REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

REPUBLIC OF CAMEROON
Peace – Work - Fatherland

MINISTERE DES ENSEIGNEMENTS SECONDAIRES
MINISTRY OF SECONDARY EDUCATION

INSPECTION GENERALE DES ENSEIGNEMENTS
INSPECTORATE GENERAL OF EDUCATION

PHYSICS TEACHING SYLLABUS

Forms 3, 4 and 5







Observer son environnement pour mieux orienter ses choix de formation et réussir sa vie

INSPECTION DE PEDAGOGIE CHARGEE DE L'ENSEIGNEMENT DES SCIENCES
INSPECTORATE OF PEDAGOGY IN CHARGE OF SCIENCES

Décembre 2014

REPUBLIQUE DU CAMEROUN
Paix - Travail – Patrie

MINISTERE DES ENSEIGNEMENTS SECONDAIRES

INSPECTION GENERALE DES ENSEIGNEMENTS

REPUBLIC OF CAMEROON
Peace -Work – Fatherland

MINISTRY OF SECONDARY EDUCATION

INSPECTORATE GENERAL OF EDUCATION

Order N° 419/14 /MINESEC/ IGE ..... - 9 DEC 2014

To outline the syllabuses for Form III, Form IV and Form V of Secondary General Education.

THE MINISTER OF SECONDARY EDUCATION,

Mindful of the Constitution;
Mindful of the Law N° 98/004 of 14 April 1998 to lay down Guidelines for Education in Cameroon;
Mindful of Decree N°2011/408 of 9 December 2011 to reorganise the Government;
Mindful of Decree N°2011/410 of 9 December 2011 to form the Government;
Mindful of Decree N°2012/267 of 11 June 2012 to organise the Ministry of Secondary Education;

HEREBY ORDERS AS FOLLOWS:

Article 1: The syllabuses for Form III, Form IV and Form V of Secondary General Education shall be outlined as follows:

PREFACE

SYLLABUSES FOR 21ST CENTURY CAMEROON

At the beginning of this millennium, as Cameroon chooses to become an emerging nation by the year 2035, its secondary education sector faces many challenges. It should:

- Offer quality training and education to most young Cameroonians within a context marked by large classes in primary education;
- Prepare them for smooth insertion into a more demanding job market worldwide, through a pertinent teaching /learning process.

In addition, training tools have significantly evolved in their conception and implementation. A school that was mostly based on contextualised knowledge acquisition has given room, all over the world, for a school that aims at empowering learners to help them cope with complex and diversified real life situations. Instead of a school cut off from society, we now have a school deeply rooted in a society that takes into account sustainable development, local knowledge and cultures.

The implementation of this new school ,prescribed by the Law to lay down guidelines for education in Cameroon, and the necessity for socio-professional insertion require the adoption of a pedagogic paradigm for the development of syllabuses relating to **"The competence based approach with an entry through real life situations ".**

In this perspective, new syllabuses for Secondary General Education, those of Teacher Education and Training Referentials for Technical Education are part of this great change for the re-dynamisation of our education system. They are in line with the implementation of the provisions of Growth and Employment Strategy Paper (DSCE) which, by the year 2020, specifies the minimum amount of knowledge which each Cameroonian is supposed to possess by the time they leave the first cycle of secondary education.

These syllabuses define essential competencies that should be acquired by learners within the first cycle of secondary education, in terms of knowledge, know how and attitudes. They equally define the framework that will enable teachers to organise their pedagogic activities.

While congratulating all those who designed these syllabuses, I hereby exhort all the members of the education family, notably teachers, to acquaint themselves with the new paradigm, to effectively implement it and make the Cameroon education system successful.

The Minister of Secondary Education

Louis Bapes Bapes

FIRST CYCLE SYLLABUS REVIEW

A PARTICIPATORY AND INNOVATIVE APPROACH

The syllabuses that were drawn up by the Inspectorate General of Education in the Ministry of Secondary Education since 2012 are in accordance with the major guidelines for education in general and secondary education in particular as they are enshrined both in the 1998 law to lay down guidelines for education in Cameroon and in the 2009 Growth and Employment Strategy Paper(DSCE) .

These orientations could be summarised, amongst others, to train within the framework of an emerging Cameroon in the year 2035, citizens that will have a good mastery of the two official languages (English and French), deeply rooted in their cultures but open to a world in search for sustainable development and dominated by Information and Communication Technologies.

Conceived in the various Inspectorates of Pedagogy, and later introduced for trialling in secondary and high schools during the 2012/2013 school year, these syllabuses were developed with the contributions of classroom teachers and teacher trade unionists.

The new syllabuses had to undergo many changes:

- a shift from a skill based approach to a competence based approach through real life situations;
- a shift from a school cut off from society to one that prepares citizens for a smooth insertion into socio-cultural and economic activities ;
- a shift from an evaluation of knowledge to that of competences necessary to sustainable development.

When these new changes and orientations were taken into account, they naturally led to a shift of paradigm within the curriculum reform process. The option we have adopted is the competence based approach through real life situations.

The syllabuses of the first cycle of Secondary General Education are broken down into 5 areas of learning, each of them containing a given number of disciplines as shown in the table below.

Areas of learning	**Disciplines**
1- Languages and Literature	- French - English - Living Languages II - Ancient Languages - Literature(in English and in French)
2- Science and Technology	- Mathematics - The Sciences(Physics, Chemistry, Technology, Life and Earth Sciences) - Computer Science
3- Social Sciences/Humanities	- History - Geography - Citizenship Education
4- Personal Development	- Sports and Physical Education - Manual Labour
5- Arts and National Cultures	- National Languages - National Cultures - Arts

For 6e and 5e (Francophone sub -system of education), the weekly workload and the quota as compared to the total number of hours on the time table (32 h) are displayed in the table below.

Domaines d'apprentissage	Volume horaire	Quota
Langues et Littératures	10 h	30%
Sciences et Technologies	08 h	25%
Sciences Humaines	06 h	20%
Arts et Cultures Nationales	04 h	15%
Développement Personnel	03 h	10%

One hour is allotted for preps.

For the Anglophone sub-system of education (Form I and Form II) the same information is summarised in the table below.

Areas of Learning	Weekly workload	Quota
Languages and Literature	10 h	30%
Science and Technology	08 h	25%
Social Sciences	06 h	20%
Arts and National Cultures	04 h	15%
Personal Development	03 h	10%

The Inspector General of Education

Dr. Mrs Evelyne Mpoudi Ngolle

3

END - OF - FIRST CYCLE LEARNER'S EXIT PROFILE

The first cycle of Secondary General Education admits young graduates from primary schools aged between ten and fourteen. Its general objectives are not only to build intellectual, civic and moral skills in these children but also competences and fundamental knowledge which will either enable them to foster their education in the second cycle, or to prepare them for a smooth insertion into the job market after professional training.

Thus, within the framework of these new syllabuses, the learner is expected , after the first cycle of secondary education, to be able to use his/her competences to solve problems through family of situations relating to domains of life as indicated in the table below:

N°	**Domains/Areas of life**	**Families of situations to be treated in the 1st cycle**
1	Family and social life	• Participation in family life • Healthy professional relationships • Social integration
2	Economic life	• Discovery of income generating activities • Discovery of the job market, social roles, jobs and professions • Self confidence, aspirations, talents, self potential • Practising healthy eating habits
3	Environment , health and well being	• Preservation of the Environment • Quest for a healthy life style • Choosing and practising a healthy life style
4	Citizenship	• Mastery of rules and regulations governing the Cameroonian society • Discovery of cultural values and customs of the Cameroonian society
5	Media and Communications	• Discovery of the media world • Discovery of Information and Communication Technologies

In order to achieve these objectives, the learner should be able to mobilise , within the various disciplines and constructive areas of learning of the syllabuses, all the pertinent resources in terms of knowledge, know how and attitudes.

The next table gives you a general overview of the afore-mentioned objectives, while the syllabus for each subject unfolds, in details, all the expected competences per level and at the end of the 1st cycle.

Areas of Learning	**Disciplines**	**Expected outcomes at the end of the 1st cycles**
1-Languages and Literature	**Living languages:** English, French , German, Italian, Spanish, Chinese, Etc.	**French and English , L1** Receptive skills: reading and listening Read in an autonomous way, different types of texts related to areas of life as defined in the syllabus; Listen and understand various texts related to the above mentioned areas of life Productive skills: speaking and writing Produce various types of texts , of average length related to these areas of life; Language tools: appropriate use of various language tools in order to produce and read types of texts related to that level;
	English to Francophone learners French to Anglophone learners	Communicate accurately and fluently using all four basic skills in language learning; Be able to transfer knowledge learnt in class to real life situations out of the classroom; Be able to cope and survive in problem solving situations;
		Living languages II Receptive skills: reading and listening Read and understand simple texts on social life, citizenship, the environment, well being and health, media etc.. Listen and get oral information in order to simply interact during communication situations related the various domains of life. Productive skills: speaking and writing

		Sing, recite, dramatise , orally answer questions related to the various domains of life as defined in the syllabus; Write short passages on various familiar topics.
	Ancient languages: Latin, Greek **National languages** **Literature** Cameroon Literature; French Literature; Francophone Literature; Other literatures	Develop general knowledge through ancient languages and cultures; know the origins of the French language for linguistic mastery; Carry out elementary tasks in translation.
2-Science and Technology	Mathematics, The Sciences Computer Science	Use mathematic knowledge skills and values with confidence to solve real life problems within the different domains of life; Communicate concisely and unambiguously and develop power of mathematical reasoning (logical thinking, accuracy and spatial awareness).
		The Sciences: Acquire the fundamentals of sciences in order to understand the functioning of the human body, the living world, the earth and the environment; Acquire methods and knowledge to understand and master the functioning of technical objects made by man to satisfy his needs; Demonstrate attitudes to protect his/her health and environment.
		Computer Science : Master the basics of Information and Communication Technologies; Exploit and use ICTs to learn.
3- Social Sciences /Humanities	**History** **Geography** **Citizenship Education**	Possess cultural references to better locate events in time and space within a democratic system and become a responsible citizen. **History:** Acquire a common culture ; be aware of heritage from the past and current challenges; **Geography :** Develop one's curiosity and knowledge of the world;

		Get acquainted with landmarks to find your way and fit in the world. **Citizenship Education:** Possess essential knowledge in rights and duties in order to fulfil his/her citizenship.
4- Personal Development	**Moral Education;** **Home Economics;** **Sports and Physical Education** **Health Education**	Develop his / her physical abilities/skills ; Get ready for physical challenges , save and regain energy after physical efforts; Identify risk factors; possess basic knowledge and principles in hygiene and health education; Demonstrate a sense of self control and appreciate the effect of physical activities. Conceive and draw up sports and cultural animation projects; Acquire methods and develop a high sense of efforts; Conceive, draw up and implement projects that will enable one to project his/her image and feel the well being inspired by self-confidence.
5- Arts and National Cultures	**Arts/Artistic Education;** **National Cultures**	**Artistic Education:** Observe and appreciate works of art; Carry out an artistic activity; Gradually acquire the love for personal expression and creativity; Possess a mastery of creativity in music, plastic arts and the performing arts. Dramatise, recite texts (poems, tales, proverbs, etc.) relating to various areas of society; Practise the different dramatic genres: sketches, comedy, tragedy, drama, etc. **National languages and Cultures** Demonstrate a mastery of Cameroon cultures; Visit the various cultural areas of the country in order to discover their characteristics; Demonstrate a mastery of basic rules in writing Cameroonian languages as well as basic grammatical notions applied to these languages; Demonstrate a mastery of one of the national languages at 3 levels: morpho-syntax, reception and production of simple oral and written texts.
Even though the learners acquires skills in different disciplines, these competences are accompanied by other		

skills known as cross curricular competences related to intellectual, methodological, social and personal areas of learning.		
6- Cross curricular competences	Intellectual and Methodological domains	Solve Problem in a given situation; Use knowledge skills and values with confidence in order to solve real life problems within the different domains of life; With confidence, find useful information to solve problems he/she is faced with; Give his/her opinion ; Support his/her opinion with strong arguments ; Assess him/herself with a view to remediation; Demonstrate basic knowledge in note taking ; Conceive and realise individual projects; Analyse and summarise information, give feedback and report orally or in writing. Develop problem solving approaches; Exploit and use ICTs in his/her activities.
	Social and Personal Domains	Interact positively and assert his/her personality while respecting that of other people; Join team work, fit in a common initiative project /group; Demonstrate interest in cultural activities ; Develop a sense of effort, love for work, perseverance in tasks or activities carried out ; Understand and accept others in intercultural activities; Accept group assessment.

The resources to be mobilised by the learner are found in many disciplines and areas of learning. So it is important to implement these syllabuses not in isolation but as interrelated subjects. These remarks hold both for subject and cross curricular competences. They are so called to show that they should be developed through teaching/learning activities of the different subjects. The development of subject and cross curricular competences concern the entire education family as they are capable of inspiring an educative project and the putting in place of extra curricular activities. The ultimate training goal of these syllabuses, at the end of the first cycle, is to enable the learner to be self reliant, to be able to keep on learning through out his/her life, to contribute to sustainable development and become a responsible citizen.

LEARNING AREA: SCIENCE AND TECHNOLOGY

SUBJECTS: PHYSICS

CLASSES: FORM 3, 4 and 5

ANNUAL HOURS: 63 hours (75 periods per class)

WEEKLY WORKLOAD: 03 periods per week of 50 minutes each

COEFFICIENT: 03

TABLE OF CONTENTS

GENERAL INTRODUCTION

The syllabus is designed for a three year course of physics occupying about 189 hours in all, following introductory courses in science and mathematics done in Form 1 and Form 2. The syllabus should, however, be regarded by teachers as a framework round which to fit their individual courses rather than specifying a list of items to be taught. It is a teaching syllabus and not an end of course examination syllabus. It is hoped that the course will be taught in a spirit of investigation, and it is expected that the student will be involved in practical work/hands-on exercises at every (state) stage.

The purpose of the program of study is to:

- provide a curriculum structure which encourages students to complete secondary education;
- foster the intellectual, social and moral development of students, and in particular developing their:
  - ✓ knowledge, skills, understanding and attitudes in the fields of study they choose
  - ✓ capacity to manage their own learning
  - ✓ desire to continue learning in formal or informal settings after school
  - ✓ capacity to work together with others
  - ✓ respect for the cultural diversity of (the) Cameroonian society;
- provide a flexible structure within which students can prepare for:
  - ✓ further education and training
  - ✓ employment
  - ✓ full and active participation as citizens;
- provide formal assessment and certification of students' achievements;
- provide a context within which schools also have the opportunity to foster students' physical and spiritual development.

Rationale for Physics in the Curriculum

Physics in Form 3 to 5 provides students with a contemporary and coherent understanding of energy, matter, and their interrelationships. It focuses on investigating natural phenomena and then applying patterns, models (including mathematical ones), principles, theories and laws to explain the physical behaviour of the universe. It uses an understanding of simple systems (single particles and pairs of particles) to make predictions about a range of objects from sub-atomic particles to the entire universe and aims to reveal the simplicity underlying complexity.

The study of physics relies on the understanding and application of a small number of basic laws and principles that govern the microscopic and macroscopic worlds. The study of Physics provides students with an understanding of systems that is the basis of the development of technological applications. The interplay between concepts and technological and societal impacts is embodied in the history and philosophy of science and forms a continuum relating our past to our future. Physics Forms 3 to 5 draws upon and builds on the knowledge and understanding, skills and values and attitudes developed in Form 1 and 2. It further develops students' understanding of science as a continually developing body of knowledge, the interdisciplinary nature of science, the role of experiment in deciding between competing theories, the provisional nature of scientific explanations, the complex relationship between evidence and ideas and the impact of science on society.

The study of Physics involves the students working individually and with others in active, practical, field and interactive media experiences that are related to the theoretical concepts considered in the course. It is expected that students studying Physics Form 3 to 5 will apply investigative and problem-solving skills, effectively communicate the theoretical concepts considered in the course and appreciate the contribution that a study of Physics makes to our understanding of the world.

The subject matter of the Physics course recognizes the different needs and interest(s) of students by providing a structure that builds upon the foundations laid earlier yet recognises that students entering the course have a wide range of abilities, circumstances and expectations.

Further, M(m)odern life requires general scientific literacy for every Cameroonian citizen, a requirement that will result in the creation of a scientific culture in line with the country's Growth and Employment Strategy Paper and emergence in 2035. Scientific culture should therefore become the common property of every citizen of this country because it is the antithesis to superstition and the catalyst that will help us toward faster development.

Finally, this syllabus is a conscious effort to raise the level of scientific literacy of all students and equip them with the relevant basic scientific knowledge needed for their own survival and for the development of the country. The study of Physics will also provide excellent opportunities for the development of positive attitudes and values which include:

- curiosity to explore their environment and question what they find;
- keenness to identify and answer questions through investigations;
- creativity in suggesting new and relevant ways to solve problems;
- open-mindedness to accept all knowledge as tentative and to change their view if the evidence is convincing;
- perseverance and patience in pursuing a problem until a satisfying solution is found;
- concern for living things and awareness of the responsibility they have for the quality of the environment;
- honesty, truthfulness and accuracy in recording and reporting scientific information;
- love, respect and appreciation for nature and desire to conserve natural balance.

2 PROFILE TO BE ACQUIRED AT THE END OF THE SOURCE

Be able to:

- explain natural phenomena ;
- meet with the challenges of life, through the use of scientific approach in problem solving;
- manage the environment in a sustainable manner;
- safeguard his/her health and that of all others in his/her surrounding;
- imbibe the scientific method;
- use process skills to acquire knowledge;
- read security notices;
- communicate his/her results effectively and concisely.

3 SCOPE OF CONTENT

The design and teaching of the present **Physics** syllabus is centred on the Competency-Based Approach (CBA) which should begin from the identification of a real life situation or problem and proceed through the definition of the competencies (skills) required to transform, modify or improve the situation to the mobilisation of the appropriate resources necessary for transforming, modifying or improving the situation. This approach ensures the understanding and use of scientific knowledge and methods by involving the learner in the active construction of his/her own knowledge. It equally goes beyond the gathering of scientific knowledge to the application of such knowledge to seek solutions to real life problems in different contexts. This approach is therefore carefully selected to fulfill the prescriptions of the 1998 Educational Policy Framework of Cameroon and the Growth and Employment Strategy Paper which calls for the training of a citizen who is autonomous, self-reliant and imbued with the appropriate tools to face the challenges of a rapidly changing socio-economic and technological world. The content covers the basic **Physi**cs and includes topics in Health, Agriculture and Industry. The course has been designed to offer a body of knowledge and skills to meet the requirements of everyday living, and provide adequate foundation for those who want to pursue further education and training in Physics and Physics related vocations.

Practical experiences are an essential component of the course. Students will complete (63) hours of study per year for three years including, practical/field work during the course.

Practical experiences should emphasize hands-on activities, including:

- undertaking laboratory experiments, including the use of appropriate computer based and digital technologies;
- field work;
- research using a wide range of sources, including print material, the Internet and digital technologies;
- using and reorganising secondary data;
- extracting and reorganising information in the form of flow charts, tables, graphs, diagrams, prose and keys;
- the use of animation, video and film resources that can be used to capture/obtain information not available in other forms.

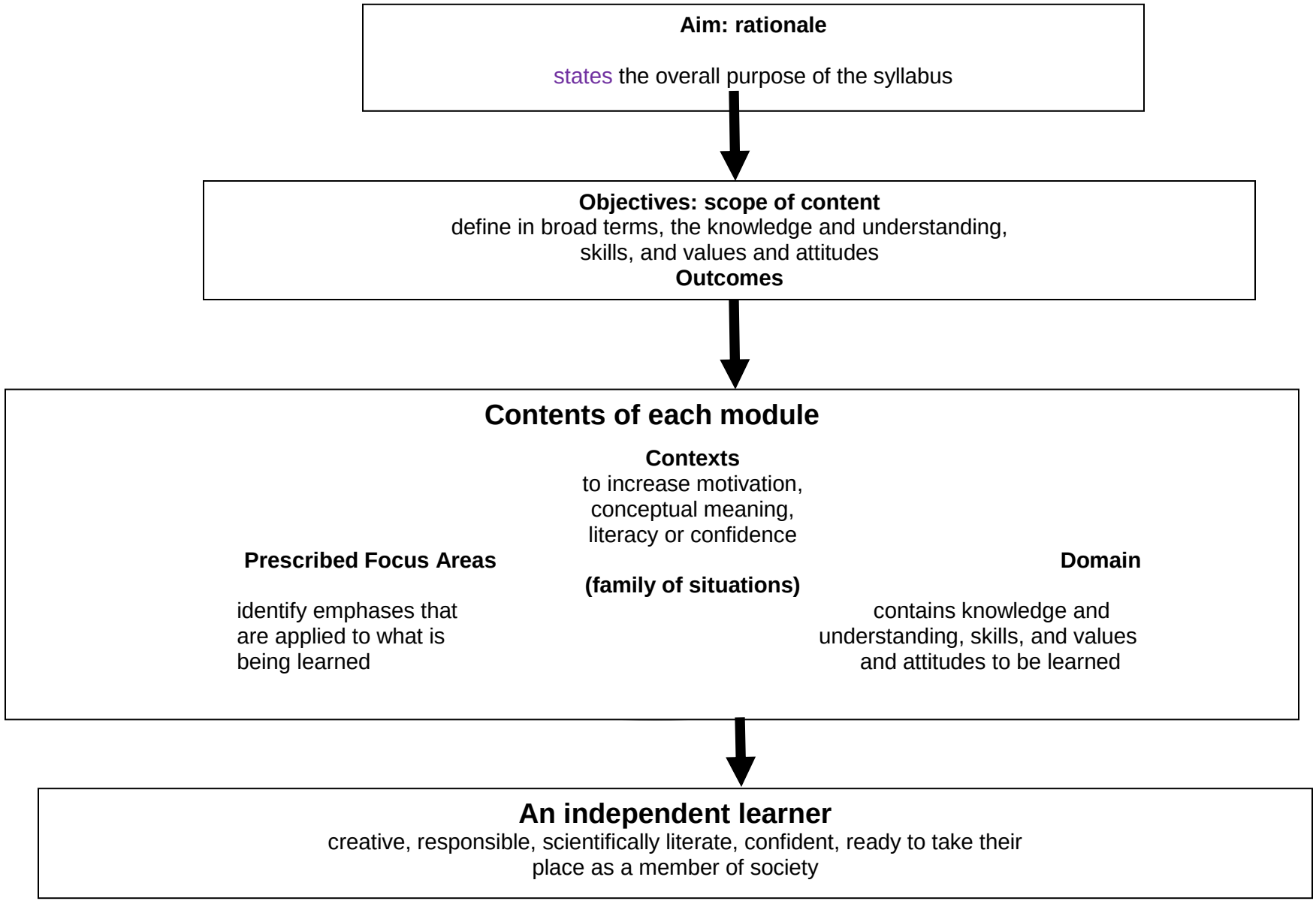
The course will be presented in four modules per class.

Another feature of the syllabus is the *Spiral Approach*. This is characterized by revisiting concepts and skills at different levels with increasing degrees of depth at each stage. The spiral approach has the benefit of matching scientific concepts and skills to students' cognitive development. It therefore helps students to build a gradual mastery of scientific skills.

The titles of the modules may not be the same for each class level. However, the knowledge, understanding as well as the activities and range of process skills presented have been extended at the different class levels.

3.1 Overview

The following diagram summarises the relationship between the various elements of the course:



4 Context through which the syllabus is taught.

Contexts are frameworks devised to assist students to make meaning of the Prescribed Focus Areas and Domain (family of situations). Contexts are culturally bound and therefore communicate meanings that are culturally shaped or defined. Contexts draw on the framework of society in all aspects of everyday life. The contexts for each module encourage students to recognise and use their current understanding to further develop and apply more specialised scientific understanding and knowledge.

Prescribed Focus Areas (family of situations)

The Prescribed Focus Areas are different curriculum emphases or purposes designed to increase students' understanding of Physics as an ever-developing body of knowledge, the provisional nature of scientific explanations in Physics, the complex relationship between evidence and ideas in Physics and the impact of Physics on society.

The following Prescribed Focus Areas are developed in this syllabus:

History of Physics

An understanding /knowledge of the historical background of Physics is important to adequately understand natural phenomena and explain the applications of those phenomena in current technologies. Students should develop knowledge of:

• the developmental nature of our understanding of energy, matter and their interrelationships;
• the part that an understanding of energy, matter and their interrelationships plays in shaping society;
• how our understanding of energy, matter and their interrelationships is influenced by society.

Nature and practice of Physics

A study of Physics should enable students to participate in scientific activities and develop knowledge of the practice of Physics. Students should develop knowledge of the provisional nature of physical explanations and the complex relationship between:

• existing physical views and the evidence supporting these;
• the process and methods of exploring, generating, testing and relating ideas;
• the stimulation provided by technological advances and constraints imposed on understanding in Physics by the limitations of current technology that necessitates the development of the required technology and technological advances.

Applications and uses of Physics

Setting the study of Physics into broader contexts allows students to deal with real problems and applications.

The study of Physics should increase students' knowledge of:

• the relevance, usefulness and applicability of laws and principles related to Physics;
• how increases in our understanding in Physics have led to the development of useful technologies and systems;
• the contributions Physics has made to society, with particular emphasis on Cameroonian achievements.

Implications of Physics for society and the environment

Physics has an impact on our society and the environment, and students need to develop knowledge of the importance of the positive values and practices in relation to these. The study of Physics should enable students to develop:

• understanding about the impact and role of Physics in society and the environment;
• skills in decision-making about issues concerning Physics, society and the environment.

Current issues, research and developments in Physics

Issues and developments related to Physics are more readily known and more information is available to students than ever before. The syllabus should develop students' knowledge of:

• areas currently being researched in Physics;
• career opportunities in Physics and related fields;
• events reported in the media which require an understanding of some aspect of Physics.

Domain

Knowledge and understanding

As one of the major disciplines of science, the Physics course presents a particular way of thinking about the world. It encourages students to use inference, deductive reasoning and creativity. It presumes that the interrelationships within and between matter and energy in the universe occur in consistent patterns that can be understood through careful, systematic study. This course will build upon this fundamental knowledge to increase students' conceptual understanding of systems involving energy, force and motion as well as interactions between these systems and the living and non-living world. The course will assume that students have an elementary knowledge and understanding of energy, motion, electricity and forces.

Skills

The Physics course involves the further development of the skills students have developed in the Form 1 and Form 2 courses through a range of practical experiences.

Practical experiences should be designed to utilise and further develop students' expertise in each of the following skill areas:

• **planning investigations**

This involves increasing students' skills in planning and organising activities, effectively using time and resources, selecting appropriate techniques, materials and equipment to complete activities, establishing priorities between tasks and identifying ways of reducing risks when using laboratory and field equipment.

• **conducting investigations**

This involves increasing students' skills in locating and gathering information for a planned investigation. It includes increasing students' skills in performing first-hand investigations, gathering first-hand data and accessing and collecting information relevant to Physics from secondary sources using a variety of technologies.

• **communicating information and understanding**

This involves increasing students' skills in processing and presenting information. It includes increasing students' skills in speaking, writing and using nonverbal communication, such as diagrams, graphs and symbols to convey physical information and understandings. Throughout the course, students become increasingly efficient and competent in the use of both technical terminology and the form and style required for written and oral communication in Physics.

• **developing scientific thinking and problem-solving techniques**

This involves further increasing students' skills in clarifying issues and problems relevant to Physics, framing a possible problem-solving process, developing creative solutions, anticipating issues that may arise, devising appropriate strategies to deal with those issues and working through the issues in a logical and coherent way.

• **working individually and in teams**

This involves further increasing students' skills in identifying a collective goal, defining and allocating roles and assuming an increasing variety of roles in working as an effective member of a team within the agreed time frame to achieve the goal. Throughout the course, students will be provided with further opportunities to improve their ability to communicate and relate effectively with each other in a team.

Values and attitudes

By reflecting about past, present and future involvement of Physics with society, students are encouraged to develop positive values and informed critical attitudes. These include a responsible regard for both the living and non-living components of the environment, ethical behaviour, a desire for critical evaluation of the consequences of the applications of Physics and recognising their responsibility to conserve, protect and maintain the quality of all environments for future generations. Students are encouraged to develop attitudes on which scientific investigations depend such as curiosity, honesty, flexibility, persistence, critical thinking, willingness to suspend judgement,

tolerance of uncertainty and an acceptance of the provisional status of scientific knowledge. Students need to balance these with commitment, tenacity, a willingness to take risks, make informed judgements and at times, inflexibility. As well as knowing something about Physics, students also need to value and appreciate Physics if they are to become scientifically literate persons.

4.1 COMPETENCIES THAT THE PHYSICS SYLLABUS WOULD DEVELOP IN THE LEARNER

Physics provides the context within which to develop general competencies considered essential for the acquisition of effective, higher-order thinking skills necessary for further education, work and everyday life.
Competencies are embedded in the *Physics Syllabus* to enhance student learning and are explicit in the objectives and outcomes of the syllabus. The competencies of ***collecting, analysing and organizing information*** and ***communicating ideas and information*** reflect core processes of scientific inquiry and the skills identified in the syllabus assist students to continue to develop their expertise in these areas. Students work as individuals and as members of groups to conduct investigations and, through this, the competencies, ***planning and organising activities*** and ***working with others and in teams***, are developed. During investigations, students use appropriate information technologies and so develop the competency of ***using technology***. The exploration of issues and investigation of problems contributes towards students' development of the competency ***solving problems***. Finally, when students analyse statistical evidence, apply mathematical concepts to assist analysis of data and information and construct tables and graphs, they are developing the competency ***using mathematical ideas and techniques.***

PHYSICS SKILLS

During the course, it is expected that students will further develop skills in planning and conducting investigations, communicating information and understanding, scientific thinking and problem solving and working individually and in teams. Each module specifies content through which skill outcomes can be achieved. Teachers should develop activities based on that content to provide students with opportunities to develop the full range of skills.

Course Outcomes	**Content**
A student: . identifies and implements improvements to investigation plans	**Students:** **Identify data sources to:** a) analyse complex problems to determine appropriate ways in which each aspect may be researched b) determine the type of data that needs to be collected and explain the qualitative or quantitative analysis that will be required for this data to be useful c) identify the orders of magnitude that will be appropriate and the uncertainty that may be present in the measurement of data d) identify and use correct units for data that will be collected e) recommend the use of an appropriate technology or strategy for data collection or information gathering that will assist efficient future analysis
	Students: **Plan first-hand investigations to:** a) demonstrate the use of the terms 'dependent' and 'independent' to describe variables involved in the investigation b) identify variables that need to be kept constant, develop strategies to ensure that these variables are kept constant, and demonstrate the use of a control

	c) design investigations that allow valid and reliable data and information to be collected d) describe and carry out trial procedures to undertake investigations and explain why a procedure, a sequence of procedures or the repetition of procedures is appropriate e) predict possible issues that may arise during the course of an investigation and identify strategies to address these issues if necessary
	Students: **Choose equipment or resources by:** a) identifying and/or setting up the most appropriate equipment or combination of equipment needed to undertake the investigation b) carrying out a risk assessment of intended experimental procedures and identifying and addressing potential hazards c) identifying technology that could be used during investigations and determining its suitability and effectiveness for its potential role in the procedure or investigation d) recognising the difference between destructive and non-destructive testing of material and analysing potentially different results from these two procedures
A student: Discusses the validity and reliability of data gathered from first-hand investigations and secondary sources	*Students:* **Perform first-hand investigations by:** a) carrying out the planned procedure, recognising where and when modifications are needed and analysing the effect of these adjustments b) efficiently undertaking the planned procedure to minimise hazards and wastage of resources c) disposing carefully and safely of any waste materials produced during the investigation d) identifying and using safe work practices during investigations
	Students: **Gather first-hand information by:** a) using appropriate data collection techniques, employing appropriate technologies, including data loggers and sensors b) measuring, observing and recording results in accessible and recognisable forms, carrying out repeat trials as appropriate
	Students: **Gather information from secondary sources by:** a) accessing information from a range of resources, including popular scientific journals, digital technologies and the Internet b) practising efficient data collection techniques to identify useful information in secondary sources c) extracting information from numerical data in graphs and tables as well as from written and spoken material in all its forms d) summarising and collating information from a range of resources

	Students: **process information to:** a) assess the accuracy of any measurements and calculations and the relative importance of the data and information gathered b) identify and apply appropriate mathematical formulae and concepts c) best illustrate trends and patterns by selecting and using appropriate methods, including computer assisted analysis d) evaluate the validity of first-hand and secondary information and data in relation to the area of investigation e) assess the reliability of first-hand and secondary information and data by considering information from various sources f) assess the accuracy of scientific information presented in mass media by comparison with similar information presented in scientific journals
A student: Identifies appropriate terminology and reporting styles to communicate information and understanding in physics	*Students:* **Present information by:** a) selecting and using appropriate text types or combinations thereof, for oral and written presentations b) selecting and using appropriate media to present data and information c) selecting and using appropriate methods to acknowledge sources of information d) using symbols and formulae to express relationships and using appropriate units for physical quantities e) using a variety of pictorial representations to show relationships and present information clearly and succinctly f) selecting and drawing appropriate graphs to convey information and relationships clearly and accurately g) identifying situations where use of a curve of best fit is appropriate to present graphical information
A student: Draws valid conclusions from gathered data and information	Students: **Analyse information to:** a) identify trends, patterns and relationships as well as contradictions in data and information b) justify inferences and conclusions c) identify and explain how data supports or refutes an hypothesis, a prediction or a proposed solution to a problem d) predict outcomes and generate plausible explanations related to the observations e) make and justify generalisations f) use models, including mathematical ones, to explain phenomena and/or make predictions g) use cause and effect relationships to explain phenomena h) identify examples of the interconnectedness of ideas or scientific principles

	Students: **Solve problems by:** a) identifying and explaining the nature of a problem b) describing and selecting from different strategies, those which could be used to solve a problem c) using identified strategies to develop a range of possible solutions to a particular problem d) evaluating the appropriateness of different strategies for solving an identified problem
	Use available evidence to: a) design and produce creative solutions to problems b) propose ideas that demonstrate coherence and logical progression and include correct use of scientific principles and ideas c) apply critical thinking in the consideration of predictions, hypotheses and the results of investigations d) formulate cause and effect relationships

When the above would have been achieved the competencies and skills treated in Form 1 and Form 2 would have been reinforced namely:

- Personal attributes are the underlying characteristics that are deep and enduring parts of an individual, expressed most of the time. They are one's personal style or personal effectiveness such as feeling, attitudes, self – image, values, motives, habits and traits. These attributes are hidden and it is expected to be uncovered and improved upon in the learner.
- Skills can be observed. They are acquired through practice and experience. This includes the ability to understand and apply procedures to complete specific tasks and respond to inquiries.
- Knowledge is a baseline of information that allows a person to perform from an informed perspective. This information consists of theories, facts and principles. This information may be acquired through formal and/or informal learning and experiences.

PRESENTATION OF THE LEVEL, MODULE AND RELATIVE DURATION OF THE PHYSICS SYLLABUS

CLASS	TITLE OF MODULE	DURATION
Form 3	1 The introduction to Mechanics	12
	2 Matter: Properties and transformation	18
	3 Energy: some applications and uses	25
	4 Technology/Project	8
Form 4 .	1 Energy: Application and Uses.	15
	2 Waves	16
	3 Energy: Electrical energy; applications and uses	24
	4 Technology / Project	8
Form 5	1 Fields	14
	2 Environmental protection: Modern Physics	10
	3 Mechanics.	32
	4 Technology/Project	7--

4.2 PLACE OF THE SYLLABUS IN THE CURRICULUM

This programme would contribute to:

- enabling the learner acquire a scientific and technological culture in doing things;
- enabling the learner acquire the knowledge to explain the laws that govern natural phenomena;
- providing the learner with the ability to utilise technological instruments and tools;
- developing his/her capabilities of observation, integration, creativity and autonomy;
- developing in the learner the skills to seek solutions to daily problems in different contexts (life situations);
- building in the learner the spirit of research and team work;
- developing a positive approach to life.

4.3 CONTRIBUTION OF THE PROGRAMME TO LEARNING

PHYSICS should be the crucible for experimentation; an experimental practice that will enable learners to acquire:

- process skills (observation, investigation, manipulation and problem-solving);
- creative skills;
- critical, inferential and scientific thinking skills; and
- the spirit of autonomy, self-reliance and team work.

5 PRESENTATION OF THE FAMILIES OF SITUATIONS COVERED BY THE PROGRAMME

N°	Module	**FAMILIES OF SITUATIONS**
I	Introduction to mechanics	Basic understanding of physical quantities and scientific measurements.
II	Matter: Properties and transformation	Utilization of products and consumer goods.
III	Energy: some applications and uses	Utilization of energy in daily life. See the relationship between matter and energy.
VI	Technology (Elementary Engineering)	Inaccessibility and the malfunctioning of common tools
V	Fields	Utilization of invisible forces created by stationary and moving things.
VI	Environmental protection	Utilization of Modern Physics to explain the need for radiation control.

5 PRESENTATION OF THE PROGRAMME MATRIX

a) The Matrix

The programme matrix is a table made up of three major columns:

- The first column is the **Contextual Framework** which embodies the *families of situations* and *examples of real life situations* where the knowledge and skills can be applied.
- The second column is the **Competencies,** made up of *categories of actions* and *examples of actions*: These are groups of some actions which are related to the mastery of the competencies expected for each module.
- The third column is the **Resources** and consists of the *essential or core knowledge* which gives all the set of cognitive and affective resources which the learner needs to mobilise to successfully treat a family of situations. It is divided into four components: the *subject content,* the *aptitude* (skills or know-how), *attitudes* to be disposed or displayed as well as *other resources* (material, human, finances, etc.) necessary for the acquisition of the competencies.

The table appears as below.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
Families of Situations	**Examples of Situations**	**Categories of Actions**	**Examples of Actions**	**Content (Core Knowledge)**	**Aptitude (Skills)**	**Attitudes**	**Other Resources**

6 ASSESSMENT OF THE PHYSICS PROGRAMME

The overall goal of this programme is to assess the ability of the learner to integrate scientific knowledge and methods in the different subject areas to seek solutions to real life situations in their local environments and in different contexts.

Assessment will therefore aim to test the knowledge and competencies (skills, abilities) in different areas including the:

- ability to apply scientific knowledge and methods in problem-solving; which should involve the ability to sort, organise, classify and analyse scientific data and information; to interpret phenomena and find solutions to problems;
- ability to explain certain natural occurring phenomena;
- ability to organise material and present ideas in a clear and logical manner;
- ability to handle patterns in scientific knowledge and show critical, imaginative and inferential thinking skills;

Practical skills will be assessed with respect to the:

- use of and care for equipment;
- design and use of experiments;
- quantitative and/or qualitative analyses; (draw simple conclusion(s) from experimental results.)

Integrative skills will be assessed with respect to the ability of the learner to identify locally specific (real life) problems and design projects to solve such problems which should integrate knowledge, skills and methods acquired in this programme.

7- PROFILE TO BE ACQUIRED AT THE END OF THE SOURCE

GENERAL COMPETENCIES	PROCESS SKILLS	SKILLS	ATTITUDES	CONCEPTS
Ability to solve complex problems in similar life situations.	• analyse and synthesis • creativity • sense of observation • accuracy and precision • formulation of hypothesis.	• method of collection and treatment of data. • method if looking for evidence. • inductive method • deductive • modelling	• curiosity • objectivity • autonomy • rigor • initiative • attitude conducive to research • perseverance	• different strategies to resolve problems.
Ability to form new ideas and conceptualise them.	• schematic skill. • establishment of relationship	• graph plotting and analysis.		• principles and justification of over simplification or illimination
Ability to be self reliance.		• application of knowledge.	• autonomy • sense of responsibility • commitment • curiosity	• General culture
Ability to work in groups. Team spirit.	• argumentation (logical arguement) • leadership • Entrepreneurial	• group discussion. • accepting others' opinion	• open spirit • good listener • tolerance • self confidence.	• interrelations
Ability to work honestly in the scientific domain.	• take complete control of tasks placed at his disposal • be precise and accurate.	• applying security norms.	• honesty • integrity	• concepts of ethics and moral.
Ability to communicate results orally and in writing.	• verbal and written expression of new developments • being able to adequately use the second language. • *be good at mathematics*	• experimental reporting;	• pay attention to oneself and others. • give and seek clarification.	• principles of communication • proper terminology

PHYSICS - FORM III

Module 1

INTRODUCTION TO MECHANICS.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES (Projects)**
Mechanics	Physical quantities	-Forces originate through action of physical quantities -Identify and use PHYSICAL quantities. - Scalar quantities only. -Measurements of mass, volume, temperature and time using laboratory apparatus. -Practice and respect laboratory safety rules.	- Writing measured values with numbers and units -Use of balance to measure masses of solids. -Use of measuring cylinder to measure volume of liquids. -Use of thermometer to measure temperature. -Use of time piece to measure time. -Read and interpret labels on measuring instruments. - Read, interpret and appropriate hazard signs.	**Topic 1: Introduction to MECHANICS** **Physical quantities.** Its importance in everyday life 1.1 Some basic equipment used in the study of force : Newton metre, Balance, springs, masses, 1.2 Safety rules for working with these equipment including signs and symbols. 1.3 Difference between mass and weight. 1.4 How mass is affected by temperature? 1.5 Density	-Discuss the importance of forces. -Measure distance, mass, volume, time and temperature in their appropriate units. -Read, identify and understand labels on equipment. -Identify and use basic laboratory apparatus.	- Appreciate the importance and use of numerical values and their units. -(Great) care when handling equipment. -Observe safety rules. -Respect hazard signs.	-Balance(s) -Stopwatches -Thermometer -Labelling tags -Other basic apparatus -etc. Project 1: Go to a building-site and list all the instruments used for measurements. Project 2: list the various means by which building materials are moved from place to place within the building site.

Module II

Matter: Properties and Transformation.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Properties of matter	**Knowing why things of the same volume weigh more than others**	**- Measure the density of objects.** **-Appreciate why things float on water and in air.**	**- Measure the density of oil.** **- Appreciate why oil floats on water.**	**3.0 Define density and state its units.** **3.1 Show density as a derived physical quantity.** **3.2** Describe experiments to measure the density of regular and irregular objects using any appropriate method. **3.3** Do appropriate calculations. **3.4** Appreciate the use of different density bodies in engineering works.	- Have the ability to handle building materials form their densities. - Know why things float. Construct a hydrometer.	-Know when and how to mix materials. - Care in the handling of materials. -Know and appreciate the weight of materials.	- Regular and irregular solids - Liquids -Density bottle. Overflow can -Measuring cylinder - Scale balance. - Top pan balance.

	Pressure	- Effects of force and area. -Making use of the atmosphere. -Construction of dams. -Pressure and Health. -The manometer	**-Why objects penetrate or sink in liquids.** **-How a liquid flows under gravity.** **- Making use of atmospheric pressure.** **-the pressure pot** **-how manometers work.**	4.0 Define pressure and state its units. 4.1 Understand the effects of force and area on pressure. 4.2 Describe experiments to demonstration atmospheric pressure e.g. the collapsing-can experiment. 4.3 Appreciate the relationship between pressure and weather. 4.4 Understand the influence of height and density of liquid column on pressure. 4.5 Appreciate the transmission of pressure in fluids. 4.6 Do calculations using the relationship, $\Delta p = \rho gh$ 4.7 Appreciate the existence of atmospheric pressure **4.8** State the effects of pressure on boiling point.	-know why some mountain climbers have nose bleeding. -explain why soldier can make movements in muddy areas or marshy areas. - Effects of flat and narrow heel shoes on the ground - Widths of foundations of bridges/buildings being larger than those of the walls -flow of water from holes at different heights from a cylinder Have the ability to choose the right relationship between quantities - Have the ability to build up the definition of a quantity from other quantities -Conceive and construct a device to facilitate work using atmospheric pressure (project) -Appreciate the effect of pressure on boiling point - Take the right precautions when using a pressure pot - Use a water manometer to determine two points at the same horizontal level(Building site)	- appreciate the effect of density in the relation $\Delta p = \rho gh$ **Logical thinking: putting the cause before the effect** **- team spirit** **- search for alternative uses of common devices**	High heel shoe Flat heel shoe Bridge

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Properties of matter	**Hooke's Law**	**- Understand the strength of various materials.**	**- Apply force on a material and measure the extension.**	5.0 State Hooke's law 5.1 Describe situations in which the law applies 5.2 Stretching of springs, rubber bands and threads	- Understand the use of expansion gaps in bridges, roofs, railway lines, etc. -Appreciate the use of springs in cars and related devices. -Understand the behaviour of rubber. - Appreciate the strength of materials. Classify them according to their characteristics.	-Be able to know and use different materials for different proposes. -materials that obey Hooke's law and those that do not	- Rubber band. - Wooden materials - Thread -Springs - Various masses - Ruler

Module III

ENERGY: APPLICATIONS AND USES

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Energy	**Forms of Energy**	• PE = mgh and $KE = \frac{1}{2}mv^2$ • Elastic potential energy (qualitative treatment only).	-Conversions from one form of energy to another. --Principle of conservation of energy.	6.0 Define energy. 6.1Name forms of energy. 6.2 State different sources of energy. 6.3 Distinguish between renewable and non-renewable energy sources. 6.4 Describe energy conversions in stretching of springs, rubber bands and threads. 6.5 Do appropriate calculations.	- Understand that energy cannot be created nor destroyed. - Understand how energy can be changed. - Understand that mechanical energy has only two types: Potential and Kinetic.		-a moving object (car) -water flowing in a stream then at a waterfall -stretching a rubber
Work	**Work**	Work as a product of force and distance in the same direction.	- Moving a load along a horizontal surface.	6.0 Define work and state its units. 6.1 Do simple calculations involving force and displacement (in the same direction only).			-moving a small force then a larger force over the same distance in same time
Machines	• Simple machines;	• How machines work. • Mechanical Advantage (MA) • Velocity Ratio (VR) and efficiency.	Lever; Pulley; Inclined plane $\text{Efficiency} = \frac{\text{Power output}}{\text{Power input}} \times 100\%$	7.0 Define machines. 7.1 State the advantages of using machines. 7.2 Define MA, VR, and Efficiency. 7.3 Explain why a machine is not 100% efficient. 7.4 Describe simple experiments using each machine. 7.5 Do appropriate calculations. 7.6 Describe the use of various machines at building sites.	-understand and appreciate the use of some simple machines such as the inclined plane, pulleys, levers, wheel barrow. -develop easy ways of lifting heavy loads -design and construct a machine (project)	**- Reducing energy losses in different situations while working** **-avoiding waste in different situations** **Sustainable use of resources**	-single moving and fixed pulleys, pulley blocks, inclined planes, practical machines(scissors, wheel barrow, etc)

Power	Power	Power as a produce of work and the inverse of time or force and velocity.	Power of a car engine.	8.0 Define power and state its units. 8.1 Estimate the average power developed by e.g. a person running upstairs person repeatedly lifting weights, etc. 8.2 Appreciate the power ratings of devices e.g. light bulbs, motors, etc. 8.3 Do appropriate calculations		- appreciate the impact of the power rating of a device on the energy of a power source	

OPTICS

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Light	Reflection of light	-Use of mirrors -State the laws of reflection. -Shadows -Images	-Identification of an oncoming vehicle using a car mirror. -Identification of a problem in the mouth, ear and eye using light rays. Construct a pinhole camera and a periscope. -Construct a ray box.	9.0 Represent the paths of narrow beams of light travelling in uniform media by rays 9.1 Appreciate that objects are seen because of the light which they give out or reflect. 9.2 Recall that angle of incidence equals angle of reflection for a mirror. 9.3 Appreciate that image of a point objects is the point through which all rays from a point on the object pass or appear to pass after reflection or refraction. -Shadow(s)	- Appreciate how objects are seen. - Understand how to draw ray diagrams. - Understand how images are formed. - Understand the capturing of an image by a camera.	-Know that convex mirrors are used as driving mirrors and uses of concave mirrors.	-Plane mirror -Convex Mirror -Concave mirror -Light source -Screen -Protractor. -Tennis ball.
	Refraction of light	• Laws of refraction. • Total internal reflection.	• Lenses: Converging and diverging lenses. Focal length. • Viewing of internal organs using total internal	9.4 Recall and use the relationship, Refractive index = $\frac{\sin \square}{\sin \square}$ $= \frac{\square}{\square}$ $= \frac{\square\square\square\square\ \square\square\square\square/\hbar}{\square\square\square\square\square\square\square\square\ \square\square\square\square/\hbar}$ 9.5 Describe an experiment to	-Understand how to draw ray diagrams through prism, rectangular glass block -Understand the use of protractor. -Appreciate how the eye captures images.	-Be able to explain why people drown in rivers more in the dry season than in the rainy season. - use of	Lenses(converging and diverging), rectangular glass blocks, semicircular glass, optical pins/boards, tall measuring cylinders,

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			reflection • Measurement of the focal length of a convex lens.	determine the refractive index of glass using a glass block. 9.6 Appreciate the conditions for total internal reflection. 9.7 Be familiar with the refraction of light in everyday phenomena e.g. the apparent depth of a swimming pool. 9.8 Appreciate the relationship between refractive index and wave speed for light. 9.9 Regard a lens as being made up of a number of part prisms. 9.10 Draw ray diagrams to illustrate the meaning of principal foci, for converging and diverging lenses. 9.11 Understand what is meant by the focal length of a lens. 9.12 Draw ray diagrams to illustrate the formation of images by lenses e.g. converging lens used as a magnifying glass. 9.13 Describe how to measure the focal length of a converging lens by a distant object and by an auxiliary plane mirror methods. 9.14 Describe experiments relating object and image distances to object and image sizes for converging lenses. 9.15 Be familiar with the relationship, $m = \frac{v}{u}$. 9.16 Define and calculate critical angle	-explain how total reflection occurs -use of optical fiber for total reflection - Draw a normal at any point on a surface or line - How to produce different types of images: real, virtual, larger, same size, smaller	calculators to calculate trigonometrically functions.	mention the endoscope -Ray box Prism Meter ruler -Protractor

ELECTROMAGNETIC SPECTRUM

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Colours of light	• Dispersion. Electromagnetic Spectrum	-Producing colours of the rainbow.	• Use of a prism	Appreciate dispersion by a prism and a diffraction grating. 9.18 Be familiar with the relative positions of radiations on the electromagnetic spectrum, in terms of wavelength and frequency. 9.19 Describe methods of detection of UV and IR radiations. 9.20 Recall the properties of X-rays. 9.21 Be familiar with health hazards caused by high dosage of EM waves.	**-Know that white light is made of many colours.** **-Remove the believe around the rainbow.** -	Understand light as a source of energy and that white light has many colours.	Prism Colour pencils Circular sheet. Pin Prism, light source , screen Colour filters Eletctric motor from radio.

MODULE VI

1 Projects and Elementary Engineering

2- DURATION/: 18 *HOURS*

3- PRESENTATION OF THE MODULE

The module has two parts:

- Technical drawing;
- Projects.

4- CONTRIBUTION OF THE MODULE TO THE CURRICULUM GOALS

The basic notions and techniques that this module gives to the learner help in the production and amelioration in the manner of consumption and services render and even affect one's life style. In addition, it permits the learner to be focus on choosing careers.

5- CONTRIBUTION OF THE MODULE TO LEARNING AND IN THE DOMAIN OF LIFE.

This module reinforces the technical knowledge already acquired in Form 1 and Form 2 by preparing the learner to know how to write feasible technical and industrial projects. It also reinforces the **capacities of** the learner to analysis, to fabricate and to maintain certain devices mentioned in the other modules of the syllabus

It helps the learner to offer good services as a consumer and as a producer, to intervene positively in his environment and open to the working world.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Amelioration of life style	Understanding how to go about a project.	Realisation of a project and its economic value.	- interpret a diagram.	1. Technical drawing : - General notions involve in technical drawing; - Two dimensional diagram; - Do a orthogonal representation ; - Price list.	-Explore elements in a technical diagram. -Read construction plans – Realise a plan	Develop : - a critical spirit -team spirit; - manual skills -make an effort to discover -Curiosity ; -rigour at	- Technician : - mechanics; -computer scientist. -electrician… - Visit to factory site. - Internet - Users and consummers.
			- build and understand the functioning of some common equipment. (compass, bike, touch light,	2.Technical Project 2.1. Types of technical projects; 2.2. Elements involve in a project;; 2.3. Steps involved in planning a project ; 2.3.1. Definition of planning	-Find needs and establish the cost of the project. - Find elements of a given project. -Establish a plan of		

			water filter) - lead students to understand the various aspects of a project - technical file for the realisation of a project.	2.3.2. Study the advantages offered by the project; 2.3.3. Feasibility Studies ; 2.3.4. Theorical knowledge of the a simple tehnical object; Bring out the different energy components when using the instrument; - Technical diagram . 2.3.5. Technical studies : - Links. - Identification of the movement of certain parts with respect to others (guide, reducing friction…) - Definition :drawing board, mould, welding, soldering, bolt, 2.4. Realisation of a project.	study of a project. - Elaborate a technical sheet for construction -Produce a plan of activity. -Evaluation and supervision of a project.	work ; -Patience ; Perseverance Respect of the environment. - Respect the functional norms of an appliance. .-Managerial skills. -Techniques of making public speeches. - Respect of gender. -Spirit of tolerance.	
	Investigating forces	Observe how and why things move	-measure various distances covered with respect to time -make a collection of different scale in the market with respect to the quantities measured. - state the advantages and disadvantages of the scales.	-Understand the uses of measuring instruments and their limitations. -Understand why and how things move. -Understand the relationship between mass and volume through measurements - Observing colours of light on a CD or DVD and suggesting reasons for their appearance. -Observe a pen or pencil in a glass of water and explain why there are two images. Use the images to estimate the refractive index of water.	-Be able to explain the importance of using good scales. -Know that size does not imply weight. -Know why rivers are more dangerous in the dry season than in the rainy season.	-Be of good conduct. -Tolerant -Observant - Patient -Do not accept things from the surface.	Pen / Pencil, water, glass, various balances, CD, DVD, various masses

PHYSICS - FORM IV

Module 1

ENERGY: APPLICATIONS AND USES

HEAT

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
CLIMATE CHANGE	Temperature	- Concept of heat. -Thermometry - Calorimetry	- Effect of heat to the environment. -Degree of hotness or coldness. -Measuring values of temperature and its units. -Construction of a temperature scale with numbers and units --Use of liquids in thermometers to measure temperature. -How to determine the amount of heat in a solid or liquid.	**Introduction to Heat. I**ts importance in everyday life -Some basic equipment used in the study of heat. - Safety rules for working with these equipment including signs and symbols. **Construction and use of liquid – in- glass thermometers**. - Appreciate the need for calibrated thermometers to measure temperature. -Read–off the numerical values of the fixed points in the Celcius scale of temperature. -Calibrate a thermometer using the fixed points -Calculate an unknown temperature from the length of the liquid column. - Appreciate the differences between a clinical and a normal laboratory thermometer. **Heat capacity and specific heat capacity of solids and liquids**. - Define heat capacity and specific heat capacity. -State the units of each of the terms. -Distinguish between heat capacity and specific heat capacity. -Appreciate the use of materials with high and low heat capacities.	-Discuss the importance and disadvantages of heat. -Measure temperature. -Read, identify and understand labels on food containers such as drinks. -Use a clinical thermometer to measure body temperature. -Make inferences from temperatures measured. -Be able to construct and calibrate a prototype thermometer. -Be able to explain effects of climate change.	- Appreciate the importance and use of storage temperatures for different materials. -Great care when preserving items under thermal conditions. . -Observe safety rules. -Respect hazard signs -Show concern for climate change. Appreciate the use of liquids in thermal systems such as the car engine.	-Balance(s) -Stopwatches -Thermometer -Labelling tags -Other basic apparatus -etc. Car radiator Ice Spirit

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
		-Latent Heat -Heat transfer.	- Where is heat stored during a change of state?	-Do calculations using $Q = mc\Delta\theta$. -Describe experiments to measure the specific heat capacity of a metal or liquid and state any assumptions made. **Uses of latent heat and specific latent heat (qualitative treatment only)** -Define latent heat and specific latent heat. -State the units of each of the terms. -Distinguish between latent heat and specific latent heat. -Appreciate the cooling effect due to loss of latent heat. -Compare the heat content of the specific latent heat with that of specific heat capacity of the same material. **Conduction, Convection and Radiation.** -Define conduction, convection and radiation. -Describe experiments to show the conductivity of different materials. -Thermal expansion. -Explain the principle of the bimetallic strip. -Appreciate the bulk movement of particles of the fluid in convection. -Explain the phenomena of land and sea breeze in terms of convection. -Appreciate the effects of surface area, surface nature and temperature on the rate of radiation. -Name devices that convert radiant energy into other forms of energy.	Be able to appreciate a change of state at constant temperature. Be able to show that evaporation causes cooling through the use of volatile liquids.	Understand the use of expansion gaps in bridges, roofs, railway lines, etc	Camphor

Module II
WAVES

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Wave phenomena	**Properties of waves**	--Reflection -Refraction -Diffraction -Interference -Stationary waves - Relationship between inter-node distance and wavelength. - Diffraction effect.	**-Uses of reflection and refraction.** **-Pool of water on a tarred road.**	**Properties of waves.** **Reflection, Refraction, Diffraction, Interference, Stationary waves, Relationship between inter-node distance and wavelength. Diffraction effect:** - Describe wave motion in strings, ropes and springs and ripple tank. -Recall and use the equation $v = f\lambda$. -Distinguish between transverse and longitudinal waves. Give suitable examples. - Define the phenomena of reflection, refraction, diffraction, and interference. -Use water waves to show reflection at a plane surface, refraction due to change of speed, and diffraction produced by wide and narrow gaps. -Production of stationary waves. - Harmonics and overtones.	Be able to measure the speed of sound in air. Appreciate the use of refraction to explain why sound is better heard on a cold day than a hot one.		-slinky, tuning fork, ripple tank, thick lenses, resonance tube
Vibrations and Sound	**The wave nature of sound**	-Reflection -Refraction -diffraction -interference	**-How sound is used to measure the depth of the sea.** **- Echo**	**The wave nature of sound** **Reflection, Refraction, diffraction and interference** **Describe the longitudinal nature of sound wave.** **-State the approximate range of audible frequencies.** **-Show an understanding that a medium is required in order to transmit a sound wave.** **Speed of sound in various media.** -Describe an experiment to measure the speed of sound in air.			

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				Characteristics of notes. Amplitude, frequency, and pitch, quality and overtones. Frequency limit of audibility -Relate the loudness and pitch of sound waves to amplitude and frequency respectively. -Describe how the reflection of sound will produce an echo. -State the order of magnitude of the speed of sound in air, liquid and solid. **Vibration in strings. Stationary waves in strings**. **Relationship between frequency and length, frequency and mass per unit length, frequency and tension.** **.**	-Be abe to construct a simple musical instrument e.g. flute and guitar	**Know the importance of resonance.**	
	Force vibration Resonance	Wave in an open tube	Use of tuning force at the mouth of a tube opened at one end	-Explain force vibration on a string, and tube. - Explain resonance. -State its applications.			

Module III
ELECTRICAL ENERGY

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Electrical energy	**Electrostatics**	**Charging by friction** Conductors and Insulators	**-Explain the origin of positive and negative charges when two bodies are rubbed together.** **-Compare the relative conductive or insulative properties of a wide range of materials.**	**Charges** -Types of charge ➢ Understand that two types of charge exist. ➢ Understand the methods of separation of the charges. ➢ Understand the type of charge certain materials can have such as polythene, perspex/cellulose acetate. ➢ Define the coulomb. ➢ Explain the inductiion of equal and opposite charges on a conductor. ➢ Experiment: state and use the laws of electrostatics. (Coulomb's Laws) ➢ Understand the relative magnitude of force between charged bodies with respect to the distance between them (Qualitative treatment only) -Electrification by contact, rubbing(friction) -Conductors and Insulators. -Unit of charge(coulomb) -Electrification by induction. -The gold leaf electroscope: the structure and uses of the leaf electroscope. -Force between charges ➢ Describe experimentally how to distinguish between positively, negatively and neutrally charged bodies. ➢ Give and explain everyday observations of electrostatics. ➢ Explain the disadvantages due to statics elelctricity. ➢ Lightning ➢ Explain some applications of electrostatics e.g. industrial painting, photocopying.	**-Name substances which become negatively or positively charged when rubbed.** **-Explain in terms of mobile electrons and bound protons (fixed) why substances become charged when rubbed.** **-Be capable of comparing the relative conductive or insulative properties of materials.** -Be able to explain the use of a chain under a petrol tanker. -Appreciate the production of sparks and sound during charge transfer.	**-Care in handling electrostatic systems** **-Work in dry conditions**	**Cloth** **Plastic materials.** **Glass rods**

	Current Electricity	**What causes charges to move and in what type of materials?**	**-Effect of moving charges on materials such as:** ➢ **Heating** ➢ **Lighting** ➢ **Productin of sound, etc.**	**-Understand and define electric current.** **-Understand the conditions under which charges move.** **-Know what is electromotive force (e.m.f.)** **-What is potential difference (p.d) between two points on a conductor. What causes it?** ➢ **-Understand and state the differences between e.m.f and p.d. Also explain the difference in terms of energy transfer or changed.** (e.m.f changes chemical or mechanical energy to electrical and p.d changes electrical energy to other forms of energies.) **-Identify and name sources of e.m.f.** ➢ Mains, simple cell, dry batteries, lead-acid accumulator, thermocouple, solar cell. -Set up and construct simple electrical circuit. -Draw circuit diagrams. -state and use the relationship W= QV in energy transfer in components of a closed circuit. -Use the relationship power P = current I x voltage V in a closed cicuit.	➢ **Appreciate that current I is measured in amperes A which is the rate of flow of charges in a conductor. Q/t (coulomb per second)** ➢ **Undersand the role of e.m.f in the flow of electric current.** ➢ **Be able to interpret circuit diagrams.** ➢ **Appreciate that electric current should be put off if a house is on fire.** ➢ **-Understand house wiring and the use of fuse.** ➢ **Be able to appreciate and regulate electrical consumption at home.**		**Dry cell, wires connecting leads, multimeters**
		Electric circuit	**-Components in a circuit network.** **-Resistance in a circuit ; types and effects.** **- Circuit network**	-Define resistance and state its units. -State and use Ohm's law in simple calculations. -Understand and be able to use the relationship between length L, cross-sectional area A, and the resistance of a given conductor. $R = \rho\frac{L}{A}$ -Understand that resistance varies with temperature. -Understand and use the relationship between current, potential difference and resistance in simple calculations. -Use of series and parallel connections of resistors. -Calculate the combined resistance of two or more resistors in series and only two resistors in parallel. -Calculate the combined resistance of resistors in series and parallel in a single circuit.			**Dry cells, wires connecting leads, multimeters, resistors, rheostats**

		Direct Current; d.c and Alternating Current; a.c.	**-Sources of d.c and a.c** **- Where are d.c. and a,c used.** **-HTT (High tension transmission)**	-Understand the effects of d.c. and a.c. in wires, filament lamps, and (non inductive) coils. -Appreciate te heating effect of electric current. -Explain the advantages of transmitting electrical energy at high voltage. -Calculate power dissipated in simple cases. -Calculate energy consumption at home using kilowatt-hour (kWh) and ENEO bill. -Understand the functions of a fuse in a circuit. -Select fuses of appropriate values for various electrical appliances. -Understand the need for good electrical contact in house wiring circuits, -Appreciate the need for good earthing in house wiring.. -Compare linear and ring circuits in house wiring. - Understand and appreciate the need for safety precautions in electrical installations.	**-Understand how house wire is done.** **-Explain an ENEO Bill**	**-Be able to advise on electrical energy matters.**	Filament bulbs, various fuses
	Displace of electrical signals	**Cathode Ray Oscilloscope**	**Peak voltage**	Structure and functions of the CRO	**Detect very small signals**	**- uses of CRO** **- Reading voltage using CRO**	

MODULE VI

1 Projects and Elementary Engineering

2- DURATION/: 18 *HOURS*

3- PRESENTATION OF THE MODULE

The module has only one part:

- Realizing a Technical project.
-

4- CONTRIBUTION OF THE MODULE TO THE CURRICULUM

The basic notions and techniques that this module gives to the learner help in the production and amelioration in the manner of consumption and services render and even affect one's life style. In addition, it permits the learner to be focus on choosing careers

5- CONTRIBUTION OF THE MODULE TO LEARNING AND IN THE DOMAIN IF LIFE.

This module reinforces the technical knowledge already acquired in Form 1 and Form 2 by preparing the learner to know how to write feasible technical and industrial projects. It also reinforces the capacities of the learner to analysis, to fabricate and to maintain certain devices mentioned in the other modules of the syllabus.

It helps the learner to offer good services as a consumer and a producer, to intervent intervene positively in his environment and be open to the working world.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Improving on Life-style.	Production of appliances	Realisation of a technical project and production of appliances.	Communication with the help of a diagram.	1. Technical Drawing 1.1. Reading of technical drawing 1.2. Cross section of an object - List the various ways of viewing an object. e.g top – view.	- Realise of model – plan. -Realise the cross-section of a deivce. -Read a plan or a construction sheet.	Develop: -Rigour -interest -Curiosity -Patience -Respect of gender -Respect of the environment -Perseverance -Managerial skills --Self confident -Spirit of tolerance -Respect of others opinion. -Care of the external features of appliances	-Drawing Kits Construction sheet. Internet -Competent technician
		Construction of a thermometer	-expansion of a liquid in a straw.	2 Know how to construct a thermometer. 2.1 Know how to calibrate a thermometer. 2.2 Know the different substances have different thermometric properties.	Know how to measure with a thermometer -Know how to calibrate.		**-Straw** **-Thermometer** **-Liquids**
		Construction of a sound instrument.	-Make guitar using a single string -Make a flute using Indian bamboo. -Make a musical instrument using bamboos of different length.	-Understand that the frequency of vibration depend on the length, mass and type of material used.	Be able to develop a project of constructing a musical instrument and realizing it.		String Indian bamboo Milk cup Stick
		Velocity of sound	Measure the velocity of sound in a pipe	-Understand resonance. -Use resonance to measure the velocity of sound in a resonance tube experiment.-	Be able to say for sure the value of the velocity of sound in air.		**Water pressure pipe about 40 cm long** **Tuning fork** **Container** **Water**

		Rate of flow of heat in a material such as a metal	-Conduction of heat in a metal rod. Use candle wax and mark on the metal at equal intervals. Heat at one end and time the melting of the wax. -Conduction in liquids. Use a transparent plastic bag filled with water. Put a few grains of omo blue to rest at the bottom of the bag and heat with a candle from the bottom observe the movement of the grains.	-Thermal conduction in metal. -Convection in liquids	-be able to handle matters concerning the flow of heat.		**Metal rod** **Candle** **Match** **Stop watch** **Plastic bag** **Omo blue** **Water**
		Electrical energy consumption	-List appliances that use electricity at home. -Take a radio and show its parts. (the input, the processing unit/central unit, the output and the power supply) -Show what happens if one of these components is removed. - How to repair such a device	- Know that all appliances have basically four parts: the input, the processing unit/central unit, the output and the power supply/battery) -Know that in some devices like the touch the central unit may be the filament of the bulb. -Know for a computer that • the input is the keyboard • the central unit is the process and memory unit • the output is the screen	Be able to maintain electrical devices once the parts are known.		**Screw driver** **Radio**

PHYSICS - FORM V

Module 1

FIELDS: MAGNETIC FIELDS AND THEIR EFFECTS

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Magnets	**Attraction and repulsion of specific materials**	• Discovering naturally attractive and repulsive materials • Appreciating why this happens	- To feel the effect of magnetic materials -Appreciate the poles of a magnet.	-What is a magnet? Name some types of magnets. -Magnetic properties of a dipole magnet ➢ How is a magnet different from a non-magnet? ➢ State the difference between the magnetic properties of iron and steel. ➢ Appreciate that magnetic poles exist in pairs. -State the laws of magnetism. ➢ **List the uses of magnets**	- Understand how a simple magnet can be made - Understand how to identify that a rock is a magnet by suspension in air. -Appreciate that not all materials can be magnetized -Appreciate that the only true test to determine a magnet is repulsion.	Appreciate the use of magnets in sorting of magnetic materials (coins) and separating mixtures. Care in handling DVDs players, etc.	Iron, nails, bar magnets, horse shoe magnet, iron filings, wooden plugs, pieces of Aluminium, clamp and stand, plotting compasses, copper wires.
	Magnetic Field	-Understand why magnets are difficult to separate and some time difficult to join together	- Use a compass to study the behaviour of its needle around a magnet. -Consider the paths traced by the compass as magnetic field lines. - Place two magnets side by side and use a compass to trace the path of its needle.	-Define Field lines and magnetic flux. -Set up various patterns for magnetic flux around a single permanent magnet and also two permanent magnets placed side by side. -Know the properties of magnetic field lines. -Draw magnetic flux pattern. -Understand how the earth's magnetic field is used in navigation (using magnetic compasses)	-locating your position with the help of a magnetic compass (plotting compass)		**Plotting compass, Magnet**

Current in a magnetic field	**Magnetic effect of current**	What causes turning effect in an electric motor	-Place a current carrying conductor over a compass needle and study the effect produced.	-Understand the magnetic effects of a steady current. ➢ Use the compass to identify that magnetic fields are produced when current flows in a conductor. ➢ Sketch and understand magnetic flux patterns for a straight wire, a flat circular coil and a solenoid, each carrying a current and also the pattern for a strong permanent dipole magnet.			
	Force on a current carrying conductor placed in a magnetic field.	The role of field lines in force effects of current	-Suspend two coils wound on soft iron pieces. Pass a steady current through the coils and try bringing them together.	-Appreciate that there is a force on a current – carrying conductor placed in a magnetic field as long as the conductor is not parallel to the field. -Appreciate that there is a force on a charged particle when it moves in a magnetic field as long as the particle is not parallel to the field. -Understand that the force on a current–carrying conductor in a magnetic field increases with the strength of the field and with the current. -Sketch and recognize the magnetic flux patterns for a straight wire carrying a current perpendicular to the plane of a magnetic field.			

	Electromagnetic Induction	Production of current electricity.	-Use wires, a changing magnetic field from a permanent magnet or current source to produce electrical energy, -Study factors that affect the induced current.	-What is electromagnetic induction? -State Faraday's law. -State lenz's law. -Describe the construction of electromagnets. -State the uses of electromagnets. -List the factors that affect induced current in conductor placed in a changing magnetic field.			
	Alternating Current	-Show how current changes direction.	-Functioning and uses of transformers. -Understand why some electrical system like bulb may take some time to have full brightest.	-Describe experiments to demonstrate that induced current increases when the rate of change of magnetic field lines increases. -Understand how voltage and current vary with time. -Understand the production of induced e.m.f. -Appreciate electromagnetic induction as an energy transfer process. -Understand the concept of mutual and self induction. ➢ Be familiar with the structure and functioning of the transformer. ➢ Appreciate the factors that affect the efficiency of a transformer. ➢ Relate the turns ratio of an ideal transformer to the ratio of the input to output voltages. ➢ Differentiate between direct current and alternating current.		

Module II

ENVIRONMENTAL PROTECTION: Modern Physics

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
The atom	The relative sizes of nuclei and atoms	-Bohr model of an atom -Name the components that make up the atom.	-Identification of an electron as the smallest indivisible quantity of charge	The atom. Identify an electron as one of the basic components of an atom. Understand the nature of the electron. Define an electron. Recognize that the electron carries the basic quantity of charge, Q = Ne. Understand the relative mass of the electron.	- Appreciate the relative size of an electron. - Appreciate that bigger things are built from smaller ones. - Able to draw an atomic structure showing where the electron is found.	Know that the quantity of charge is a whole number multiple of **e.** The harmful nature of radiation to the environment	
	The Nucleus	-The nuclear model of an atom.	-Show that the nucleus can be broken down into small components.	-Structure of the atom and the nucleus. -Relative sizes and masses of the nucleus and atom. -Bohr model of the atom. -Relative charges of electrons and nucleons. -State nucleus as containing protons and neutrons. -Be familiar with nucleon number / proton number notation for an atom, e.g $^{A}_{Z}X$ - State and use A = Z + N			
RADIATION		-Radioactivity	-Understand that matter can break down to small particles by giving out some radiations and particles.	-Define radioactivity -Know that radioactivity can be natural as well as artificial. -Distinguish between natural and artificial radioactivity. -Understand some nuclei emit particles such as α, β and γ.	Appreciate the dangers of long exposure to ionizing radiations. Know medical applications of ionizing radiations and other positive application.		

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				-Properties of α, β and γ. -Identify α, β and γ radiations from their speed, range in air, penetration, ionization ability, deflection in electric and magnetic fields. - The GM –tube (uses only) -Use of the diffusion cloud chambers to detect radiations. -Balanced nuclear equations. -Stability of the nucleus. Relate N-Z ratio to the stability of the nucleus. -Explain the meaning of half–life and state its importance. - Understand the importance and use of isotopes. -What are radioisotopes?			
		Background radiation	-Appreciate the environmental and health hazards of background radiation.	-Define background radiation. -Name sources of background radiation. -Understand the concept of background radiation and how it is used in calculation and count rate. -Appreciate the environmental and health hazards caused by background radiation.			
		Radioisotopes	- To understand their importance in medical diagnoses	-Appreciate that radiations are easily detected hence their uses. -Name areas of use such as: medicine; agriculture; dating; industry; food preservation;			

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				therapy; etc. Understand how the uses relate to their properties. . -Explain the effect of ionizing radiation on humans, showing how it depends on the type of radiation, the activity of the source and the type of tissue irradiated.			
		Nuclear Energy	-The source of energy from the sun.	-Define fusion and fission. -State the differences between fusion and fission. -Explain the origin of the energy released during nuclear decay. Interpret nuclear reaction.			
		Safety and hazard	-Why nuclear waste should be handled with care.	-State safety precautions that must be observed when handling radioactive materials. -Name some diseases caused by exposure to radiation.			

MODULE III

MECHANICS

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
FORCES	Scalars and Vectors			Define scalar and vector quantities. Give examples in each case. Understand how to use, denote, and express (through diagrammatic and algebraic representation) scalar and vector quantities. Do calculations involving, addition, subtraction and resolution of vectors in 2 dimensions only. Understand vector diagrams.			
	Type of forces	Contact and non contact forces	• Cause a body to be suspended over another body without touching.	Define force and state its units. Define contact and non-contact forces giving examples. Appreciate the importance of force in everyday life situations. Describe the advantages and disadvantages of the effect of forces. Draw free body diagrams. Solve problems involving addition and subtraction of forces. Resolve a force into two perpendicular parts. Force due to gravity, **g** and its variation over the earth's surface. Calculate weight **W = mg**. Differentiate between mass and weight. Relate drag force with velocity.			

FORCES	Newton's Laws of motion.	-Understand why things change positions, size and shape.	• What causes changes in position, size and shape.	State Newton's laws. Describe demonstrations to explain the laws. Appreciate life situations such as seat belt, movement of rockets, sports, air-bags, etc.			
	Force	Understand change in momentum leading to a force.	• Describe experiments where there is momentum change. e.g moving vehicle.	Define force and momentum and show how the two are related from Newton's second law. State the units of force and momentum. Treat force as a vector quantity. Show the F = ma. Calculations on F = ma and momentum.			
	Moment	Moment **of a** force	• Explain why things turn.	Define moment and couple. Describe simple experiments on moment and couples. Do calculations on coplanar forces. Name and describe everyday situations where torques and couples are used. e.g opening of tap, handle bars of a bicycle, moving coil galvanometer, simple motor. The lever and gear systems.			
	Conditions for equilibrium	Stability of objects		State conditions for static and dynamic equilibrium.			

Kinetics	Linear motion			Define distance, displacement, speed, velocity, acceleration and state their units. Describe experiments to measure velocity and acceleration. Apply knowledge of concepts in everyday situations like sports and moving objects. Draw distance, displacement–time graphs. Use the graphs to obtain speed and velocity. Draw velocity–time graphs. Use the graph to determine; acceleration, initial speed, total distance. Study graph for constant velocity and uniform acceleration. Use the equations of motion. Describe experiments to measure acceleration of free fall, **g**. Do calculations using the equations of motion.			
	Conservation of linear momentum	Principle of conservation of linear momentum		Define linear momentum Do calculations on **p = mv.** State the principle of conservation of linear momentum. Describe experiments to demonstrate the principle of conservation of linear momentum. Describe real life situations where the principle is applied, e.g collisions, explosions, water jets, etc Do appropriate calculations where mass is constant.			

MODULE VI

1 Projects and Elementary Engineering

2- DURATION/: 18 *HOURS*

3- PRESENTATION OF THE MODULE

The module has only one part:

- Maintenance of a simple mechanical/electrical system.

4- CONTRIBUTION OF THE MODULE TO THE CURRICULUM GOALS

The basic notions and techniques that this module gives to the learner help in the production and amelioration in the manner of consumption and services render and even affect one's life style. In addition, it permits the learner to be focus on choosing careers

5- CONTRIBUTION OF THE MODULE TO LEARNING AND IN THE DOMAIN OF LIFE.

This module reinforces the technical knowledge already acquired in Form 1 and Form 2 by preparing the learner to know how to write feasible technical and industrial projects. It also reinforces the capacities to the learner to analysis, fabricate and maintain certain devices mentioned in the other modules of the syllabus.

It helps the learner to offer good services as a consumer and a producer, to intervene positively in his environment and open to the working world.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Improving on living conditions.	Production and uses of appliances.	Upkeep and repairs of appliances	Ability to maintain appliances.	1. Preservation and Maintenance of appliances. 1.1. Definition of maintenance. 1.2. The essential element s in a repair box. (give the name, role and method of application) 1.3. Understand the labelling on appliances. 1.4. Techniques of dismantling and assembling of appliances. 1.4.1. Technique FOLI (Dismantling) First out last in 1.4.2.Technique LIFO (Assembling) Last in first out 6.5. Applications: radios, computers. Tester, screw-drivers, soldering iron.	Good use of tools. Read and exploit information on labels place on appliances.		

Article 2: The syllabus presented in article one here above shall be implemented as from the beginning of the 2016-2017 school year;

Article 3: All previous provisions repugnant hereto are hereby repealed;

Article 4: Inspectors Coordinator General, the Director of General Secondary Education, the Director of Examinations and Certification, Regional Delegates of Secondary Education, Divisional Delegates of Secondary Education, Education Secretaries of various Private Educations Agencies, Principals of public and private schools, each in their own sphere shall be charged with the strict implementation of this order which shall be inserted and published in the Official Gazette in English and French.

Yaoundé, - 9 DEC 2014

THE MINISTER 0F SECONDARY EDUCATION

Copies :
- PRC
- PM
- MINESEC/SEESEC
- MINESEC/SG
- IGE
- DSGE
- RDSE/DDSE
- Education Secretaries
- School Heads
- Files/Archives