 : Programming II

➤ Web design: 2 credits (30 hours); L, T, P, SPW

1. History of web design
2. Basic concepts
3. Criteria used in web design
4. Colour language
5. Some examples and commentaries

➤ Web programming II: 3 credits (45 hours); L, T, P, SPW

1. XML
2. XHTML
3. PHP and Mysql
4. Dreamweaver

❖ CWD235 : Computer graphic design II

➤ Graphic design II: 4 credits (60 hours); L, T, P, SPW

1. Palette
2. Setting colours
3. Typography

❖ CWD236 : Computer Aided Presentation

➤ Computer aided presentation: 4 credits (60 hours); L, T, P, SPW

1. Technical environment and the tools of computer aided presentation
2. Image processing with photoshop
3. Creation of drawings and vector illustration with Illustrator
4. Page setting with InDesign
5. Publication and editing of documents in PostScript PDF universal format using adobe acrobat

6. Documentary research
7. Techniques of work exposure

❖ **CWD237 : Enterprise creation and Civics & Moral Education**

- **Enterprise creation : 2 credits(30 hours); L, T, SPW**
 5. Characteristics of the entrepreneur
 6. Opportunity recognition
 7. Starting a business
 8. Business operation
- **Civics and Moral education : 1 credit(15 hours); L, T, SPW**
 1. The citizen
 2. The nation
 3. The state
 4. Public goods – collective goods
 5. Freedoms
 6. Public services
 7. Ethical problems
 8. Ethics, rights and privileges
 9. Management and ethics of the responsibility
 10. Ethics and management

❖ **CWD241 : Entrepreneurship**

- **leadership: 2 credits (30 hours); L, T, P, SPW**
 1. Define leader, leadership
 2. Basic concepts on leadership
 3. Model of a young leader
 4. Quality of a leader
- **Designing a project: 3 credits (45 hours); L, T, P, SPW**
 1. Work on a project that falls with the HND curriculum
 2. Enterprise magasin
 3. Radio spot, advertisement message

4. 3d animation of a typical logo
5. TV spot and televised message
6. Synthesis and visual aesthetic writing

❖ CWD242 : Computer system II

➤ Factual programming: 2 credits (30 hours); L, T, P, SPW

1. Creation of interface with Visual Basic
2. Coding
3. Insertion of data in the database and manipulation of this data using formulars

➤ Living online: 2 credits (30 hours); L, T, P, SPW

1. Looking at the Internet
2. Managing media literacy
3. Digital communication
4. Understanding e – mail
5. Contacts and calendaring
6. Your life online

❖ CWD243 : Drawing II and graphics animation IV

➤ Drawing II: 3 credits (45 hours); L, T, P, SPW

1. Reproduce an object, a portrait or a layout

- Setting the situation
- Preparation the model to be reproduced
- Preparing the drawing sheet and the grid
- Reproducing the portrait or layout

2. Drawing according to the nature of an artistic expression

- Interpretation of the artistic expression (object, portrait, layout)
- Study of the elements of artistic art
- Execution of an artistic expression

3. Construction of a figurine

- Interpretation of Figurine proportions
- Identification of the Different parts of a figurine
- Representation of Construction techniques of figurines movement
- Representation of Construction techniques of the hands and arms of a figurine

- Representation of Construction techniques of the legs and feet of a figurine
- Representation of Construction techniques of the sketch and attitudinal of a figurine
- Representation of a real model

4. Bring out the nuance of an artistic expression in gouache or the color pencil

- Representation of simple volumes in gouache
- Representation of the rendering of the different materials and texture(vegetable, organic, wood, rubber, etc)
- Representation of the shadow and light
- Reproduce and artistic drawing using colour pencils of water color
- Draw to scale the different views of a plan using water color or colour pencils

5. Give artistic expressions using a graphic software(Artweater, Art rage, Illustrator or Inkscape)

- Launch the software to be exploited
- Select the Software tools
- Exploration of the files of the menu, format control, posting orders, the tracing, the objects(properties and transformation), the routes of the graphic software, the menu effects. work orders with the nodes and the objects
- Representation of the objects, animals, landscape, or the persons with artistic software

➤ **Animation IV: 2 credits (30 hours); L, T, P, SPW**

1. Usage of tools used in creation
2. Introduction to animation in Flash
3. Advanced techniques
4. Exportation

❖ **CWD244 : Video editing and graphic design**

➤ **Graphic design IV: 2 credits (30 hours); L, T, P, SPW**

1. Advanced functions
2. Finalizing a document
3. Workshops on frames
4. Conceiving a calendar

5. Writing, birth and origins
6. Art and power
7. Apology format
8. Memory materials
9. Modernity and evolution
10. Resources of the unconscious one
11. Subversion and repression
12. History of the media
13. Technological evolution
14. Designing the whether

➤ **Video editing: 2 credits (30 hours); L, T, P, SPW**

1. Basic concepts
2. Installation of 4D cinema software
3. Discovery of the interface
4. Creation of an object
5. The texture and lighting
6. 3D object animation

❖ **CWD245 : Programming and administration of a web site**

➤ **Web programming III: 1 credit (15 hours); L, T, P, SPW**

1. Basic concepts
2. Tools for animation adapted for the Web
3. Web format

➤ **Administration of a web site: 2 credits (30 hours); L, T, P, SPW**

1. Introduction to CMS

2. Installation and configuration of JOOMLA

- Installation of XAMP and WAMP server
- Installation of Joomla
- Configuration of the site

3. Administration of a Web site

- Configuration and administration of admin parameters
- Account and access rights
- Updating
- Practical session

4. Articles

- Articles
- Advanced editing
- pdf, youtube
- Categories
- Practical session

5. Menu

- Creating a menu
- Configuring sub menu systems

6. Templete

- Installation and modification of templete
- Practical session on installation and modification of templete

7. Components and modules

- Add a down loaded module
- Polls
- Contact forms
- Slide show
- Search module
- Practical session

8. Advanced Web site programming

- PHP code modification
- CSS code modification
- HTML code modification
- Practical session on PHP, CSS, HTML

9. Other CMS

- Wordpress
- Drupal

10. Complete Web site

- Analyse an existing site
- Create a second joomla installation
- Planning and paging a site
- Project on site creation

11. Security of a Web site

- Protection
- Restoration

❖ CWD246 : Internship

- Internship : 6 credits (90 hours) ; L, T, P

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content :

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning
 - Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
 - Report writing format (page setup, character format etc)
 - Defense

❖ EDM 247 : General Economics and Law

- General Economics: 2 credits (30 hours); L, T, SPW

1. Introduction

- Classification of economic actors
- Economic operators

- Relationship between economic agents: economic circuits ;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.

➤ **Law: 1credit (15 hours)**

Business Law

Labour Law

Field : COMPUTER ENGINEERING

Specialty :

E-Commerce and Digital Marketing

Field:

COMPUTER ENGINEERING

Specialty:

E-Commerce and Digital marketing

1. The objective of the training

An HND in Digital marketing will provide you with a strong foundation in the core concepts of digital marketing. It will give you an in-depth understanding of how to effectively strategize and implement powerful digital marketing campaigns that convert. From social media marketing to search marketing, you'll learn everything you need to excel at your digital marketing career.

2. Expected skills

→ **General skills**

- Work in autonomy, work together as a team;
- Analyze, synthesize, a professional document (French, English);
- communicate to the oral, written, in business or outside (French, English);
- Participate in /conduct an approach to the management of the project;
- Know and exploit the professional networks and institutional sectors of the informatics.

→ **Specific skills**

- Continuously exploit available commercial information to monitor and develop the activity of the business unit in line;
- Ensure constantly to adapt the offer e-commercial in function of the evolution of the market;
- Ensure the operating balance and the management of the human resources of the unit e-business;
- Carry out actions to attract, accommodate and build customer loyalty by selling him the products and/or services to meet its expectations;
- Develop a commercial offer adapted to the clientele.

3. Career opportunities

- Content Marketer, Digital Designer, Online Campaign Manager, Social Media Marketer, Email Marketer, etc;

- Inbound Marketer, Social Media Marketer, Digital PR Executive, etc.
- Analytics Specialist, Acquisition Specialist, PPC Analyst, CRM Data Analyst, Email Marketer, etc.
- Digital Strategy Planner, Digital Marketing Manager, SEO Strategist, etc.

4. Organization of teachings

• FIRST SEMESTER

Field: Computer Engineering		Specialty: E-Commerce and Digital Marketing					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
EDM111	Mathematics for computing I	45	25	0	5	75	5
EDM112	Basic Environment I	15	10	30	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
EDM113	Database and SQL language	30	15	10	5	60	4
EDM114	System analysis and design	30	30	10	5	75	5
EDM115	Introduction to Web Programming	20	20	30	5	75	5
EDM116	Small business management	20	10	25	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
EDM117	English and general accounting	30	10	0	5	45	3
Total		190	120	105	35	450	30

• SECOND SEMESTER

Field: Computer Engineering		Specialty: E-Commerce and Digital Marketing					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
EDM121	Mathematics for computing II	35	20	15	5	75	5
EDM122	Basic Environment II	20	15	20	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
EDM123	Object oriented programming	30	15	40	5	90	6
EDM124	Digital Economy	30	15	10	5	60	4
EDM125	Legal regulations	30	25	0	5	60	4
EDM126	Strategic management	35	20	0	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
EDM127	Economics and Enterprise Organisation (EEO) and French	30	10	0	5	45	3
Total		210	120	85	35	450	30

• **THIRD SEMESTER**

Field: Computer Engineering		Specialty: E-Commerce and Digital Marketing					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
EDM231	Mathematics for computing III	45	25	0	5	75	5
EDM232	Applied Mathematics and quantitative finance	20	20	15	5	60	4
Professional courses 60% (4 UC) 18 credits 270 hours							
EDM233	E – Commerce technology I	20	10	25	5	60	4
EDM234	E – Commerce	40	20	10	5	75	5
EDM235	Digital Marketing I	40	20	10	5	75	5
EDM236	ERP Technologies	20	20	15	5	60	4
Transversal Courses 10% (1 UC) 3 credits 45 hours							
EDM237	Enterprise creation and civics and moral education	30	10	0	5	45	3
Total		215	125	75	35	450	30

• **FOURTH SEMESTER**

Field: Computer Engineering		Specialty: E-Commerce and Digital Marketing					
Course Code	Course titles	Number of hours					Number Of Credits
		L	T	P	SPW	Total	
Fundamental Courses 30% (2 UC) 9 credits 135 hours							
EDM241	Technical Communication	30	15	10	5	60	4
EDM242	Introduction to Computer Application	20	20	30	5	75	5
Professional courses 60% (4 UC) 18 credits 270 hours							
EDM243	E – Commerce technology II	40	20	10	5	75	3
EDM244	Technological infrastructure for e-commerce	30	15	15	0	60	4
EDM245	Digital Marketing II	10	10	20	5	75	5
EDM246	Professional Internship	0	0	60	30	90	6
Transversal Courses 10% (1 UC) 3 credits 45 hours							
EDM247	General economics	30	10	0	5	45	3
Total		160	90	145	55	450	30

SPW: Students' Personal Work

5. Courses content

❖ EDM 111 : Mathematics for computing I

- **Mathematical analysis : 3 credits (45 hours); L, T, SPW**
- **Fundamental algorithmic : 2 credits (30 hours); L, T, SPW**

❖ EDM 112 : Basic environment I

- **Computer fundamentals : 2 credits (30 hours); L, T, P, SPW**
 1. Hardware
 2. Networks and mobile devices
 3. Software
 4. Operating system
 5. File management
 6. Security and maintenance
 7. Cloud computing
- **Key applications : 2 credits (30 hours); L, T, P, SPW**
 1. Apps and Applications
 2. Using Microsoft Word
 3. Using Microsoft Excel
 4. Database Concepts
 5. Using Microsoft Powerpoint

❖ EDM 113 : Database and SQL language

- **Database and SQL : 2 credits (30 hours); L, T, P, SPW**
 - 1. Relational database conception principles**
 - Functional dependence
 - Algorithms and normalization
 - Normal forms
 - Integrity constraints (static, dynamic, etc)
 - 2. SQL language**
 - 3. Database administration**

- Physical implementation of the data
- Structure of the file and index
- Control of concurrent access
- Breakdown resistance
- Security and protection of data
- Parameter setting, start, stop, save, restoration
- Distributed database, distributed processing
- Auditing, optimization

➤ **Advanced data structure : 2 credits (30 hours); L, T, P, SPW**

1. Function and procedures
2. Notion on recursiveness
3. Search techniques(sequential, sequential with guard, dichotomy)
4. Sorting techniques(insertion, selection, bubbles)
5. Practical on one of the programming languages(C, C++)

❖ EDM 114 : System analysis and design

➤ **Introduction to information systems : 5 credits (75 hours); L, T, SPW**

1. Specification languages of an information system.

- Data models(Entity relational models, relational models)
- Processing models(petri diagram, MERISE diagram, SADT diagram)
- Communication models
- Objects models

2. Analysis of the is – the system and opportunities offered

- Methods of studying an existing information system
- Data representation and processing of an existing information system in terms of the models studied above.
- Quality criteria of an information system
- Criticizing the is – the system
- Study of the opportunities
- Audit

3. Design

- Data conceptual diagrams
 - Construction of data conceptual diagram

- Normalization
- Processing conceptual diagram
 - Processing architectural diagram
 -
 - Dynamic representation
 - Conceptual diagram of a communication system
 - Representing a communication system
 - Determination of the elements of a communication system
 - Object conceptual diagram

➤ **Introduction to software engineering : 2 credits (30 hours); L, T, P**

1. Software development life cycle (SDLC)
2. Quality
3. Specifications
4. Ergonomics
5. Tests
6. Management of requirements
7. Control of development
8. Writing of specifications
9. Methods of estimating the cost

❖ **EDM 115 : Introduction to web programming**

➤ **Introduction to Web programming : 5 credits (75 hours); L, T, P, SPW**

1. the WWW fundamentals
2. the architecture and anatomy of the web
3. URI, URN, URL and the browser.
4. Client and Server side programming languages((HTML, CSS, JavaScript), (PHP, Perl, Python, Ruby)
5. Coding a web page content with HTML.
6. Code reusability and presentation with CSS
7. Miniprojects (Login forms, Registration forms, landing page etc)
8. Proxy caching and its advantages
9. Introduction to JavaScript for object behavior

❖ EDM 116 : Small Business Management

➤ Small business management: 4 credits (60 hours); L, T, P, SPW

1. Range and scope of a small business (importance and problems associated with small business operations).
2. Types of small scale business (advantages and disadvantages of self employment)
3. Starting problems and signs of failure of a small business
4. Types of business organization. (legal form of business)
5. Government policies for small enterprises development. (effects of government policies on direct and indirect assistance to small businesses)
6. Business plan (purpose of business plan, components of a business plan from project development up to project cost.)
7. Necessary steps in carrying out financial analysis and planning for a small business (personal goal and business goals, influences of family goals in business goals).
8. Basic concept of marketing (steps in conducting market surveys to determine demand and supply for particular products).
9. Distribution channels for a selected product or service.
10. The basic concepts of production

❖ EDM 117 : English ang General Accounting

➤ English: 2 credits (30 hours); L, T

1. Vocabulary

- Technical and usual vocabulary of the specialty

2. Grammar

3. Bilingual expression

- Understanding in interaction in Technical Discussions
- Continuous oral communication: Show, explain, develop, summarize, account, comment;
- Interactions oral communication
- How to introduce oneself

4. Autonomous reading of "writings" of all levels

- Lead by a quick reading to understand the general sense;
- Browse a text long enough to locate desired information;

- Gather information from different parts of the document or of the different documents in order to accomplish a specific task.

5. Write clear, detailed texts

- Essay writing;
- Application for employment;
- C.V.;
- Letter of motivation;
- Lettre / memo writing and minutes of a meeting

➤ General Accounting: 1 credit (15 hours); L, T

1. Heritage
2. Influx at an enterprise and its registration
3. Balance sheet and results
4. Accounting law and accounting plan
5. Buying and selling
6. Expenses and products
7. incidental expenses on buying and selling
8. packing supplies
9. Transport
10. Classical accounting system
11. Balancing of accounts
12. Cash regulations
13. Terms regulation
14. Depreciations
15. Provisions

❖ EDM 121 : Mathematics for computing II

- Advanced algorithmic 1: 3 credits (45 hours); L, T, SPW
- Statistics and Probability 1: 2 credits (30 hours); L, T, SPW

❖ EDM 122 : Basic environment II

- Living Online: 4 credits (60 hours); L, T, P, SPW

1. Understanding the Internet

2. Managing Media Literacy
3. Digital Communication
4. Understanding Email, contacts and calendaring
5. Social Media and Digital Identity

❖ **EDM 123 : Object oriented programming**

- **Object oriented programming: 6 credits (90 hours); L, T, P, SPW**
1. Introduction and First Program
 2. Language Features(How C++ differs from C, Variables Declaration, Function overloading, Basics of Console Input and Output, Dynamic Memory Allocation)
 3. OOPs Concepts(Overview of OOPs Principles, Introduction to classes & objects, Member Functions, this Pointer, Constructor & Destructor)
 4. Inheritance(Introduction and benefits, Types of Inheritance, Function overriding, Destructor overriding)
 5. Polymorphism(What is Polymorphism, Pure virtual functions, Virtual Base Class)
 6. I/O Streams(C++ Class Hierarchy, File Stream, Text File Handling, Overloading << and >> operators)
 7. Exception Handling
 8. Templates

❖ **EDM 124 : Digital Economy**

- **Digital Economy: 4 credits (60 hours); L, T, P, SPW**
1. **Transformation of the real economy into digital economy. Role of technology revolution in the world economy.**
 2. **Digital innovation and its impact on economic growth. Concept of the “Fourth Industrial Revolution”.**
 3. **Digital economy's ecosystem :**
 - infrastructure,
 - IT skills and growing digital population,
 - online platforms.
 - Internet of Things
 - Cloud computing
 - E – commerce

- E – finance
 - Data protection
 - Cybersecurity
4. **Review of regression analysis. Machine learning. AI (Artificial Intelligence)**
 5. **Distributed ledger technology. Blockchain's disruptive potential.**
 6. **Firms in the digital economy :**
 - digital business models, increasing pressure to innovate,
 - large internet companies and OTT (over the top) services.
 - cross-border trade barriers.
 7. **Households in the digital economy :**
 - individualization of products and services,
 - changing structure of consumption,
 - potential for economic participation.
 8. **States in the digital economy :**
 - e-government, e-public service,
 - digital enabling,
 - Evolving governance frameworks relevant to the digital economy.
 9. **Global technology frontiers and laggards; Comparative global overview of the advancement in innovation in the digital economy.**
 10. **Digital economy's social impact. The digital divide.**
 11. **Key factors of globalization and economic growth in the digital age**

❖ **EDM 125 : Legal regulation**

➤ **Legal Regulations: 3 credits (45 hours); L, T, SPW**

1. Copyright protection for computer programs and databases
2. Intellectual property issues on the Internet;
3. Data privacy;
4. Computer-related crimes.
5. General Data Protection Regulations(GDPR)

❖ **EDM 126 : Strategic management**

➤ **Strategic management: 4 credits (60 hours); L, T, P, SPW**

1. Understand the strategic decisions that organizations make and have an ability to engage in strategic planning.

2. Explain the basic concepts, principles and practices associated with strategy formulation and implementation.
3. Integrate and apply knowledge gained in basic courses to the formulation and implementation of strategy from holistic and multi-functional perspectives.
4. Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective.
5. Conduct and present a credible business analysis in a team setting.
6. Understand the crucially important role that the HRM function plays in the setting and implementation of an organization's strategy

❖ **EDM 127 : Economics and Enterprise Organization (EEO) and French**

➤ **Economics and Enterprise Organization(EEO): 2 credits (30 hours); L, T, P**

1. Enterprise and typology of enterprises

- Definition of an enterprise
- Analysis mode
- Enterprise as a production unit
- Enterprise as a distribution unit
- Enterprise as a social center
- Classification of enterprise based on the following economics criteria
 - According to economic activities
 - According to dimension
 - According to judicial criteria

2. Organizational structure of an enterprise

- Distribution of tasks and power hierarchy
 - Distribution of tasks
 - Organizational structure
 - Departmental structure
 - Site location
 - Practical structure
 - Power hierarchy
 - Functional hierarchy
 - Staff and line hierarchy
- Coordination and relationships in the enterprise
 - Coordination of tasks in the enterprise

- Relationships in the enterprise

3. Insertion of the enterprise into the economic web

- Basic notions on the enterprise environment
- Inter – enterprise relationship
 - Competing relationship
 - Complementary relationship
- Relationship between the enterprise and other aspects of the environment.

4. Income earning activities

- Commercial policies (the 4p)
 - Policy of the products
 - Price policy
 - Distribution policy
 - Communication policy
- Production and processing policies
 - Production policy:
 - o Production on command
 - o Production in series
 - o Continuous production
 - Processing policy
 - o Studies and research office
 - o Methods office
 - o Office of scheduling and launching
 - Various production methods(influence of technology on production)
 - o Mechanization, automation and computer assisted production (CAP)
 - Quality policies (Production control)
 - o At the level of production factors
 - o At the level of work advancement
 - o At the level of quality
 - Work organization and evolution
 - o Taylorization

- Fordism
- The actual form of a work organization
- Robotization, enrichment,

5. Know how to undertake

- Steps of the creator
- Steps of the decision maker
- Steps of the manager

6. Information system and decision system

- Importance of information and communication to an enterprise
- Organization of an information system:
 - Data bank
 - Database
 - Communication networks
- contribution of information as regards information system
- Decision processing
- Types of decision
- Tools that helps in decision-making
 - Decision in unquestionable future
 - Decision in questionable future
- Capacities and participation in the company
 - Delegation of authority
 - Decentralization of decision making

➤ **French : 1 credit (15 hour) ; L, T**

1. Etude des situations de communication

- Identification des facteurs de la situation de communication (émetteur, récepteur, code, canal, message, contexte) ;
- Situation de communication et interactions verbales ;
- Etude des éléments para verbaux (kinésique, proxémiques, mimogestuels, etc.) ;
- Identification et manipulation des figures d'expression et de pensée (métaphores, ironie, satire, parodie, etc.).

2. Typologie des textes et recherche documentaire

- Lecture des textes de natures diverses (littéraires/non littéraires, image fixe/image mobile, dessin de presse, caricature, etc.) ;
- Analyse des textes publicitaires et des discours (scientifiques, politiques, littéraires, etc.) ;

- Constitution et exploitation d'une documentation et montage des dossiers ;
- Lecture des textes cultivant les valeurs morales et civiques.

3. Communication orale

- Réalisation d'un exposé ;
- Réalisation d'une interview ;
- Réponse à une interview ;
- Présentation d'un compte-rendu oral ;
- Résumé de texte ;
- Réalisation d'un jeu de rôles ou d'une simulation ;
- Initiation au leadership et à la dynamique des groupes ;
- Ecoute et lecture attentive de documents sonores et/ou graphiques ;
- Lecture méthodique à l'oral.

❖ EDM 231 : Mathematics for computing III

- **Advanced algorithmic 2 : 3 credits (45 hours); L, T, SPW**
- **Statistics and Probability 2 : 2 credits (30 hours); L, T, SPW**

❖ EDM 232 : Applied Mathematics and quantitative finance

- **Financial analysis : 2 credits (30 hours) ; L, T, SPW**
- **Linear Algebra for economist : 2 credits (30 hours) ; L, T, SPW**

❖ EDM 233 : E-commerce Technology I

- **E – commerce technology I : 4 credits (60 hours); L, T, P, SPW**
 1. An introduction to Electronic commerce
 2. The Internet and WWW
 3. Building Own Website
 4. Internet Security
 5. Internet and Extranet

❖ EDM 234 : E-commerce

- **E – commerce : 4 credits (60 hours); L, T, P, SPW**
 1. Introduction to Internet Business

2. Infrastructure: The Internet and Technology
3. Business Models for Internet Business
4. Internet Business & Marketing :
5. Basic Marketing Concepts & Technology
6. B2C and B2B Marketing and Branding Strategies
7. E-Commerce Advertising
8. E-Commerce Retailing & Services
9. Online Media: Publishing & Entertainment Industry
10. Social Networking, Communities, & Actions
11. E-Commerce & Ethics

❖ **EDM 235 : Digital Marketing I**

- **Digital Marketing 1: 4 credits (60 hours); L, T, P, SPW**
1. Digital Marketing Foundations
 2. Website Optimization
 3. Content Marketing
 4. Organic social Media
 5. Paid Social Media

❖ **EDM 236 : ERP Technologies**

- **ERP Technologies: 4 credits (60 hours); L, T, P, SPW**
1. Overview of ERP philosophy
 2. Structure of ERP systems
 3. Integration of business applications - Analysis of business processes
 4. ERP II
 5. SAP ERP
 6. Organizational structures and business processes
 7. Life Cycle of ERP systems
 8. Implementation of ERP projects
 9. ECP diagrams
 10. Processing of integrated processes with SAP ERP
 11. Case studies

❖ EDM 237 : Enterprise creation and Civics & Moral Education

➤ Enterprise creation : 2 credits(30 hours); L, T, SPW

1. Characteristics of the entrepreneur
2. Opportunity recognition
3. Starting a business
4. Business operation

➤ Civics and Moral education : 1 credit(15 hours); L, T, SPW

1. The citizen
2. The nation
3. The state
4. Public goods – collective goods
5. Freedoms
6. Public services
7. Ethical problems
8. Ethics, rights and privileges
9. Management and ethics of the responsibility
10. Ethics and management

❖ EDM 241 : Technical Communication

➤ Technical Communication : 4 credits (60 hours); L, T, SPW

1. Project Planning
2. Project Analysis
3. Content Development
4. Organizational Design
5. Written Communication
6. Review and Editing
7. Visual Communication
8. Content Management
9. Production and Delivery

❖ EDM 242 : Introduction to computer animation

- **Introduction to computer animation: 3 credits (45 hours); L, T, P, SPW**
 1. Toonboom
 2. Adobe Animate
- **Introduction to Photoshop: 2 credits (30 hours); L, T, P, SPW**
 1. Introduction to digital photography and digital images
 2. Planning and Communications
 3. Image Editing
 4. Illustration
 5. Publishing

❖ EDM 243 : E-Commerce Technology II

- **E – commerce technology II: 4 credits (60 hours); L, T, P, SPW**
 1. Electronic Data Exchange
 2. Electronic Payment System
 3. Planning for Electronic Commerce
 4. Internet Marketing

❖ EDM 244 : Technological infrastructure for E-commerce

- **Technological infrastructure for E – commerce: 4 credits (60 hours); L, T, P, SPW**

❖ EDM 245 : Digital Marketing II

- **Digital Marketing II: 5 credits (75 hours); L, T, P, SPW**
 1. SEO
 2. Paid Search
 3. Display and Video advertising
 4. Email Marketing
 5. Analytics
 6. Digital Strategy

❖ EDM 246 : Internship

➤ Internship : 6 credits (90 hours) ; L, T, P

Objective:

A comprehensive internship program in which the student spends full four to six weeks in approved engineering establishments (private and public) and industries. The exposure also provide opportunity for students to sharpen their technical writing skills through field reports, keeping log-book and preparation of technical documents under close supervision of professionals and lecturers. During this period the student uses tools and procedures put in place by the enterprise to carry out activities or solve a problem individually or as part of a team. The student is expected to write an academic report of scientific nature. The report should reflect the technological applications in the enterprise, the professional skills acquired and suggestions/proposals for improvement of the activities of the company.

Course Content :

- How to write an industrial attachment report
- How must it be presented?
 - Presentation of enterprise and its functioning
 - Structure of industrial achievement report (industrial training activities, technological applications in the enterprise, professional skills acquired during industrial attachment, identification of technological problems affecting the productivity of the enterprise, proposed solutions, suggestions if any, references, appendices)
 - Report writing format (page setup, character format etc)
 - Defense

❖ EDM 247 : General Economics and Law

➤ Law: 1 credit (15 hours)

Business Law

Labour Law

➤ **General Economics: 3 credits (45 hours); L, T, SPW**

1. Introduction

- Classification of economic actors
- Economic operators
- Relationship between economic agents: economic circuits ;
- Basic notions on national accounting: aggregates and their circuit; products, revenue, expenses.

2. Consumption

- Demographic elements
- The needs, the level of life, way of life.
- Individual consumption and collective consumption
- The demands

3. Production

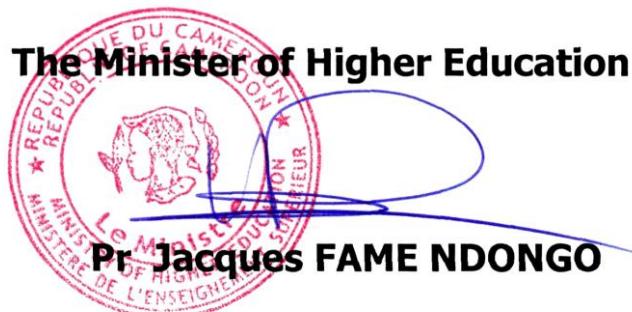
- Production units, the sectors and branch activities
- Production factors and their combinations, offers
- concentration

4. Growth and development

- Growth
 - Definition and measures
 - Growth factors
 - Growth and notions on neighbors
- Development
 - Definition
 - Development criteria

5. The payment of the international exchanges

- The exchange
- Formation of exchange rate
- Tests of international monetary organization and its difficulties.



TECHNICAL COMMITTEE

President

: **Pr Jacques FAME NDONGO**, Minister of Higher Education

Supervisor

: **Pr NYONGBET GABSA Wilfried**, General Secretary of Ministry of Higher Education

General Coordinator

: **Pr Richard Laurent OMGBA**, Head of Department of Higher Education Development (DDES)

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