REPUBLIC OF CAMEROON
PEACE – WORK – FATHERLAND

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MINISTRY OF SECONDARY EDUCATION
INSPECTORATE GENERAL OF EDUCATION
INSPECTORATE OF PEDAGOGY IN CHARGE OF THE TEACHING OF COMPUTER SCIENCE

High School Teaching Syllabus

for

Information and Communication Technology (ICT)

August 2020

Observe the environment and choose better study options for a fulfilling life

TABLE OF CONTENT

I. INTRODUCTION

Information and Communication Technology (ICT) is the driving force in technological development. Its role in boosting economies of nations, industrial productivity, socio-cultural integration, development of professions, education and research, medicine, politics, communication, private households, and entertainment etc., has been enormous and popularized. There is therefore the need, to guide the Cameroonian youth into developing competencies in this domain thereby providing solutions to real life challenges. Such competencies developed at this level are to build a solid foundation for learners who would like to continue with this domain of study or other related disciplines to the university, those who would like to kickstart their employment activities after High School, and those who would just require digital literacy for solving commonly encountered personal problems.

This syllabus is designed to mould learners into acquiring or developing a range of ICT skills in the context of a sound understanding of the technical foundation of current computer systems and to promote the knowledge and use of a wide range of current computer applications, particularly from the point of view of their design and implementation. It highlights issues related to societal implications of the use of ICTs. It extends to the design of simple software and basic digital circuits, thus equipping the learner with preliminary skills in Information System Design. The emphasis is on fundamental principles that underlie ICTs rather than on the current state of the art, so that the knowledge acquired remains relevant even after significant technological evolution.

Prerequisites to taking this ICT course are given in the General Certificate of Education Examination syllabus and restated in the Teachers Guide that accompanies this teaching syllabus. The concepts used for the column headings to elaboratethe modules in this syllabus are contextual and non-standard, and so describing them are significant and required for the common understanding of its users. In this regard, subject to expected future revisions, the explanations in the accompanying Teachers Guide for this teaching syllabus is an authoritative source for the correct interpretation and application of the modules in this document.

II. HIGH SCHOOL LEAVER PROFILE

Mindful of the fact that society is fast developing with rapid changes in knowledge, it is but pivotal to study the fundamental basis of how such knowledge is produced, acquired and used in this information age. Learners in high school therefore need to have a

fundamental understanding of the role of ICT in the acquisition and use of this evolving knowledge in various fields such as entertainment, education, utility, communication and solving problems requiring digital solutions.

The high school ICT leaver profile is summarized in the following components:

- Demonstrate understanding and choice of career paths that lead to IT and computer-focused employment including computer management, programming, IT services, and systems development.
- Exhibit proof of a thoroughly trained citizenry and a better equipped workforce for an emergent knowledge society.
- Acquire and show essential preparedness for or exemptions from requirements in higher studies in ICT and related disciplines;
- Understand and apply pre-requisite knowledge for and exemptions from computing-related requirements in vocational and tertiary educational programmes.
- Make informed decisions on when and where to use ICT and should also be aware of the implications of the use of ICTs in the home, at the job site, and in society at large.

III. LEARNING DOMAIN AND CORRESPONDING DISCIPLINES

Though ICT is a subject, it is in a wider perspective seen as a tool that would enable and facilitate the comprehension of all the subjects across the curriculum. Consequently, the subject is open to the Arts, Humanities and the Sciences.

IV. THE PLACE OF ICT IN THE CURRICULUM AND ITS CONTRIBUTION TO THE LEARNING AREAS

The teaching of high school Information and Communication Technology (ICT) builds in the learner, analytical and critical thinking skills which are needed in other learning areas or domains of life. Also, the learner's ability to seamlessly manipulate Information and Communication Technology tools will facilitate research and access to a wealth of information.

ICT support, enhance, and optimize the delivery of information as well as enhance relationships between teachers and learners, improve on learning and teaching across all school subjects, and also enable teachers to efficiently do pedagogic and administrative tasks.

V. CONTRIBUTION OF THE ICT SYLLABUS TO LIFE SITUATIONS

The syllabus contributes to several life situations as shown in the table below.

Table 1: Summary of contribution of the ICT syllabus to Life Situation

LIFE SITUATION	CONTRIBUTION
Social and family life	Study and appraise business correspondence Prepare home budgets Manage domestic chows Manipulate electronic devices Communicate and disseminate information Propose technologies for home use
Business	Develop and manage business databases Make rational use and management of resources and services Research and employment Decision making Project planning implementation and evaluation Digital services Entrepreneurship
Environment, Health, and well-being	Protect nature Develop and manage databases of sites Practice e-healthcare including telemedicine Take actions and act wisely to protect and harness the environment
Citizenship	Use the computer resources purposefully Manage privacy and intellectual property Protect public utilities
Media and communication	Facilitate communication through multimedia resources Manage multimedia resources Manipulate communication devices

VI. FAMILIES OF SITUATIONS COVERED IN THIS SYLLABUS

The successful acquisition and use of a computing or ICT system may go through 5 stages. These stages have been coined here, into 5 modules. The paradigm behind the development of each of the five modules is as follows:

1. Understanding what a computer system looks like and how it works (Module 1)
2. Identifying what it can be used for and how its existence affects the user and the environment(Module 2)
3. Building the computing environment and configuring it to solve various problems (Module 3)
4. Linking or interconnecting multiple computing environments for the purpose of sharing resources (Module 4)
5. Solving real life problems using already built computing environments (Module 5)

A successful navigation through the 5 modules adequately prepares the learner to demonstrate competencies in solving most real life situations that can be handled with the use of ICTs. Thus, the first three (03) modules are taught in Lower Sixth (First Year) and the last two (02) in Upper Sixth (Second Year).

VII. COMPREHENSIVE TABLE SHOWING THE DIFFERENT MODULES FOR EACH CLASS

Table 2: Modules for each Class

CLASS	MODULES	DURATION (H)
LOWER SIXTH	**Module 1:** Computing Systems and Components	**76**
	Module II: Impacting society with digital technology	**80**
	Module III: Building ICT systems	**116**
UPPER SIXTH	**Module IV:** Communication, resource sharing in IT and Information Security	**77**
	Module V: Practical problem solving in the digital world	**77**

The total learning time for all the modules on the High School ICT syllabus within two years is 426 periods with about 272 periods for use in the First Year and 154 periods for the Second Year. A period has a duration of 50 to 60 minutes as may be scheduled on the timetable. The total time spent in each module, depends on the content and nature of lessons in that module. However, an average of 8 periods is attributed to the teaching of ICT per week in which 6 periods are for theory and 2 periods for practical tasks in the lab.

VIII. PRESENTATION OF THE MODULES

The contents of each module are arranged in a table having three leading columns and eight sub-headings. This structure is intended to give teachers an orientation of how to exploit the entries and subsequently prepare lessons. The terminologies used here are contextual and warrants definition and clarification.

I. CONTEXTUAL FRAMEWORK: This gives a global picture of the life situation from which lesson inspirations are drawn. This leading column is further broken down into two sub-headings:

- ***Family of Real-life situation***: This presents an umbrella statement that groups related real life situations.
- ***Examples of Real-life situations:*** This column situates the lesson by bringing examples of life situations. This can be an activity within a task. It is expected that the teacher can use this type of example to coin a life situation for a lesson.

II. COMPETENCIES: Competencies refer to the ability to do something successfully and efficiently. It is understood here to be a process(es) evident in an action(s). This leading column is subdivided into two sub-headings:

- ***Categories of Actions:*** These group the examples of related actions learners are expected to be able to carry out in the course of the lesson facilitated by the teacher. This may serve as the topics from where lessons are derived.
- ***Examples of Actions****:* These refer to the actions or activities the learners are expected to do with or without the teacher successfully and efficiently during the lesson as indicators of having built specific abilities in the course of the lesson. These may serve as lessons.

III. RESOURCES: These refer to both the cognitive and material requirements to ensure a successful lesson. This leading column is further broken down into five sub-headings:

- ***Core knowledge:*** These are terminologies or concepts that learners have to define and comprehend for the lesson to be effective.
- ***Skills:*** These are indicators of competencies/skills that the learner should demonstrate in class/team during lesson or out of class as the context may demand.
- ***Attitudes:*** These are the behavioural responses as learner builds and demonstrate competence during and after the lesson. It is inherent in the learner for performance in the learning process.
- ***Other Resources****:* These are material resources to be used by the teacher or learner which are required to facilitate the teaching/learning process.
- ***Duration****:* This is the expected time interval of a lesson within which teaching/learning is supposed to take place.

MODULE 1: COMPUTING SYSTEMS AND COMPONENTS

Duration: 76 hours

PRESENTATION OF THE MODULE

This module introduces learners to what a computing environment looks like, and prepares them to demonstrate competency in identifying, selecting and installing preferable hardware and software components of a computer system, while implementing solutions to problems encountered in the course of working with them.

CONTRIBUTION OF MODULE TO CURRICULAR GOALS AND ACHIEVEMENT

This module enables the learner to understand what the computing system looks like and how it works for the learner to be productive in the economic, Social and Family, and Media and communication life domains.

CONTRIBUTION OF MODULE IN THE LEARNING DOMAIN

The module is expected to lead the learner to explore and identify components of computer networks and functions of operating systems. The learner would also develop a wide range of competencies that would lead to:

- Articulate an understanding of operating system and network technologies;
- Evaluate relative importance of operating system and network technologies;
- Exploit operating systems, networks, and system tools.

CONTRIBUTION OF MODULE TO THE TEACHING SYLLABUS AND OTHER DOMAINS OF LIFE

This module would enable the learner to:

- Describe computing trends;
- Choose a computer based on processor;
- Design the workplace to reduce health related hazards;
- Choose an operating system;
- Work with files and folders;
- Select and use computer network resources;
- Facilitate sharing of knowledge and other resources;
- Uphold ethical and responsible attitudes when using computers.

TABLE OF MAIN COMPONENTS OF MODULE 1: COMPUTING SYSTEMS AND COMPONENTS

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Exploring Computer Systems	• Buying a computer • Assembling a computer • Cleaning a computer • Buying software	Description of computing trends	• Identify generations of computers; • Describe main technology for each period; • Explain stored program concept.	• Vacuum Tubes; • Transistors; • Integrated; • Circuits; • Artificial intelligence	• Compare characteristics: size, processing capabilities, price …. of different generations; • Differentiate technologies used in different generations of computers;	Team spirit Communicative Creative Ethical reasoning Prudence	Computer laboratory Online resources(Photographs and videos of computer types) Human	4H
		Categorization of computers	• Identify types of computer; • Describe types of computer (Supercomputer, mainframe, minicomputer,		• Choose appropriate computer suited for a given situation; • Compare types of			3H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
	• Choosing software • Choosing hardware • Using a computing interface • troubleshooting		and microcomputer).		computers (super, mainframe, mini, micro) based on size, power, cost, purpose, …	Self-discipline Passion for technology Accurate and rapid writing Vigilant observant	resources Links: YouTube Google Sample hardware devices charts	
		Categorization of components	• Classify peripheral devices; • State performance; characteristics of storage devices; • Describe functioning of data capture devices (MICR, OCR, OMR, barcode Reader); • Describe memory types (RAM, ROM, Cache, registers) and their function; • Describe storage types (USB key, HDD, CD DVD) and their functions; • Illustrate with a diagram storage hierarchy based on speed and size; • Describe the types of RAM (SIMM, DIMM).	• Input; • Output; • Storage; • Primary storage; • Secondary storage;	• Choose appropriate device for a given situation (MICR, OCR, OMR, Barcode Reader …); • State characteristics (volatility, storage capacity, access speed); • Compare memory types (access speed, cost, storage capacity); • State characteristics (storage capacity, access speed) • Compare storage types (access speed, cost, storage capacity); • differentiate technology characteristics in optical readers (CD-R, DVD-R, CD-RW, DVD-RW); • choose the type of RAM for a given computer; • *Replace, add the RAM of a microcomputer.*			10H
		Functioning of the processor	• Explain the machine instruction cycle (Fetch-decode-execute-store); • Explain how interrupts are generated.	• Fetch-decode-execute-store; • Polling; • Interrupt;	• Contrast polling and interrupt. • Explain polling in the case of printing; • Explain generation of interrupts (faults, keyboard, new device).			2H
		Choosing a computer based on processor	• Explain processor architectures (CISC and RISC); • Describe Flynn's architectures (SIMD, SISD, MISD, MIMD); • Differentiate between parallel and distributed computing.	• CISC; • RISC; • Parallel computing; • Distributed computing.	• Compare RISC and CISC based on characteristics like RAM usage, cache usage, type of instruction; • Choose appropriate processor for a given task or situation; • Evaluate techniques used to boost processing power (parallel computing and distributed computing).			2H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
		• Conversion of measuring units	• State relations between storage units; • Convert between units; • Convert from one SI unit of time (Second, millisecond, picosecond, nanosecond, microsecond) to another.	• Bits, bytes, Terabyte …; • Hertz, Kilohertz Gigahertz …;	• Convert between units of storage; • Convert between units of CPU speed; • Convert between units of time;			3H
		categorization of software	• Explain system software; • Explain application software; • Explain differences between custom made and general purpose software; • Distinguish between demo ware, shareware and freeware with examples; • Establish with examples, the difference between open source and proprietary software;	• System software; • Application software; • Bespoke; • Operating system; • Utility software; • Device drivers; • Open source; • Proprietary software;	• Identify a software or its type when given its features or purpose; • Choose appropriate software for a given task or situation; • Compare categories of software (open vs. proprietary, shareware vs. freeware, system vs. application, custom made vs. general purpose); • *Install correctly the windows or Linux operating system;* • *Install correctly device drivers, utility programs, and application software.*			8H
		Choosing an operating system	• Recall history and evolution of operating systems; • Describe types of operating system (Single user OS, Batch OS, On-line OS, multiuser OS, NOS, multitasking OS, Real-time OS,…); • Differentiate between multitasking and multiprogramming.	• Operating System	• Explain in a report the evolution of operating systems; • Choose an appropriate operating system when given a task to accomplish, device to use on, number of simultaneous users, ...			5H
		Functioning of an operating system	• Describe functions of an operating system; • Distinguish between pre-emptive and non-pre-emptive scheduling; • Describe scheduling algorithms (FCFS, SJF, SRT, round robin).	• process management, • Memory; management, • Device management; • File management • Pre-emptive, non-pre-emptive	• Explain how the operating system manages processes; • Explain how the operating system manages memory; • Propose a scheduling algorithm for a given situation.			4H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
				scheduling.				
		Choosing a user interface	• Identify OS interfaces (GUI, CLI, WIMP) ; • Explain strengths and weaknesses of each interface; • Select the desired interface for use.		• Determine the appropriate user interface for a given user or given situation; • Identify the different user interfaces used in a given operating system.			2H
		Exploring user interface	• *Launch a command line interface (MS-DOS or LINUX)*; • *Identify some command line environments*; • *Determine the appropriate command for a given task*; • *Set up OS to avoid unauthorized access.*		• *Display the command line interface*; • *Access the HELP facility of a command line interface*; • *Use commands to create and manage files and folders*; • *Format a storage device using command line;* • *Create a batch file;* • *Create user accounts and passwords.*			8H
		Working with files and folders	• Identify commonly used file formats; • Explain notions of file organization ; • Explain file compression methods; • Identify different file systems (Binary, Graphic(i.e. bit-mapped, and Vector; Sound; Video; • Explain advantages of compressing a file;	File, folder, file format; Document transmission; Hypermedia; WinZip; WinRAR; Lossy compression; lossless compression; FAT, NTFS.	• identify objects stored in a given file format; • list file extensions in a folder; • Identify applications used in handling a given file; • Display storage hierarchy and file paths; • Select file compression software; • *Install compression software*; • Calculate the file compression ratio; • *Compress a file of at least 5MB and determine its compression ratio.*			8H
		Detecting common problems with hardware and software	• *Identify software and hardware faults in a computer system*; • *Propose techniques to curb software/hardware failures*.	• *Error codes;* • *Blue screen;* • *screen flickering;* • *Beeps.*	• *Recognise error codes Beeps*; • *Connect computing devices correctly*; • *Use the defrag functionality*; • *Demonstrate awareness of good practices (regular*			6H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
					cleaning, blowing, use of dust covers, etc.)			
		Selecting hardware/software for different category of users	• Identify different category of computer users and their impairments (visual, physical, …); • describe assistive technologies (braille keyboard and audio devices, ASR,);	Assistive technology.	• Suggest appropriate assistive technology for a given impairment.			3H
		Designing the workplace to reduce health related hazards	• Explain computer related health hazards and their causes; • Explain practices used to prevent computer generated health hazards.	• Ergonomics; • Musculoskeletal disorders; • Eye strain.	• Determine wrong posture and wrong equipment positioning; • Illustrate right posture and right equipment positioning to avoid health hazards.			5H
		Researching on information system vendors and hardware vendors	• Identifying companies and their products; • Identify manufacturers of computing products, computer dealers and distributors; • Identify manufacturers of software packages.	• Leasing; • Timesharing; • ISP.	• Establish in a report the comparative advantages and disadvantages hardware/software vendors and their products (Apple, Microsoft, Google)..			3H

MODULE 2: IMPACTING SOCIETY WITH DIGITAL TECHNOLOGY

Duration: 80 hours

PRESENTATION OF THE MODULE

This module leads the learner into finding out the positive and negative changes which the use of computers has brought or will bring into society while proposing instruments for promoting its positive use and preventing negative use. It also looks at how computers and Information Systems can be used to solve real-life problems that need ICT solutions. Learners here are prepared to demonstrate competency in using some common Information Systems, identifying and proposing digital solutions to a variety of real-life problems, and also to cause positive change in society through the use of ICTs while preventing negative change.

This module has as goals to encourage the learner to:

- Discuss types of productivity tools (Word processor, Spreadsheet, Presentation slides/graphics, etc.);
- Use advanced functions of productivity tools;
- Identify characteristics of an algorithm;
- Exploit software development tools to implement simple algorithms.

CONTRIBUTION OF MODULE TO ACHIEVEMENT AND CURRICULAR GOALS

This module would enable learners to be productive in order to exercise societal roles in business, social and family life, and above all in media and communication world.

CONTRIBUTION OF MODULE IN THE AREA OF LEARNING

This module would lead the learner to carry out word processing, manage spreadsheets, presentation slides/graphics and make of other productivity tools. These competencies would be employed by the learner to facilitate knowledge and skills acquisition in other disciplines in the domain of science and technology:

- Select and exploit application package that is suitable for a given task;
- Facilitate sharing of knowledge and other resources;

- Evaluate relative importance of each application package.

CONTRIBUTION OF MODULE TO THE TEACHING SYLLABUS AND OTHER DOMAINS OF LIFE

The main objective is to encourage the learner to become autonomous with the computer. In this regard, the learner should be able to identify and select appropriate productivity tools with respect to the task at hand and uphold ethical and responsible attitudes

TABLE OF MAIN COMPONENTS OF MODULE 2: IMPACTING SOCIETY WITH DIGITAL TECHNOLOGY

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Determining the range and scope of computer applications	• Choosing a system • Making informed decisions • Using an information systems in an organization : school, banks, business … • Proposing digital solutions to variety of real life problems • managing tasks that are risky for humans • Home applications	Description of systems	• Describe a system • Distinguish between natural and artificial systems • Differentiate between manual and automatic (email, e-learning, …) systems • Model a system using a data flow diagram.	• Natural Systems; • Artificial systems; • System diagrams; • Data flow diagrams; • Automated system.	• Categorise systems in their environment (manual, automatic, …) • Propose limitations on an identified manual system. • Identify existing digital replacements of a given manual system. • produce a dataflow diagram for a given system	Team spirit Communicative Creative Ethical reasoning Prudence Self-discipline Passion for technology Accurate and rapid writing Vigilant observant	Computer laboratory Online resources(Photographs and videos of computer types) Human resources Links: YouTube Google Sample hardware devices charts	4H
		Mobilising resources to establish an information system	• Define an information system • Describe types of information system (MIS, DSS, EIS, TPS GIS, HIS, LIS) • State the components (people, procedures, technology and data) of an information system • Establish the hierarchical structure of an organisation • Describe the role of each of the levels in the hierarchical structure of an organisation • Identify factors affecting the success/failure of an IS	• Information system	• State the roles of: people, procedures, technology and data in an information system. • Illustrate the hierarchical structure of an organisation • Establish the necessity for information systems as used in a library, hospital, company, school • Assemble resources for an effective information system in a library, hospital, company, school; • Compare TPS, MIS, DSS, EIS based on characteristics like purpose, users, inputs, etc. • Select a suitable information system for a given context.			7H
		Describing general and commercial data processing	• State examples of general and commercial data processing systems (stock control, order processing, etc.)	• Stock control; • Order processing; • MIS;	• Suggest an example of a data processing system for a given organisation (school, shop, bank, etc.) or situation.			3H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
	of computer technology. ● Illegal use of computer systems ● Unethical use of computer systems ● Practices that put a computer system at risk ● (Not logging out after using a computer system, Opening an email from an untrusted source, …) ● Impact of malware ● Protection of computer systems (Prevention of malware, prevention of computer attacks, …)	systems	● Explain how general data processing works ● Explain how commercial data processing works ● ***Give an appraisal of the functioning of data processing systems in a real life organisation***.		● Assess the level of automation and technological tools as used in data processing activities of an organisation (school, shop, bank, etc.). ● Choose existing application packages that can be tailored to help in data processing such as spreadsheets			
		Describing systems for solving industrial, technical and scientific problems.	● Describe the application of computer systems in sciences and industries (weather forecasting, CAD and CAM, image processing, industrial inspection systems, simulation and modelling) ● Describe how industrial, technical, and scientific systems work; ● ***Visit institutions using systems for solving industrial, technical or scientific problems, and appraise their functioning.***	● Simulation; ● Modelling; ● CAD; ● CAM;	● Illustrate with examples industrial, technical and scientific uses of computer systems; ● Evaluate the level of: automation and technological tools used in a manufacturing or scientific organisation in the learner's environment.			3H
		Exploring automation, control systems, monitoring systems embedded systems and running robots for different tasks.	● State examples of automation, control systems, monitoring and control systems(patient monitoring systems, chemical process control, traffic control); ● , Embedded systems and robotic systems; ● Explain how monitoring systems work; ● Explain how control systems work; ● Explain how automated systems (domestic equipment, automatic navigation systems). work.	● Automation ● Monitoring and Control systems.	● Determine a real life application of control systems, automated systems and monitoring systems. ● *Install and configure a control system* ● *Install and configure a monitoring system* ● Compare the functioning of automated, control and monitoring systems.			8H
		Producing arts and media with computer systems	● Describe the applications of computers in arts and media (music, graphic design and animation for television and film, production of newspapers); ● *Exploit computer systems for art and* media	● Media; ● Multimedia;	● Explain how computer systems are used in: music production, desktop publishing …); ● *Create beats using music production software*; ● *Edit songs using music production software*;			8H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
					• *Produce photographs*; • *Edit images*; • *produce and edit motion pictures(or movies)* ; • *design a magazine using publication software.*			
		• Responsible use of computer systems	• State positive and negative uses of computer systems; • Explain social effects of computer systems; • Explain economic effects of computer systems; • Explain legislation, code of ethics and moral obligation of computer users; • Explain the effects of ICTs on communication, citizenship and cultures; • Explain how ICT can be responsibly used to influence communication and cultures; • Demonstrate knowledge of international Acts and Standards. • Demonstrate knowledge of current data protection and copyright acts	• Ethics; • Legislation; • BCS; • IEEE ; • ACM; • Digital divide;	• Explain in a report unethical acts with focus on those punishable by Cameroon law; • Explain in a report the importance of International Acts; • Determine the effects of global communication on the concept of citizenship, cultural issues and digital divide; • Establish how digital divide can be reduced in the community.			6H
		Protecting computer systems from natural threats and computer crimes	• Explain security, reliability and resilience of systems and consequences of system failure; • Describe data handling; • Describe measures to protect systems from illegal access and use (backup, use of passwords, security codes, encryption, biometrics physical security); • State the importance of recovery in the event of system failure; • Explain the importance of privacy, and safe working practices; • Describe types of computer crimes with examples; • Explain measures to combat	• Computer crime; • Copyright; • Plagiarism; • Computer related crime; • Computer assisted crimes.	• Explain the necessity of data handling; • establish the necessity of securing computer systems; • Classify computer crimes into computer related and computer assisted; • Illustrate with examples how safe working practices can help protect a computer system; • Identify types of computer crimes in the learner's environment; • Associate computer crimes to specific measures in combatting them.			10H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
			computer crime;					
		Protecting computer systems from malware	• Describe different types of malware (virus, worm, Trojan horse, rootkit); • Describe techniques and practices used to fight against malware;	• Malware; • Antivirus; • Firewalls	• Compare the different types of malware (virus, worm, Trojan horse, rootkit, backdoor, spyware, …); • Explain good practices (open only email attachments from trusted source, scan email attachments, download from trusted websites ...) to protect against malware; • *scan a computer system using an antivirus*; • *block untrusted websites using a firewall*; • *set up protection against unauthorised access using a firewall*.			7H
Artificial intelligence in simulating real systems. Using Simulation and Multimodal systems	• Working with artificial intelligence	• Applying Artificial Intelligence (AI) to improve on working and living standards	• Explain Artificial intelligence (AI); • Establish difference between human brain and computers; • Describe how AI is used in specific areas of life.	• Neural networks; • Patten recognition; • Natural language analysis; • CYC; • COG.	• Explain how AI is used in: Health, banking, manufacturing, …			5H
		Employing robots for personal, business and industrial purposes	• Describe a robot; • Explain how robots are used in manufacturing, health, home, … • Describe advantages and limitations of robots; •	• Robotics	• Illustrate with examples situations that may need the use of robots; • Write an essay on advantages and disadvantages of robots;			4H
	• Using simulation systems (virtual reality, Augmented reality, …), • Using multimodal systems	Demonstrating use of simulations, VR, AR in different areas of life	• Explain simulation; • Establish advantages and limitations of simulation; • Explain how Virtual reality (VR) works; • Describe the role of VR in different areas of life; • Explain how Augmented Reality (AR) Works; • Describe the role of AR in different areas of life; • differentiate between AR and	• Games • Videos • Head mounted display, • VRML,	• Determine simulations in the learner's environment or in a given situation; • Design simulation in the learner's environment using technology i.e. represent it in a computer system; • Compare AR and VR systems.			8H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
	● Using multimedia authoring tools		VR. ● Describe the application of VR and AR in the field of education, entertainment, military, and medicine.					
		Demonstrating the use of multimedia systems for presentation and entertainment	● Explain how multimedia systems work; ● State features of multimedia authoring tools; ● *Use multimedia authoring tools* (photo story, Camtasia, Animate, …) *to produce multimedia content.*	● Multimedia; ● Multimedia authoring tool;	● Differentiate between multimedia and non-multimedia content;. ● *Produce a video using pictures, audio and text*;			5H
		Identifying multimodal systems	● Describe multimodal systems; ● Give examples of multimodal systems (Multimedia, Augmented reality[AR], Virtual reality[VR])	● Multimodal systems	● Identify the use of multimodal systems in a given computer system.			2H

MODULE 3: BUILDING ICT SYSTEMS

Duration: 116 hours

PRESENTATION OF THE MODULE

This module would lead the learner to:

- Identify and explore underlying concepts in building computer systems;
- Develop competencies in building information systems, computer applications and other digital contents;
- Develop an understanding in the building of basic digital electronic circuits;
- Develop an understanding in the programming of low-level languages.

CONTRIBUTION OF MODULE TO ACHIEVEMENT AND OTHER CURRICULAR GOALS

The competencies acquired through this module would permit the learner to write programs and build IS that solve issues related to society, business and other areas of life that need digital solutions.

CONTRIBUTION OF MODULE IN THE AREA OF LEARNING

The module is expected to lead the learner to identify and explore underlying concepts in building computer systems. The learner will develop competencies in building information systems and other digital contents. They also develop an understanding in the building of basic digital electronic circuits which facilitate the understanding of low level programming. Among other aspects, the learner will:

- Use the SDLC and other models to build IS
- Work with Relational Databases such as Access, Open Base, MySQL
- Use UML in designing an IS
- Use Entity Relationship Diagrams to design relational databases and information systems
- Carry out normalization and write SQL codes

- Design software using different approaches
- Use algorithms for writing efficient programs
- Use both High level and low level languages
- Write programs to solve different user needs
- Identify and work with logic gates, truth tables and Boolean expressions

CONTRIBUTION OF MODULE TO THE TEACHING SYLLABUS AND OTHER DOMAINS OF LIFE

The main objective is to encourage the learner to be able to build some IS and confidently use the computer system, while being able to identify where a problem occurred in the system if any. Such confidence exhibited would be due to their knowledge acquired in building ICT systems.

TABLE OF MAIN COMPONENTS OF MODULE 3: BUILDING ICT SYSTEMS

Contextual framework		**Competencies**		**Resources**				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Developing Information systems	Building information systems using standard models:	Describing IS	• Describe stages in System Development Life Cycle (SDLC) ; • Describe different system development models (waterfall, Prototyping, Boehm's Spiral etc.).; • Explain the different changeover strategies (direct, parallel, pilot and phase).	• System Development Life Cycle (SDLC); • SDLC Models	• Identify activities involved at each stage of a SDLC; • Compare SDLC models; • Propose suitable change over strategy for a given context.	Team spirit Honesty and diligence Accountability Communicative Algorithmic thinking A desire to automate Creative	**Didactic materia**l Charts on different models . **Link** Google YouTube	3H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Developing Information systems		Prototyping approach, for system development.	• Explain the steps in prototyping • Explain the types of system prototyping (Throw-away or close-end and Evolutionary prototyping)	• Prototyping	• Explain reasons for prototyping; • Compare types of prototyping; • Choose appropriate type of prototyping in a given context.	Logical reasoning Systemic reasoning Passion for technology	**Didactic materia**l Charts of the various models.	5H
	Modeling data in an IS	Distinguishing between old and modern methods of data modeling.	• Distinguish between flat file and relational databases; • Explain types of database model; (Entity relationship (ER) model, Relational model and object-oriented model) • Describe various levels of data modeling (conceptual, logical, and physical modeling).	• Data modeling	• Differentiate between data models; • Compare flat file model with other databases models e.g. relational database model; • Use the steps involved in data modeling (e.g. design tables, determine primary keys, model queries required by the application etc.) to design a database.	Team spirit Honesty and diligence Accountability Communicative Algorithmic thinking Strong problem solving skills A desire to automate Critical thinking Creative Ethical Logical reasoning Systemic reasoning Prudence Self-discipline Passion for technology	**Didactic materia**l RDBMS application Projector . **Digital resources**(e.g. pictures and videos tutorials on data modeling approaches)	7H
		Applying basic ER modeling	• Explain notions of entity relationship models	• Entity; • Attributes /Field; • Records /Tuple; • Key attributes; • (Primary, Foreignkeys…); • Data mapping.	• Examine concepts of entity relationship model (entity, attributes, primary and foreign keys ...) ; • Draw Entity Relationship (E-R) diagrams.			3H
		Applying the relational model	• Explain notions of the relational model; • State examples of RDBMS; • Explain the different types of relationship (1-1, 1-M and M-M).	• Relational database management systems (RDBMS); • Redundancy; • Normalization of a database	• Propose advantages of relational database model; • Transform a table into 1NF, 2NF, 3NF.		**Didactic material** Database application	3H
	Software Testing System testing	Employing and appreciating the issues addressed by various testing regimes	• Describe types of testing (System testing; Volume testing;	• Software testing	• Explain reasons for testing an Information System. • Select suitable testing method for a given context.		**Digital resources** (e.g. videos on testing methods)	5H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
			Integration testing, and Acceptance testing.) ● Carry out the procedure for module testing; ● Establish the importance of carrying out the tests.					
Building logic circuits	Working with Binary arithmetic	Converting from one number base to another	● Identify number systems; ● Convert from base 2 to base 8, 10 and 16 and vice versa; ● Computing arithmetic operations.	● Binary arithmetic; ● Sign magnitude representation; ● Bit, nibble, byte, word… ● One's complement; ● Two's complement;	● Carry out binary operations e.g. addition, subtraction, multiplication and division; ● Convert from base 2 to base 8, 10 and 16 and vice versa.	Team spirit Honesty and diligence Accountability Communicative Algorithmic thinking Strong problem solving skills A desire to automate Critical thinking Creative Ethical Logical reasoning Systemic reasoning Prudence Self-discipline Passion for technology	**Didactic materia**l Computer, projector **Digital resources**(e.g. pictures and videos tutorials) **Link** Google YouTube	5H
	Building a bugler alarm Traffic lights	● Implementing Boolean logic ● Design logic circuits	● Sketch logic gates (OR, AND, NOT, NAND, NOR, XOR, XNOR) symbols and truth tables. ● Derive truth tables from Boolean expressions (up to 3 input variables) ● Derive Boolean expressions from truth tables; ● Simplify Boolean expressions; ● Apply De Morgan's theorem.	● Logic gates ● Boolean algebra. ● De Morgan's theorem.	● Combine logic gates to form digital circuits. ● Simplify expressions using Boolean algebra ● Outline benefits of the De Morgan's Theorem.		**Didactic material** Electronic kits Digital resources (e.g. picture and video tutorials on logic gates)	7H
Developing software	Choosing appropriate data types for representation and organization of information	Constructing complex data types from standard data types	● Identify standard data types (e.g. real , Boolean, character, integers); ● Represent complex data types (e.g. arrays, strings, records lists).	● Standard data types ● Complex data types	● Explain standard and complex data types; ● Use standard data types to form complex data types.			5H
	Designing software	Applying software design to solve real life problems	● Demonstrate an understanding of structured design; ● Solve real life problems with the	● Top-down design; ● Stepwise refinement; ● Incremental construction;	● Explain approaches to software design; ● Select a suitable design method for a given problem.		**Digital resources** (e.g. video demonstrations of design strategies)	5H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
			structured design methods.	• Divide-and-conquer; • Bottom-up design; • Adapting existing solutions, and modular design.		Team spirit Honesty and diligence Accountability Communicative Algorithmic thinking Strong problem solving skills A desire to automate Critical thinking Creative Ethical Logical reasoning Systemic reasoning Prudence Self-discipline Passion for technology		
		Representing software design	• Explain uses of unit and structure diagrams (in terms of class, sequence, composite…)	• Structure diagrams; • Unified Modeling Language (UML) model	• Sketch a structure diagram for developing software.		Computer Projector	3H
Developing software		Writing algorithms	• Explain an algorithm; • Identify characteristics of algorithms; • Represent algorithms using flowcharts and pseudo code; • Use basic algorithmic constructs (sequence, selection, iteration or loop and recursion); • Analyze the efficiency of an algorithm; • Explain recursion; • Explain sorting (bubble, merge, and insertion sorts etc.); and searching techniques(binary and sequential searches); • Perform dry run using a standard algorithmic techniques	• Algorithm; • Control structures; • Complexity of an algorithm; • Dry run	• State advantages and disadvantages of pseudo code and flow chart; • Write algorithms using pseudo code and flow chart; • Explain algorithmic constructs (sequence, selection, loop and recursion) with the aid of examples; • Draw trace tables to test and detect errors in an algorithm. • Explain algorithmic strategies (brute force, greedy, divide-and-conquer …) ; • Carry out dry run of an algorithm.		**Didactic materia**l IDE, Charts, projector . **Digital resources**(e.g. pictures and videos tutorials) **Link** Google YouTube	13H
		Testing and evaluation of algorithms	• Establish correctness of algorithms; • Assessing reasonableness of solutions and relative correctness.	• Evaluation of Algorithms	• Examine the performance of an algorithm using time and space efficiency		**Didactic materia**l IDE, computer projector . **Digital resources**(e.g. pictures and videos tutorials)	5H
Developing software		Explanation of different programming paradigms	• Distinguish between different types of programming paradigms (Imperative or	• Programming paradigms • Encapsulation; • Polymorphism.	• Explain the different types of programming paradigms; • Explain the different properties of object-oriented programming (encapsulation,	Team spirit Honesty and diligence Accountability	**Didactic materia**l Charts, projector . **Digital resources**(e.g.	3H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
			procedural, Declarative Functional, Logic and Object-oriented) ; ● Establish the relative advantages and disadvantages of each paradigm.		polymorphism …)	Communicative Algorithmic thinking Strong problem solving skills A desire to automate Critical thinking Creative Ethical Logical reasoning Systemic reasoning Prudence Self-discipline Passion for technology Team spirit Honesty and diligence Accountability Communicative Algorithmic thinking Strong problem solving skills A desire to automate Critical thinking Creative Ethical Logical reasoning Systemic	pictures and videos tutorials) **Link** Google YouTube	
Developing software	Selecting and working with programming paradigms Outsourcing software	Software reuse	● Explain software reuse; ● Explain types of software reuse (internal and external) ; ● Explain criteria for selecting software for reuse (reduce development cost, time, labour, maintenance effort…);	● Software reuse ; ● Library units; ● Repositories; ● Software Package	● Determine the importance of software reuse; ● Select software for reuse.		**Didactic materia**l Program code in course of development, computer lab . **Digital resources**(e.g. pictures and videos tutorials)	5H
		Determining when to use internally or externally developed software	● Distinguish between internally and externally developed software.	● Internally developed software; ● Externally developed software.	● Choose between developing a software internally or externally.		**Digital resources**(e.g. pictures and videos tutorials) **Link** Google YouTube	2H
		Demonstrate use of language translators	● Explain language translators (compiler, interpreter ...) ; ● Determine advantages and disadvantages of a given language translator to solve problems; ● Use a language translator	● Lexical analysis; ● Code generation; ● Parsing or syntactic analysis; ● Preprocessing; ● Optimization.	● Determine language translators for specific programs; ● Demonstrate the ability to use compilers, interpreters …; ● Compare the different types of language translators.		**Didactic material** Sample language translators **Digital resources**(e.g. pictures and videos tutorials)	5H
	Implementing programming language components	Converting data structures and algorithms to programs	● Explain data structures; ● Explain the meaning of syntax and semantics.	● Data structures; ● Syntax; ● Semantics.	● *Transform algorithms into a program;* ● *Apply the correct syntax and semantics to a given programming language*.		**Didactic materia**l IDE, projector **Digital resources**(e.g. pictures and videos tutorials on	9H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
						reasoning Prudence Self-discipline Passion for technology	programming) **Link** Google YouTube	
Developing software		Using features of high level languages	● Explain stack mechanism for procedure calling and parameter passing; ● Explain types of data values (variables, constants, locations, scoping); ● Explain characteristics of a good program.	● I/O operations; ● Functions; ● Local and global variables; ● File handling operations; ● Program clarity; ● Program Efficiency; ● Program Reliability.	● *Apply features of high level language in programming;* ● *Write programs using data structures (file, …).*		**Didactic Material** IDE. , computer laboratory **Digital resources**(e.g. pictures and video tutorials on programming procedures and parameter passing) **Link** Google YouTube	5H
Developing software	Ensuring the built program works as expected	*Testing a developed program*	● *Explain steps involved in software testing (code review, static code analysis, unit testing, system testing etc.) ;* ● *Explain debugging.*	● *Boundary data;* ● *Correct and erroneous data;* ● *Debugging software;* ● *program tracing debug code.*	● *Debug a program;* ● *Compare debugging techniques (brute force, induction, backtracking …).*		**Didactic material** IDE, Computer lab **Digital resources** (e.g. videos on testing strategies)	5H

MODULE 4: COMMUNICATION, RESOURCE SHARING IN IT AND INFORMATION SECURITY
Duration: 77 hours

PRESENTATION OF MODULE

This module leads the learner to describe principles on which the Internet operates, set up basic networks with different network topologies, and build websites using web technologies. Learners are prepared to demonstrate competency in identifying, selecting, configuring and using communication systems to share resources such as data/information, hardware and software.

This module would lead the learner to:

- Describe principles on which the internet operates;
- Setup basic networks with different network topologies;
- Build websites using different web technologies;
- Implement information security and privacy in computer systems.

CONTRIBUTION OF MODULE TO ACHIEVEMENT AND OTHER CURRICULAR GOALS

The competencies acquired through this module would permit the learner to exercise societal roles in the following life domains; Economy life, Social and Family life, and Media and communication.

CONTRIBUTION OF MODULE IN THE AREA OF LEARNING

The module is expected to lead the learner to:

- Identify and explore different network devices and their functions.
- Implement different network types
- Explain methods of securing data
- Describe data transmission modes and media
- Use the Internet
- Communicate with the use of services provided through the Internet

- Evaluate issues related to security when communicating over networked systems
  Build and deploy websites

CONTRIBUTION OF MODULE TO THE TEACHING SYLLABUS AND OTHER DOMAINS OF LIFE

The main objective is to enable the learner to set up and use networks with associated services, for communication and sharing resources.

TABLE OF MAIN COMPONENTS OF MODULE 4: COMMUNICATION, RESOURCE SHARING AND INFORMATION SECURITY

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Exploring Concepts and features of networks	• Sharing resources (sharing a printer, …) • Choosing equipment for a system • Using a platform • Transferring data (sending mail, exchanging of information via a telephone …) • Securing systems • Identifying	Description of computer networking	• Describe a computer network; • Compare networked-computers with stand-alone systems; • Explain the benefits and limitations of computer networks. • *Explain complexity,* securityand *privacy concerns of* data communication networks.	• Computer Networks; • Stand-alone systems; • Client/server computing; • Distributed computing;	• Differentiate the functioning mode of computer network from stand-alone systems; • Explain the benefits and limitations of computer networks	Team spirit Honest and Diligence Research skills Multi-tasking skills Communicative Strong problem solving skills Critical thinking Ethical Systemic reasoning Self-discipline Attention to details	computer modem, phones RJ45 Jack twisted pair cable **Digital resources** Photographs and videos of computer networks Links: YouTube	4H
		Classification of computer network based on size of geographical area to cover	• Describe types of networks.	• LAN; • MAN; • WAN; • CAN; • PAN;	• Classify network based on coverage; • Select appropriate types of network for a particular; organisation (school, bank with many branches, …);			4H
		Choosing network type based on her strategy to suit the organisation's needs	• Explain network types based on the logical relationship between network nodes or computers; • Establish the advantages and disadvantages of each configuration.	• Network architecture or configuration; • Peer-to-peer network; • Client/server network	• Choose appropriate designs: client-server, peer-to-peer used by an organisation; • Compare the advantages and disadvantages of each architecture.			2H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
	data validation and data verification techniques • Implementing validation and verification techniques					Passion for technology		
		Configuration of network topology based on the physical connection of computers.	• Describe types of physical network topologies; • Establish the advantages and disadvantages of each layout or topology.	• Network topology; • Mesh topology; • Star topology; • Ring Topology; • Bus topology; • Tree topology …	• Compare the type of network topology (Mesh, Star, Ring, Bus and Tree); • Propose network topology to suit an organisation			4H
		Selection of network components (equipment)	• *Explain the role of network components (Modem, Hub, Switch, Router, Bridge, Gateway, NOS, Multiplexers, Network Cards, Repeaters);* • *Set up a computer Network.*	• *Computer network*	• *Select equipment to set up a network for an organisation (school, …)*; • *Set up a computer Network (peer to peer).*			6H
		• Implementation of network security	• Distinguish between intranet and extranet; • Describe the technologies used to implement intranet and extranet; • Describe the principles of virtual private networks VPN; • Set up a VPN; • Use protocols to ensure privacy; • Explain concepts related to computer/data security; • Explain security measures designed to protect computer systems (firewalls, protocols, encryption, digital signatures, firewall, user account); • Explain security methods designed to protect data including encryption and access rights; • Explain data validation techniques (range check, format check, length check, presence check,	• Search engines; • User profile; • Mobile apps; • Blogs; • Protocols; • VPN; • Privacy or confidentiality; • Integrity; • Availability; • Validation; • Verification;	• Contrast intranet and extranet; • Explain the requirements used by companies to put in place intranet and extranet (search engines, user profile, mobile apps, blogs, etc.) ; • *Set up a secured VPN (firewalls, digital signature, …)*; • Describe the terms: security, privacy, confidentiality, integrity and availability as used in network; • Identify measures used to protect computer systems (User accounts, passwords, authentication, …); • Describe some techniques such as encryption and access rights used for the protection of data; • Contrast validation and verification; • Identify the use of			10H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
			existence check, limit check, check digit, parity check); • **Explain verification** techniques (visual check, double entry);		validation and verification techniques in a given situation; • Choose appropriate verification or validation technique.			
		Differentiating modes of data transmission	• Explain logical topology (CSMA/CD, CSMA/CA); • Describe different transmission modes .(Simplex; Half-Duplex; Full Duplex.)	• CSMA/CD; • CSMA/CA; • Data transmission	• Detect the methods used in the transmission of signal for a given scenario (CSMA/CD, CSMA/CA) ; • Identify the direction of signal flow between two devices in a given situation; • Illustrate data transmission modes.			2H
		Identifying different transmission Types	• Differentiate between broad band and narrow band Transmissions; • Differentiate between Serial and Parallel transmissions; • Differentiate synchronous and asynchronous transmissions; • Differentiate between Analog and Digital Transmissions;	• Narrowband, • Broadband • Serial transmission • Parallel transmission • Synchronous transmission • Asynchronous transmission • Analog signal • Parallel signals	• Contrast the data transmission methods (Serial and Parallel) ; • Detect the methods of transmission used in a given situation (synchronous and asynchronous) ; • Illustrate analog and digital signals.			5H
Data transmission in communication		Classification of transmission media	Describe guided (wired) transmission mediums (Copper Wire, Coaxial Cables, Twisted Pair Cables, Optical Fiber …) • Describe unguided(wireless) transmission mediums (Bluetooth, Microwave, Radio waves, Infra-red, Wi-Fi , Wimax, Satellite Links); • Describe the properties of different transmission media.	• Transmission media	• Classify the various physical media used in the transmission of signals; • Choose appropriate transmission medium in a given context.			2H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
systems		Description of peripheral device control mechanism	• **Explain the meaning and role of Buffers, interrupts, interrupt priorities; polling and handshaking**	• Buffers; • Interrupt; • Polling; • Handshaking.	• Determine the techniques (Buffers, interrupt priorities, polling and handshaking) used to control devices in the network			2H
		Using common protocols in data transmission	• Outline the role of protocols (IP, TCP, SMTP, POP, HTTP, FTP; TCP/IP); • Explain the role of protocol suits in communication; • Describe the OSI reference model.	• Network protocols; • OSI-reference model;	• Discuss the protocols (IP, TCP, SMTP, POP, HTTP, FTP. TCP/IP) used to ease data transmission; • Evaluate the roles of protocols in data transmission; • Explain the OSI reference model.			4H
		Executing different correctness checking methods	• Identify errors which occur with the transfer of data; • Describe data transfer checks mechanisms.	• Data transfer checks; • Parity Checks; • Checksums; • Self-Correcting Codes, …	• Determine errors (duplicated bits) which can occur during data transmission; • Propose techniques used to detect errors; • Explain an error detection method (odd and even parity).			3H
		Reviewing the history of the internet	• Define the internet; • Recall the history of the internet.	• Internet; • ARPANET; • NSFNET	• Explain in a report major events in the history of the internet.			1H
		Determining the structure of the internet	• Identify the role of internet service providers (ISP) ; • Identify the technology for connecting to ISPs; • Identify requirements for connectivity to the internet. • Identify the role of internet protocols.	• ISP; • Telephone; line; • ISDN; • XDL; • Leased lines; • Web servers; • Network card; • Modems, …; • IP v4; • IPv6; • FTP, IP, TCP, HTTP.	• Determine global and local ISPs; • Determine the technologies (Telephone line, ISDN, XDL, leased lines, web servers, Network card, Modems, etc) used by ISP to ensure internet connection; • Explain the role played by protocols (IP v4, IPv6, FTP, IP, TCP, HTTP) to facilitate internet connection.			3H
		Using social networks and	• Identify examples of social media applications	• Social Media; • Chat rooms;	• Determine some interactive environments			4H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Working with the Internet		collaborative environments	(Facebook Instagram, Twitter, WhatsApp; Blogs; conferencing (Zoom, Skype) …); • Describe the impact of social networks; • Propose measures to ensure proper use of social media; • Demonstrate knowledge and use of collaborative environments.	• Forums	used in the community to communicate; • Evaluate the use of internet in the community (essay) ; • Outline ways enforced by the State to ensure internet access; • Explain how a collaborative platform can be used for learning.			
		Using the internet	• *Describe internet services*; • *Use communication services (E-mail services, TELNET, newsgroups Internet telephony(VoIP), Instant messaging …)*; • *Use information retrieval services*; • *Use web services*; • *Use the internet for teleworking;* • *Explore information retrieval services (FTP, Browser, Search Engine,)*;	• *Teleworking;* • *Videoconferencing*; • *Telecommuting;* • *URL;* • *Cookies*; • *Search engines*	• *Create an email account*; • *Attach a file to a mail and send*; • *Research information on a particular topic using a search engine*; • *Chat using instant messaging platform*; • *Set up a teleconferencing platform*; • *Participate in a teleconference*.			5H
		Using electronic services for commerce	• Describe e-commerce (purchase, transfer of funds; Refund of funds; Credit/debit card …); • Describe e-health • Using E-government and E-governance	• Medical information system; • Telemedicine; • Electronic medical record; • E-governance; • E-government;	• Explain in a report the advantages and disadvantages of e-commerce, e-health, e-government; • Identify e-government platforms in Cameroon.			8H
		Learn with the assistance of computers	• Describe computer assisted learning; • Identify methods of course delivery; • Didactic resources;	• Computer Assisted Learning(CAL;	• Explain in a report the advantages and disadvantages of e-learning; • Determine the methods			

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
			• Establishing advantages and limitations of CAL.		used over the internet to study (Computer Assisted Learning (CAL), delivery through servers, CD ROMs, e-books, videos).			
Web development		*Develop simple web pages*	• *Implement html tags*	• *web pages*; • *Tags*; • *Attributes.*	• *Create simple web Pages using HTML.*		*Text editor, Content Management System, browser, DNS* ***Digital resources*** *Video tutorials of PHP, HTML, CSS, …*	8H
		Apply common technologies, for web development	• *Use cascading styles sheets to improve look-and-feel*; • *use of JavaScript*	• *JavaScript, HTML, PHP CSS*; • *web design packages*; • *WordPress or Joomla, …*	• *Write CSS code to change color, font size, padding, …*; • *Write java script code to process client-side data and form data*;			
		Host a website	• *Exploit Content Management Systems.*	• *Domain name(public IP)* ; • *DNS …*	• *Publish a website on the internet.*			

MODULE 5: PRACTICAL PROBLEM SOLVING IN THE DIGITAL WORLD
Duration: 77 hours

PRESENTATION OF MODULE

This module leads the learner to understand the fundamentals of project management, practically configuring and using the computer system to solve daily problems and carrying out mini-projects. Learners are therefore prepared to demonstrate competency in:

- Designing and following up projects;
- Building applications using object-oriented programming;
- Tailoring spreadsheets to solve accounting, statistical, analytic and mathematical problems;
- Producing business-level presentation graphics/slides;
- Building and deploying websites using web technologies.

CONTRIBUTION OF MODULE TO ACHIEVEMENT AND OTHER CURRICULAR GOALS

The competencies acquired through this module would permit the learner to build and configure applications for solving problems in society, the economy, Social life, Family, and Media and communication.

CONTRIBUTION OF MODULE IN THE AREA OF LEARNING

The module is expected to lead the learner to:

- Build online and offline digital contents;
- Tailor applications for solving specific daily problems;
- Employ current technologies to solve contemporary problems, while acquiring skills to dynamically modify existing applications to solve different problems encountered.

CONTRIBUTION OF MODULE TO THE TEACHING SYLLABUS AND OTHER DOMAINS OF LIFE

The main objective is to encourage the learner to build real applications for solving problems in industry, education, business and other organizations.

TABLE OF MAIN COMPONENTS OF MODULE 5: PRACTICAL PROBLEM SOLVING IN THE DIGITAL WORLD

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
	• Interviewing business persons • Documenting findings	Starting a business	• Identify businesses related to basic skills • Explain customer needs	• E-business • E-commerce	• Study IT success stories (Nji Collins, Arthur Zang, Mark Zuckerberg, Bill Gates, Steve Jobs, Jack Mah,) • Study IT success stories (Google, Apple, Amazon) • Detect community needs that can be solved with IT.	• Communicative • Friendly • Knowledgeable • Conversational	- Role play - Real life scenarios (Sample interviews) - Video Projector	
Project	Organizing, planning, running and evaluating projects	Applying project management fundamentals to run sample projects	• Describe benefits of Project Management (PM); • Describe the activities of each stage (planning, executing, …) in project management; • Describe techniques used to control and facilitate the	• Projects; • Project Management; • Stages in project management; • WBS;	• Propose a WBS (Work Break-Down Structure) for a given project; • Produce scheduling tool (PERT network, Gantt chart) for a project; • Outline activities for the	Team spirit Communicative Creative Ethical reasoning	Computer laboratory Online resources(Photographs and videos	8H

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Management			success of a project; ● Explain PM constraints (Scope, Time, cost); ● Identify the roles, responsibilities and performance of members of a project team; ● Carry out basic calculations using PERT, Gantt charts and network charts; ● Outline key factors that cause project failure.	● Gantt charts; ● PERT charts; ● critical path analysis; ● Slack; ● Network diagrams; ● EF, LF, ES, LS; ● Team Management;	planning stage of a project. ● Work with methods of controlling projects (tracking, check points … ; ● Implement a simple project; ● Determine the duration of a project using a Gantt chart. ● Compute the duration of a project using network diagram; ● Calculate ES, EF, LT, and LF; ● Determine slack task, critical path.	Prudence Self-discipline Passion for technology Accurate and rapid writing Vigilant observant	of computer types) Human resources Links: YouTube Google Sample hardware devices charts	
Practical use of application software for solving problems	Producing documents for official, business and other daily uses Tailoring spreadsheets to solve specific problems ... Carrying out multimedia presentation Managing relational databases	Using formatting, editing features of Word processors for producing documents	● Select a word processor; ● Explain the main features of a word processor; ● apply features of the Word processor, to produce different types of documents.	● Word processor; ● Editing; ● graphics; ● formatting; ● Design; ● Mailings and reviews.	● Format (bold, underline, subscript, etc.) text with a word processor; ● Insert graphics and other objects; ● Produce tables; ● produce page covers; ● Produce long documents such that the table of content can be generated; ● Apply review features (proofing, commenting, etc.);			6H
		● Carrying out statistical, financial etc. analysis, calculations and projections for education, businesses	● Select a spreadsheet application; ● Explain the main features of a spreadsheet; ● utilize features of a spreadsheet application; ● Explain how to link worksheets with formulae.	● Spreadsheets; ● cell reference; ● cell range; ● formulae; ● absolute cell reference; ● what-if-analysis; ● Charts; ● Reports; ● Pie chart; ● Histogram.	● reference a range of cells; ● add or remove rows and columns; ● format cell entries; ● Format cells (adjust size, wrap text, bold, apply style, conditional formatting, ...) ; ● Do financial and statistical analysis using spreadsheet functions (sum, count, product, if, sumif, countif, sumproduct, vlookup, ...) ; ● Produce charts of relation between two or more categories ; ● Link worksheets with formulae; ● Determine the appropriate spreadsheet formulae for a given problem;			8H

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Family of life situations	**Examples of life situations**	**Category of actions**	**Examples of actions**	**Core knowledge**	**Skills**	**Attitudes**	**Other resources**	**Duration**
Discovering and making	Designing and manufacturing using the	Producing slides that display illustrative and attractive presentations	• Explain practices of good presentation; • Describe main features of a presentation software; • Select a presentation software; • Create slides (Slide-design); • Use features of a presentation software to create illustrative and attention grabbing presentations.	• Slides; • Slide-transitions; • Animations;	• Add slides to a presentation; • Produce multimedia contents using editing, formatting and multimedia features of a presentation software; • Add transitions to a presentation; • Animate components of a presentation; • Apply project management to run a presentation project.			8H
		Collecting Organizing, storing and securing data to be accessed in various ways for particular use.	• Recall main features of an RDBMS; • Demonstrate user skill in the use of a relational DBMS(MS Access or Open/Libre Office Base) ; • Use structured query language (SQL).	• RDBMS; • Tables; • Queries; • Forms; • Reports.	• create tables; • Enter data into a table; • relate tables; • create queries to retrieve data ; • Create queries to generate a calculated field; • generate reports; • create forms; • export a database; • import a database; • write SQL statements to populate a database; • write SQL statements to retrieve data from one or many tables; • write sub queries; • Apply project management to run a database project;			12H
		Using databases for web authoring	• Describe the general process of publishing a database online; • Manipulate databases in a web server (Xampp, Wamp) • Link a database to a webpage using basic PHP code;	• PHP; • MySQL; • HTML.	• Create php/mysql code that stores login and password in a database; • Publish a database on the internet ; • Apply project management concepts on a web project involving database.			6H
		Using Cloud computing	• Describe cloud computing • State characteristics of cloud computing	• Cloud computing; • SaaS, IaaS,	• Outline problems that can be solved by cloud computing. • determine cloud computing			5H

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use of innovations in digital technology	computer Storage of Data on the internet Green computing		• Describe cloud computing delivery models	PaaS; • Google drive; • I cloud; • Drop box, …	model used in a given service; • store data on the cloud; • retrieve data from the cloud; • Outline examples of cloud storage services.			
		Environmental friendly usage and disposal of computer systems	• Define green computing; • Describe practices that promote green computing (Usage disposal, eco-friendly)	• Green computing;	• Assess practices that do not promote green computing; • Use of computer systems in an environmentally responsible and eco- friendly manner; • Identify projects that exhibit green computing; • Execute projects that exhibit green computing.			4H
		Implementing programming concepts Using IDEs for building applications that run on the .NET framework or applications that run on Java runtime.	• Select an appropriate IDE; • Identify relative advantages and disadvantages of an IDE; • Explain the concepts of classes, objects, inheritance, polymorphism, … • Explain functions and parameter passing; • Use programming language to solve a real-life problems; • Build applications that provide solutions to real life problems.	• .NET framework; • Java runtime • object oriented programming;	• Write programs using an object oriented programming language; • Run an object oriented program using an IDE.			16H

Mini Projects

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category action**	**Example of action**	**Core knowledge**	**Skills**	**Attitude**	**Other resources**	**Duration**
Exploring Computer systems	**S**electing a computer system to buy following up trends in technological	**DESCRIPTION OF COMPUTING TRENDS**	The 5-G computers (2010-date) is geared towards creating machines which can process and respond to natural languages and also have the capability to learn and organize themselves. Make a presentation of the technologies that make this possible, and how they work.	Vacuum Tubes Transistors Integrated circuits Artificial	Presentations on 5-G technologies like parallel processing , superconductors, quantum computers, molecular and Nano technology	Team spirit Communicative Creative	Search engine e.g. Google youtube other educative links	

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category action**	**Example of action**	**Core knowledge**	**Skills**	**Attitude**	**Other resources**	**Duration**
	development		Explain the properties of each generation's technology, that have changed how computers operate, leading to more powerful, less expensive but more efficient and robust machines.	Intelligence		Ethical reasoning Prudence Self-discipline Passion for technology Accurate and rapid writing Vigilant observant		
Exploring Computer Systems	Exploring user interfaces	**CONFIGURING USER ENVIRONMENT AND MANAGING FILES**	Research and propose hardware and software for use by different category of computer users. The category of a user is based on their particular disability or special needs.	User disabilities ASR, Braille Ergonomic devices	Identify disabilities Propose hardware and software for each disability of the user propose creative ideas on innovations to help users with disability Carry out report on findings		Search engine e.g. Google YouTube other educative links	
Exploring Computer Systems	Solving problems encountered in the course of **using hardwae and software**	**TROUBLE SHOOTING AND MAINTAINING HARDWRARE AND SOFTWARE**	Repair a computer system to check issues related to hardware failure, corrupt OS, software malfunction, and malware action. A laboratory (or home computer) needs an upgrade given that it currently does not allow one to carry out the following tasks with it: Install and use software packages made in 2016 onwards, produce high definition graphics (video and images), produce and edit quality sound and video, install and use high speed internet, run multiple programs at the same time, run applications at a very high speed Propose (or carry out) an upgrade to the computer system, stating which component is changed , added or	System restore Malware, Security Defragmentation Disk scanners File compressors Firewalls BIOS setup RAM , HDD CPU, OS Input and output devices	Repair computers with problems such as freezing, not booting, low memory, slow to run, crashing programs, and other identifiable faults. State the tools used in solving each of the above problems Write a report on which tool was used and how it was used to solve the particular problem Upgrade computers from obsolete or lower		Search engine e.g. Google youtube other educative links	

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Family of life situations	**Examples of life situations**	**Category action**	**Example of action**	**Core knowledge**	**Skills**	**Attitude**	**Other resources**	**Duration**
			subtracted and explaining why this is done, for each of the components. Identify the properties of the new components in relation to the old ones. Identify projects or activities that can be carried out with the use of the computer system, and the minimum hardware or software requirement specification for each project or activity.		version to up-to-date standards. Configure them to run High definition software and peripherals Replace old hardware and software with new ones Write a report on the components changed and what difference this makes. Include in the report the properties of old and new system components	Team spirit Communicative Creative Ethical reasoning Prudence Self-discipline		
Exploring Computer systems	Researching on hardware and software vendors and their products	**1.10 CHOOSING CATEGORY OF COMPUTERS FOR USE, BASED ON THE QUALITY OF THEIR PRODUCTS AND SERVICES**	Identify four different manufacturers of Personal Computers(PC). Carryout a comparative analyses of their products and services	DELL Compaq HP LG Samsung Apple	In tabular form, write the differences between system manufacturers and their products by considering properties such as speed, durability, cost, reliability, availability in your own area, user friendliness, after sales services, maintainability and other properties necessary for consideration	Passion for technology Accurate and rapid writing Vigilant	Computers Phones Search engine e.g. Google YouTube other educative links	
Determining the range and scope of computer applications	Mobilizing resources to establish an IS Proposing digital	**2.1.2 USING INFORMATION SYSTEM IN AN ORGANIZATIO N**	Study the work system of a bank, a school and at least three other institutions. Describe what each institution does, stating the actors that are involved, the procedures and the available machines or technology at	MIS TPS EIS DSS	Describe works procedures or systems in the organization being studied. Identify the actors involved and the role	observant	Computers Phones Search engine e.g. Google	

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category action**	**Example of action**	**Core knowledge**	**Skills**	**Attitude**	**Other resources**	**Duration**
	solutions to a variety of real life problems		each institution. Propose an information system for each, taking note of the people(actors), procedures(methods of work) and machines(or technology) that will enhance ease of work, security, speed of work, teleworking, management, reporting, analysis and other transactions. Identify other specific problems the IS will solve. Identify issues or operations to guard against in order to avoid the failure of such a system for each of the organizations	ES Simulations systems GIS LIS Videoconferencing Telecommuting physical protection Passwords Firewalls Bio security Training of workers	they play. Propose the kind of system or systems that can facilitate their current work procedures Explain how each of your proposed IS solves problems in the work procedures and for actors in their organization. Identify risks and propose measures on what to do and what not to do, to avoid failure of the IS Report on activities carried out and proposed system changes.		YouTube other educative links	
Determining the range and scope of computer applications	Responsible use of computer systems Protecting computer systems from insecurity	**CREATING AWARENESS ON THE SOCIAL, LEGAL, ETHICAL AND ECONOMIC IMPLICATIONS OF USING COMPUTERS**	Organize an open presentation (in school, market, organization) on the importance of computerized systems, computer crime and prevention, measures for responsible use of computer systems, the legislation in place, safe working practices, codes of ethics recommended. Advice on measures to reduce the digital gap	AGM BCS IEEE Hacking Dumpster Diving Scamming Malware Phishing Theft	Identify computer crimes and prevention methods Describe issues addressed by existing standard codes of ethics and conduct(BCS, ACM, IEEE) Identify any other existing code of ethics on the use of computer systems, for some organizations Propose measures to	Team spirit Communicative Creative Ethical	Computers Phones Search engine e.g. Google YouTube other educative links	

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				Cyber crime Cyber security	reduce digital gap Produce a report on the above presentation	reasoning		
Exploring concepts and features of networks	Setting up networks sharing resources on a network	**INITIATION TO NETWORKING**	Using a simulation program for setting up networks(e.g. CISCO Packet Tracer), design network set-ups for a star topology, ring topology, bus topology and a simple mesh topology for a minimum of 5 computing nodes, but not exceeding 10 computing nodes(for this level). Setup connections between two or more mobile devices, for sharing files. Use a connection method of your choice to setup a least two users to play the same game , with each user accessing the same copy of the game from their different mobile devices. A clear report on protocols and other tools used should be produced	Protocols TCP/IP Network typologies Network sizes Client/server and peer-to-peer Bridges, Routers Switches Gateways Modems Computer peripherals Classes of IP addresses	Install and run a simulation software for setting up networks Create a Ring topology, bus topology, star topology and mesh topology for a minimum of 5 nodes Setup an online game to be played by two or more users from different devices. Produce a clear report on protocols, procedures, tools used and difficulties encountered . .	Prudence Self-discipline Passion for technology Accurate and rapid writing Vigilant observant	browser Computers Phones Search engine e.g. Google youtube other educative links	
Web Development	Build simple web pages Apply common technologies for web building	**BUILDING AND HOSTING WEBSITES**	Build and (if possible) host (online or on a local server) a website which makes use of the following technologies: HTML, CSS, JavaScript, PHP. Your website should make use of font tags, form tags, div tags, anchor tags, table tags, style tags, image and video tags, and at least 10 other tags. Apply attributes that go with each of the	Internet Browsers HTML CSS	Write HTML code to build a school website Use CSS in the code, for styling or formatting Use JavaScript for animating objects on website Use basic PHP for connecting website to a		Browser Computers Phones Search engine e.g. Google youtube	

Contextual framework		Competencies		Resources				
Family of life situations	**Examples of life situations**	**Category action**	**Example of action**	**Core knowledge**	**Skills**	**Attitude**	**Other resources**	**Duration**
			tags used above. Create links between two or more pages using menus. Your website should be dynamic and interactive	JavaScript PHP RDBMS	database Write a report on the codes used.		other educative links	
Practical use of application software for solving problems	**U**sing spreadsheet features for accounting, statistical, analytical purposes	**5.2.1 TAILORING SPREADSHEETS TO SOLVE SPECIFIC PROBLEMS**	Study the report booklet or the manual recording system of students' performance (report card) of your school. Implement a mark or performance processing system for a school using a spreadsheet. The system receives marks for various subjects taught in a particular class and presents all the information as found on the manual report card. It then outputs a chart showing average of each student against the name for each class. It carries a table which reports on the number of students who sat in the exam per class, number who passed, number who failed, number dismissed, best three students, and worst three students. The system should display report cards for first term, second term and third term.	Statistical functions Database functions Date and time functions Financial functions Logical functions Mathematical functions Text functions	Create a Report Card management system using a spreadsheet Enter marks for each subject for a number of students Print the Report Cards bearing the rubrics found on the manual report card.	Team spirit Communicative Creative Ethical reasoning Prudence Self-discipline Passion for technology Accurate and rapid writing Vigilant	Computers Phones Search engine e.g. Google YouTube other educative links	
Discovering and making use of innovation in digital	Using features of objectoriented programming	**BUILDING SIMPLE PROGRAMS FOR SOLVING DAILY**	Using a programming language of your choice(preferably an Object oriented language), build a stock management system for a grocery store. The system should consist of different user	OOP Encapsulation	Use UML or another method to design an application for managing stock for a	observant Team spirit	Computers Phones	

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Family of life situations	**Examples of life situations**	**Category action**	**Example of action**	**Core knowledge**	**Skills**	**Attitude**	**Other resources**	**Duration**
technology	and other technologies for building applications	**PROBLEMS**	accounts, invoice and inventory functionalities and carryout other operations as found in a typical stock control system .	Inheritance Polymorphism	grocery store. Implement the program using a particular programming language(preferably an object oriented programming language) Write a report on what the system does, how it solves the problem of stock management, the design and the code used in building the system.	Communicative Creative Ethical reasoning Prudence Self-discipline Passion for technology Accurate and rapid writing Vigilant observant	Search engine e.g. Google YouTube other educative links	