THE REPUBLIC OF CAMEROON MINISTRY OF HIGHER EDUCATION

HND PROGRAM

Specialty : COMPUTER MAINTENANCE

Option :

HARDWARE MAINTENANCE

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OPTION:	COMPUTER 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.
- Computer Hardware Engineer
- Computer Operator
- Computer and Information Research Scientist
- Network Architects

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

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 ≤ 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

1. **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 Organization

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

- subletting
- 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. Zenger regulated power supply
5. Bipolar junction transistor and biasing circuits
6. BJT amplifier circuits (Beer 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 thermistors and traces
- Bipolar power transistor
- Power MOSFET transistor
- Cooling Calculation

3. Uncontrolled rectifier

- Half wave rectification
- Full wave rectification

- Two diodes
- Four diodes

4. Controlled rectification

- Principles of phase control
- Simple controlled rectifier
- Double thermistor rectifier
- Mixed rectifier

5. AC – AC Converter

- Single phase and three phase ac – ac converters
- Single phase and three phase cycle 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 / Subtract or
- 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 type's
- Instruction Format types and instruction's format addressing mo.
- 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, summary account, comment;
- Interactions oral communication
- Haw 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;
- Letter / 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
- Bienaymé-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, structure unions, linked list and file management

➢ **Computer Architecture II: 2 credits (30 hours)**

1. Processors and Coprocessors
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. File Effect Transistor

➢ Power Electronics II: 2 credits (30 hours)

1. AC – to – AC Converter

- Study of Dimmers (Single – phase and three – phase)
- Study of cycle 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

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
- Valorization
- 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, defiles, interquartile 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
- Synchronization
- Critical section
- Synchronization tools
- Internal representation
- Operations on files
- Access Methods
- Bisque 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 / Share ability
- 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
- Bloc diagram algebra

4. Frequency response

- Generalities
- Bode representation
- NY Quist curve

➢ **Network Practical: 3 credits (45 hours)**

1. Study of cable network equipment's and wireless (Cable, switch, hub router …)
2. Wiring plan
3. Cabling path laying
4. Cabling (crimping straight cable, cross cable crimping)
5. Networking and sub network 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. (Move, Sub, Add) +Data definition instructions
6. Flag register + Overflow detection
7. Addressing modes
8. Debugger + Assembler
9. Data transfer Instructions (Move, Chg., Lea, Stack operations)
10. Stack Operations
11. Arithmetic Instructions (Add, Sub, Inc., Dec, Nag, Mule, Div.)
12. Arithmetic Instructions
13. Writing Arithmetic Expressions
14. Boolean Instructions (And, or, Not, or, Suhl, She, Roll, Roar, Test, Cmp)
15. Boolean Instructions

16. Unconditional/Conditional Jumps and Loops (Loop, Jump, Ax)
17. Program examples
18. Interrupts / I/O instructions (Into, 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
- Standardization 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, Optimization

❖ HWM 243 : Programming II

➢ Web Programming: 4 credits (60 hours)

1. Introduction to web programming
2. HTML
3. CSS
4. Java script
5. Pup
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
- Index response

- Speed response
- Harmonic response
- Bode
- NY Quist

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. Autonomous exchange module
5. Specialized 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. User's 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 : Professional 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 up

❖ HWM 247 : General Economics

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

1. Introduction

- Classification of economic actor's
- 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 neighbor's

- 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

Labor Law