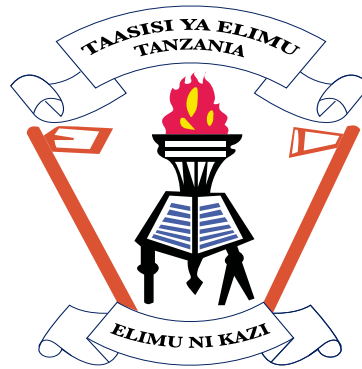


**MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY  
TANZANIA INSTITUTE OF EDUCATION**



**ENGINEERING SCIENCE SYLLABUS  
FOR TECHNICAL SECONDARY SCHOOLS  
FORM I - IV**

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## DECLARATION

The Engineering Science Syllabus is approved for use in Technical Secondary schools in Tanzania.

Approved by .....  
Signature .....  
Date 20 / 09 / 2019

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## **1.0 Introduction**

This Engineering Science Syllabus is a revised version of 1990 syllabus. Although, some of the subject contents of the phased out syllabus have been retained, changes have been effected in the arrangement of topics and sub topics, addition of new topics and removal of irrelevant and outdated contents. The revised version has taken into consideration the current social, political, economic, global and technological development as well as emerging cross-cutting issues.

The syllabus also observes the paradigm shift, from content to competence based education. As such the learner-centered pedagogy, with emphasis on activity oriented, formative assessment and assessment for learning practices are paramount strategies to engage learners in the teaching and learning processes as well as supporting them in building their own competencies. Therefore, students are expected to have hands on activities which in turn will inculcate creativity and self-confidence.

The syllabus covers diversity of topics to be covered in the four years of secondary education, i.e. from Form One to Form Four in Tanzania.

## **2.0 Objectives of Education in Tanzania**

The aims and objectives of Engineering Science subject reflects general objectives of education in Tanzania, which are to:

- a) guide and promote the development and improvement of the personalities of the citizens of Tanzania, their human resources and effective utilization of those resources in bringing about individual and national development;
- b) promote the acquisition and appreciation of culture, customs and traditions of the people of Tanzania;
- c) promote the acquisition and appropriate use of literacy, social, scientific, vocational, technological, professional and other forms of knowledge, skills and attitudes towards the development and improvement of the condition of man and society;
- d) develop and promote self-confidence and inquiring mind, understanding and respect for human dignity and human rights and readiness to work hard for personal self-advancement and national development;

- e) promote and expand the scope of acquisition, improvement and upgrading of mental, practical, productive and other skills needed to meet the changing needs of industry and the economy;
- f) enable every citizen to understand and uphold the fundamentals of the national constitution as well as the protecting human and civil rights, obligations and responsibilities; and
- g) promote love for work, self and wage employment and improved performance in the production and service sectors.

### **3.0 Objectives of Secondary Education**

The aims and objectives of Engineering Science subject reflects objectives of secondary education, which are to:

- a) consolidate, broaden and develop a deeper understanding of the ideas and concepts acquired at the primary level;
- b) enhance and further develop an appreciation for cultural values including national unity, identity, democracy, ethics, personal integrity, readiness to work, human rights, customs, traditions, civic responsibilities and obligations;
- c) develop linguistic ability and effective use of communication skills in Kiswahili, English, and at least one foreign language;
- d) develop readiness for tertiary and higher education, vocational, technical and professional training;
- e) inculcate a sense and ability for self-study, self-confidence and self advancement in new frontiers of science and technology, academic and occupational knowledge and skills; and
- f) develop readiness to join the world of work.

### **4.0 Competencies of Engineering Science Subject**

It is expected by the end of the four years course, students should have developed competencies in:

- a) applying knowledge and skills of measurements in day to day activities;
- b) applying concepts of motion in driving machines;
- c) determining classes of simple machines used in daily activities;

- d) applying engineering principles to produce items required by the society;
- e) utilizing gained skills to repair different instruments used in day to day activities;
- f) deploying principles of thermal energy in measurement of heat effect in different substances;
- g) maintaining simple analogue and digital devices; and
- h) generating magnetism and electricity necessary in engineering operations.

## **5.0 Objectives of Engineering Science Subject**

Therefore, the general objectives of Engineering Science subject are to prepare learners by the end of the four years course to be able to:

- a) apply knowledge, laws, theories and principles of Engineering Science in real life;
- b) use concepts of motion in driving machines;
- c) use engineering principles to produce different items required by the society;
- d) use acquired skills to repair different instruments;
- e) apply principles of thermal energy in measurement of heat effect in different substances; and
- f) generate magnetism and electricity necessary in engineering operations.

## **6.0 Structure and Organisation of the Syllabus Content**

This Engineering Science syllabus content has different structure compared to that of 1990. The following changes were made; class level competencies were included to improve the syllabus. Therefore, this syllabus has two parts. The first part comprises class level competencies and class level objectives. The second part is the syllabus content. It is presented in a table. It includes: topic, sub-topics, specific objectives to be achieved, teaching and learning strategies, teaching and learning resources, assessment criteria/tools and number of the periods.

## **6.1 Class level competencies**

Class level competencies are general competencies intended to be achieved within the class level or within each year of study. Class level competencies reflect the skills, knowledge and attitudes which the learner should demonstrate within that level of study. However, these competencies are not discrete but rather continuous. It is possible that a particular competency may require more than one year to be developed.

## **6.2 Class level objectives**

The class level objectives are objectives intended to be achieved within a class level. These are specific instructional objectives at a particular class level. The class level objectives in this syllabus are stated in general terms and they have been derived from the competencies.

## **6.3 Topics/sub-topics**

This part describes the matter dealt within a subject. The major topics in this syllabus have been derived from the class level competencies and objectives. Every major topic has been divided into several sub-topics. Each sub-topic comprises a portion of the content of the topic in question. The sub-topics have also been arranged to attain a logical order and facilitate the learning process. The horizontal treatment of this syllabus is controlled by the sub-topics. This means that for every sub-topic, there are teaching and learning strategies; teaching and learning resources, assessment strategies and the estimated number of periods.

## **6.4 Specific objectives**

This includes statements that describe results in terms of knowledge, attitude, skills, aspiration and behaviour that a student is expected to develop and perform after going through the programme. They also reflect the process of developing the specified competencies within the cognitive, affective and psychomotor domains.



### **6.5 Teaching and learning strategies**

Teaching and learning strategies indicate what the teacher and the students are expected to be doing in the process of teaching and learning. The teaching/learning strategies in this syllabus are simply suggestive and not exhaustive. The teacher is free to use them or design his/ her own. The teacher is expected to work as a facilitator for supporting the students to learn. Participatory and cooperative learning based activities are encouraged for the students to work in groups effectively and participate in the learning processes.

### **6.6 Teaching and learning resources**

In the teaching and learning processes, various resources will be needed. In case the commercial materials needed are not available, the teacher and students should work together to collect or improvise alternative resources available in the school environment.

### **6.7 Assessment**

The suggested assessment strategies in this syllabus are based on the specific instructional objectives. The formative and summative assessment approaches should be directed towards mastering all the competencies and skills developed within the course. Instruments of assessment should ensure that all the levels of cognitive, affective and psychomotor domains are observed.

### **6.8 Number of periods**

The number of periods has been allocated per sub-topic. Topics with relatively wider content are allocated more time than others.

## FORM I

### CLASS LEVEL COMPETENCIES

By the end of form one, students should have developed competencies in:

- a) applying properties of matter in daily life;
- b) making appropriate measurements of physical quantities;
- c) using different types of forces in daily life;
- d) applying the effects of motion in the operations of machines;
- e) applying phenomena of work, energy and power in daily life;
- f) producing and transmitting sound waves;
- g) applying properties of light in life; and
- h) applying friction in solving technical problems in daily life.

### CLASS LEVEL OBJECTIVES

By the end of form one course, students should be able to:

- a) identify the properties of matter;
- b) make appropriate measurements of physical quantities;
- c) use different types of forces in daily life;
- d) identify the effects of motion in operation of machines;
- e) make appropriate computations of work, energy and power
- f) produce and transmitting sound waves;
- g) identify properties of light; and
- h) apply concept of friction in daily life.

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>1.0 INTRODUCTION TO ENGINEERING SCIENCE</b>	1.1 Concept of Science	The student should be able to: a) Explain the concept of science. b) Identify branches of science. c) Explain the importance of science in real life.	(i) The teacher to organise students in groups and guide them to: - Brainstorm the concept of science. - Identify the branches of science. - Explain the importance of science in real life. (ii) Students to present their responses for sharing and discussion. (iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i).	<ul style="list-style-type: none"> <li>• Chalk/white board</li> <li>• Manila sheet</li> <li>• Flip chart</li> <li>• Computer projector</li> <li>• Multimedia</li> <li>• Posters</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of science?</li> <li>2. Is the student able to identify the branches of science?</li> <li>3. Is the student able to explain the importance of science in real life?</li> </ol>	2
	1.2 Concepts of Engineering Science.	The student should be able to: a) Explain the concept of Engineering Science.	(i) The teacher to use questioning strategies (what, how and why questions) to guide students to: - Explain the concept of Engineering Science. - Identify the areas where Engineering Science is applied.	<ul style="list-style-type: none"> <li>• Chalk/white board</li> <li>• Manila sheet</li> <li>• Flip chart</li> <li>• Lap top</li> <li>• Posters</li> </ul>	1. Is a student able to explain the concept of Engineering Science?	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>b) Identify the applications of Engineering Science in daily life.</p> <p>c) Explain the importance of Engineering Science.</p>	<p>- Explain the importance of Engineering Science.</p> <p>(ii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i).</p>	<ul style="list-style-type: none"> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<p>2. Is the student able to identify the application of Engineering Science in daily life?</p> <p>3. Is the student able to explain the importance of Engineering Science?</p>	2
<b>2.0 MEASUREMENTS</b>	2.1 Concepts of Measurement	<p>The student should be able to:</p> <p>a) Explain the concepts of measurement.</p> <p>b) Explain the importance of measurement in real life.</p> <p>c) Measure the dimensions of various objects.</p>	<p>(i) The teacher to use brainstorming questions to guide students to explain the concepts of measurement.</p> <p>(ii) The teacher to use think-pair and share technique to guide students to discuss the importance of measurement in real life.</p> <p>(iii) Students to present their responses for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Metre rule</li> <li>• Tape measure</li> <li>• Beam balance</li> <li>• Stop watch</li> <li>• Vernier calliper</li> <li>• Micrometer screw-gauge</li> </ul>	<p>1. Is the student able to explain the concepts of measurement?</p> <p>2. Is the student able to state the importance of measurement in real life?</p>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher to create activities for students to measure the dimensions of various objects. (v) The teacher should monitor and facilitate students in performing the tasks given in part (iv). (vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iv). (vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).	<ul style="list-style-type: none"> <li>• Engineering science text books</li> <li>• Spring balance</li> <li>• Ruler</li> <li>• Clock</li> <li>• Measuring cylinder</li> </ul>	3. Is the student able to measure the dimensions of various objects?	
	2.2 Physical Quantities	The student should be able to: a) Define the term physical quantity. b) Identify two types of physical quantities.	(i) The teacher to use brainstorming questions to guide students to define the term physical quantity. (ii) The teacher to guide students in groups to identify the seven fundamental quantities and several derived quantities.	<ul style="list-style-type: none"> <li>• Metre rule</li> <li>• Tape measure</li> <li>• Beam balance</li> <li>• Stop watch</li> <li>• Vernier calliper</li> </ul>	1. Is the student able to define the term physical quantity?	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>b) Identify the seven fundamental physical quantities and several derived physical quantities.</p> <p>c) Differentiate between derived physical quantities and fundamental physical quantities</p> <p>d) Use appropriate instruments for measuring fundamental quantities.</p>	<p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher to use questioning strategies (what, why and how questions) to guide students to differentiate between derived physical quantities and fundamental physical quantities.</p> <p>(v) The teacher to use question and answer method to guide students to:</p> <ul style="list-style-type: none"> <li>- Identify the appropriate instruments for measuring the seven fundamental physical quantities</li> </ul> <p>(vi) The teacher to design activities and require students to use appropriate instruments for measuring fundamental quantities.</p> <p>(vii) The teacher should monitor and facilitate students in performing the tasks given in part (vi).</p>	<ul style="list-style-type: none"> <li>• Micrometer screw-gauge</li> <li>• Engineering science text books</li> <li>• Reference books</li> </ul>	<p>2. Is the student able to identify two types of physical quantities?</p> <p>3. Is the student able to identify the seven fundamental physical quantities and several derived physical quantities?</p> <p>4. Is the student able to differentiate between derived physical quantities and fundamental physical quantities?</p> <p>5. Is the student able to use appropriate instruments for measuring fundamental quantities?</p>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(viii) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (vi).</p> <p>(ix) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-viii).</p>			
<b>3.0 MEASURING INSTRUMENTS</b>	3.1 Basic Instruments in	<p>The student should be able to:</p> <p>a) Name the basic instruments used for measurements.</p> <p>b) Describe the basic instruments used for measurement.</p> <p>c) Explain uses of the measuring instruments.</p>	<p>(i) In groups, the teacher to guide students to</p> <ul style="list-style-type: none"> <li>- Name the basic instruments used for measurements.</li> <li>- Describe basic instruments used for measurements.</li> <li>- Explain use of the measuring instruments.</li> </ul> <p>(ii) The teacher to create activities for students to use the basic measuring instruments.</p> <p>(iii) The teacher should monitor and facilitate students in using the basic measuring instruments.</p>	<ul style="list-style-type: none"> <li>• Metre rule</li> <li>• Spring balance</li> <li>• Beam balance</li> <li>• Measuring cylinder</li> <li>• Burette</li> <li>• Calibrated beaker</li> <li>• Pipette</li> <li>• Ruler</li> <li>• Tape measure</li> <li>• Stop watch</li> </ul>	<p>1. Is the student able to name the basic instruments used for measurements?</p> <p>2. Is the student able to describe the basic instruments used for measurements?</p>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Use the basic measuring instruments.	(iv) Students to present their responses for sharing and discussion. (v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).		3. Is the student able to explain uses of the measuring instruments? 4. Is the student able to use basic measuring instruments?	
	3.2 Errors in	The student should be able to: a) Define error in measurement. b) Investigate the sources of errors in measurement. c) Explain the concepts of parallax error, zero error and instrumental error.	(i) The teacher to use brainstorming questions to guide students define the concept of error in measurement. (ii) The teacher to organise students in groups and guide them to: - Investigate the sources of errors in measurement and how to minimize them. - Explain the concepts of parallax error, zero error and instrumental error. (iii) Students to present their responses for sharing and discussion.	<ul style="list-style-type: none"> <li>• Metre rule</li> <li>• Spring balance</li> <li>• Beam balance</li> <li>• Measuring cylinder</li> <li>• Burette</li> <li>• Calibrated beaker</li> <li>• Pipette</li> <li>• Stop watch</li> <li>• Solid objects</li> <li>• Weights</li> <li>• Ruler</li> <li>• Digital balance</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to define an error in measurement? 2. Is the student able to investigate the sources of errors in measurements? 3. Is the student able to explain the concepts of parallax error, zero error and instrumental error?	2



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).			
	3.3 Measuring Length	<p>The student should be able to:</p> <p>a) Define length</p> <p>b) State the SI unit of length.</p> <p>c) Name the basic instruments for measuring length</p> <p>d) Measure various lengths.</p> <p>e) Measure diameter of a tube by using Vernier calliper.</p> <p>f) Measure the thickness of wire using micrometer screw-gauge.</p>	<p>(i) The teacher to use questions to guide the students to:</p> <ul style="list-style-type: none"> <li>- Define length of a body.</li> <li>- State the SI unit of length.</li> </ul> <p>(ii) The teacher to create activities and guide students to:</p> <ul style="list-style-type: none"> <li>- Measure the items of different lengths such as books, desks, wall and floor.</li> <li>- Measure the inside and outside diameters of tubes by using Vernier caliper.</li> <li>- Measure thickness or diameter of wires by using a micrometer screw-gauge.</li> </ul> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their work for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Metre rule</li> <li>• Steel rule</li> <li>• Tape measure</li> <li>• Vernier calliper</li> <li>• Micrometer screw-gauge</li> <li>• Wall</li> <li>• Floor</li> <li>• SI table Books</li> <li>• Internet</li> <li>• Ruler</li> <li>• Desks</li> <li>• Table</li> <li>• Tubes</li> <li>• Conduit pipe</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the length of a body?</li> <li>2. Is the student able to state the SI unit of length?</li> <li>3. Can the student measure various lengths?</li> <li>4. Is the student able to measure diameters of tubes?</li> </ol>	3

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii). (vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).	<ul style="list-style-type: none"> <li>Wires of different diameters</li> <li>Engineering science text books</li> </ul>	5. Is the student able to measure the diameters of wires using micrometer screw-gauge?	
	3.4 Measuring Time	The student should be able to: a) Define time. b) State the SI units of time. c) Name the basic instruments for measuring time. d) Measure time using a watch/stop watch. e) Convert time from one unit to another.	(i) In pairs, the teacher to guide students to - Define the concept of time. - State the SI units of time. (ii) Students to present their responses for sharing and discussion. (iii) The teacher to design activities for students to: - Measure different time intervals. - Measure time using a watch/stop watch. - Convert time from one unit to another. (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).	<ul style="list-style-type: none"> <li>Watch</li> <li>Stop watch</li> <li>Conversion formulae, hours to minutes, minutes to seconds, seconds to points,</li> <li>Engineering science text books</li> </ul>	1. Can the student define the term time? 2. Can the student state the SI units of time? 3. Can the student Name the basic instruments for measuring time? 4. Is the student able to measure time intervals? 5. Can the student convert time measured in one unit to another?	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>			
	3.5 Measuring Mass	<p>The student should be able to:</p> <p>a) Define the term mass.</p> <p>b) Explain the concept of mass of a substance.</p> <p>c) State the SI unit of mass.</p> <p>d) Name the basic instruments for measuring mass.</p> <p>e) Measure accurately the mass of a body using beam balance.</p>	<p>(i) The teacher to use questions to guide the students to:</p> <ul style="list-style-type: none"> <li>- Define mass of a substance.</li> <li>- Explain the concept of mass of a substance.</li> <li>- State the SI unit of mass.</li> </ul> <p>(ii) The teacher to create activities and guide students in pairs to measure accurately the mass of an object using beam balance.</p> <p>(iii) The teacher should monitor and facilitate students in measuring the mass of an object using beam balance.</p>	<ul style="list-style-type: none"> <li>• Beam balance</li> <li>• Digital balance</li> <li>• Chalk/white board</li> <li>• Pens</li> <li>• Exercise book</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term mass?</li> <li>2. Is the student able to explain the concept of mass of a substance?</li> <li>3. Can the student state the SI unit of mass?</li> <li>4. Can the student name the basic instruments for measuring mass?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii).</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>		5. Is the student able to measure accurately the mass of a body?	
	3.6 Measuring Weight	<p>The student should be able to:</p> <p>a) Define the concept of weight.</p> <p>b) State the SI unit of weight.</p> <p>c) Name the basic instruments for measuring weights.</p> <p>d) Measure the weight of a body using a spring balance.</p>	<p>(i) The teacher to guide students in pairs to:</p> <ul style="list-style-type: none"> <li>- Define the concept of weight.</li> <li>- State the SI unit of weight.</li> <li>- Name the basic instruments for measuring weight.</li> </ul> <p>(ii) The teacher to use questioning strategies (why, how and what questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the difference between mass and weight of a body.</li> <li>- Explain the relationship between mass and weight.</li> </ul>	<ul style="list-style-type: none"> <li>• Spring balance</li> <li>• Various weights (stones)</li> <li>• Beam balance</li> <li>• Digital balance</li> <li>• Chalk/white board</li> <li>• Exercise books</li> <li>• Engineering science text books</li> <li>• Manila cards</li> <li>• Multi-media</li> <li>• Projector</li> </ul>	<p>1. Can the student define the of concept weight?</p> <p>2. Can the student state the SI unit of weight?</p> <p>3. Can the student name the basic instruments for measuring weight?</p>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>e) Explain the difference between mass and weight of a body.</p> <p>f) Explain the relationship between mass and weight.</p> <p>g) Convert units of weight to units of mass using the formula <math>w = mg</math>.</p> <p>h) Measure weights and masses of different objects.</p>	<p>(iii) The teacher to create activities and require students to:</p> <ul style="list-style-type: none"> <li>- Change unit of weight into units of mass using the formula <math>w = mg</math>.</li> <li>- Measure weight of a body using spring balance.</li> <li>- Measure weights and masses of different objects.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their work for sharing and discussion.</p> <p>(vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii).</p> <p>(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>		<p>4. Can the student measure the weight of a body using spring balance?</p> <p>5. Is the student able to explain the difference between mass and weight?</p> <p>6. Is the student able to state the relationship between mass and weight?</p> <p>7. Can the student measure weights and masses of different objects?</p> <p>8. Can the student convert unit of weight to units of mass?</p>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.7 Measuring Volume	<p>The student should be able to:</p> <p>a) Define the term volume of substance.</p> <p>b) State the SI unit of volume.</p> <p>c) Name the basic instruments for measuring volume.</p> <p>d) Measure the volume of a regular solid body.</p> <p>e) Measure the volume of an irregular solid body.</p> <p>f) Measure the volume of liquids.</p> <p>g) Calculate the volume of liquids and solids.</p>	<p>(i) In groups, the teacher to guide students to:</p> <ul style="list-style-type: none"> <li>- Define the term volume of substance.</li> <li>- State the SI unit of volume.</li> </ul> <p>(ii) The teacher to create activities and require students to:</p> <ul style="list-style-type: none"> <li>- Measure the volumes of different regular objects.</li> <li>- Measure the volumes of different irregular objects.</li> <li>- Measure the volumes of liquids.</li> <li>- Calculate the volumes of liquids and solids.</li> </ul> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their work for sharing and discussion.</p> <p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii).</p>	<ul style="list-style-type: none"> <li>• Calibrated measuring cylinder</li> <li>• Various solids and liquids</li> <li>• 1 litre, 10 litres etc. vessels</li> <li>• Chalk/white board</li> <li>• Exercise books</li> <li>• Engineering science text books</li> <li>• Manila cards</li> <li>• Multimedia Projector</li> <li>• Eureka can</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term volume of substance?</li> <li>2. Is the student able to state the SI unit of volume?</li> <li>3. Can the student name the basic instruments for measuring volume?</li> <li>4. Is the student able to measure the volume of a regular solid body?</li> <li>5. Is the student able to measure the volume of an irregular solid body?</li> <li>6. Can the student measure the volume of liquids?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).		7. Is the student able to calculate the volumes of liquids and solids?	
	3.8 Measuring Density	The student should be able to: a) Define the concept of density. b) State SI units of density. c) Explain concepts of density of regular object. d) Name the basic instruments for measuring density. e) Measure the density of a regular solid object.	(i) The teacher to use brainstorming questions to guide students to: - Define the concept of density. - State the SI units of density. - Explain the concepts of density of regular object. (ii) The teacher to create activities and require students to: - Measure the density of a regular solid object. - Measure the density of an irregular solid object. - Measure the density of liquids. - Calculate densities of liquids and solids.	<ul style="list-style-type: none"> <li>• Beam balance</li> <li>• Measuring cylinder</li> <li>• Water</li> <li>• Calibrated beaker</li> <li>• Eureka can or Overflow can</li> <li>• Regular objects</li> <li>• Regular and irregular materials</li> <li>• Regular and irregular objects</li> <li>• Density bottle</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the concept of density?</li> <li>2. Is the student able to state the SI units of density?</li> <li>3. Is the student able to explain concepts of density of regular object?</li> <li>4. Is the student able to name the basic instruments for measuring density?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Measure the density of an irregular solid. g) Measure the density of liquids. h) Calculate densities of liquids and solids.	(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii). (iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii). (v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).		5. Is the student able to measure the density of a regular solid object? 6. Is the student able to measure the density of irregular solid objects? 7. Is the student able to measure the density of liquids? 8. Is the student able to calculate densities of liquids and solids?	



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.9 Measuring Relative Density	<p>The student should be able to</p> <p>a) Define the term relative density.</p> <p>b) Explain why relative density has no units.</p> <p>c) Name the basic instruments for measuring relative density.</p> <p>d) Measure the relative density of a liquid.</p> <p>e) Calculate the relative densities of substances.</p> <p>f) Calculate the relative densities of liquids.</p>	<p>(i) The teacher to use brainstorming questions to guide students to define the term relative density of a substance.</p> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to explain why relative density has no units.</p> <p>(iii) The teacher to create activities and require students to:</p> <ul style="list-style-type: none"> <li>- Measure the relative density of a liquid.</li> <li>- Calculate the relative densities of substances.</li> <li>- Calculate the relative densities of liquids.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their work for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Water</li> <li>• Measuring cylinder</li> <li>• Can</li> <li>• Solid objects</li> <li>• Regular and irregular objects</li> <li>• Milk</li> <li>• Density Bottle</li> <li>• Exercise books</li> <li>• Engineering science text books</li> <li>• Chalk/white board</li> <li>• Iron nails</li> <li>• Rubber band</li> <li>• Eureka can</li> </ul>	<p>1. Is the student able to define the term relative density of a substance?</p> <p>2. Is the student able to explain why relative density has no units?</p> <p>3. Is the student able to name the basic instruments for measuring relative density?</p> <p>Is the student able to measure the relative density of a liquid?</p> <p>5. Is the student able to calculate the relative densities of substances?</p>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(vi) With the aid of preprepared assessment guideline, the teacher should guide students to assess activities performed in part (iii).</p> <p>(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-vi).</p>		6. Is the student able to calculate the relative densities of liquids?	
<b>4.0 FORCES: (PART ONE)</b>	4.1 Concept of Force.	The student should be able to: a) Explain the concept of force. b) State the SI units of force.	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of force.</li> <li>- State the SI units of force.</li> </ul> <p>(ii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i)</p>	<ul style="list-style-type: none"> <li>• Spring balance</li> <li>• Spiral spring</li> <li>• Magnetic poles</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the concept of forces?</p> <p>2. Is the student able to state the SI units of force?</p>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.2 Types of Forces	<p>The students should be able to</p> <p>a) Identify fundamental and non-fundamental types of forces.</p> <p>b) Describe the properties of each type of fundamental and non-fundamental forces.</p> <p>c) Explain the effects of forces on bodies.</p>	<p>(i) The teacher to arrange students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify types of fundamental and non-fundamental forces.</li> <li>- Describe the properties of each type of fundamental and non-fundamental forces.</li> <li>- State the effects of forces on bodies.</li> </ul> <p>(ii) Students to present their responses for sharing and discussion.</p> <p>(iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Spiral spring</li> <li>• Helical spring</li> <li>• Magnetic poles</li> <li>• Rubber band</li> <li>• Moving objects</li> <li>• Motor vehicles</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify the types of fundamental and non-fundamental forces?</li> <li>2. Is the student able to describe the properties of each type of fundamental and non-fundamental forces?</li> <li>3. Is the student able to explain the effects of forces on bodies?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.3 Effects of Force	<p>The students should be able to:</p> <p>a) Identify the effects of force.</p> <p>b) Explain the applications of force in daily life.</p> <p>c) Perform an experiment to demonstrate the effects of force.</p>	<p>(i) The teacher to use questions to guide students to discuss the effects of force.</p> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to explain the applications of force in daily life</p> <p>(iii) The teacher to create activities for students to perform an experiment to demonstrate the effects of force.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>	<ul style="list-style-type: none"> <li>• Jelly cans</li> <li>• Sponge</li> <li>• Spiral spring</li> <li>• Helical spring</li> <li>• Motor vehicles springs</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to identify the effects of force?</p> <p>2. Is the student able to state the applications of force in daily life?</p> <p>3. Can the student perform an experiment to demonstrate the effects of force?</p>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.4 Scalar and Vector Quantities.	The student should be able to: a) Define the terms scalar and vector quantities. b) Identify scalar and vector quantities. c) Differentiate between scalar and vector quantities.	(i) In groups, the teacher to guide students to brainstorm on meaning of scalar and vector quantities. (ii) The teacher uses questions to guide students to identify the scalar and vector quantities. (iii) The teacher to use questioning strategies (what, how and why questions) to guide students to differentiate scalar and vector quantities. (iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).	<ul style="list-style-type: none"> <li>• Chart showing Physical quantities</li> <li>• Chart showing a list of scalars and vectors</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student differentiate between scalar and vector quantities?</li> <li>2. Is the student able to identify scalar and vector quantities?</li> <li>3. Is the student able to differentiate between scalar and vector quantities?</li> </ol>	1
	4.5 Vector Treatment of Force	The student should be able to a) Draw diagrams to show how a force is represented by a directed line segment (a vector).	(i) The teacher to create activities and guide students in groups, to: - Draw diagrams to show how a force is represented by a directed line segment (a vector).	<ul style="list-style-type: none"> <li>• Graph papers</li> <li>• Mathematical set</li> <li>• Protractor</li> <li>• Set square</li> <li>• Divider</li> <li>• Compass</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to draw diagrams to show how a force is represented by a vector?</li> </ol>	4

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>b) Find the resultant of two forces acting at a point, in the same direction and on same plane by scale drawing.</p> <p>c) Find the resultant of two forces acting at a point, in the opposite directions, by accurate drawing.</p> <p>d) Find the resultant of two forces acting at a point, making an acute angle between them, by means of drawing.</p>	<ul style="list-style-type: none"> <li>- Find the resultant of two forces acting at a point, in the same direction and on same plane by scale drawing.</li> <li>- Find the resultant of two forces acting at a point, in the opposite directions, by means of drawing.</li> <li>- Find the resultant of two forces acting at a point, making an acute angle between them by scale drawing.</li> <li>- Find the resultant of two forces acting at a point, making a right angle between them scale drawing</li> <li>- Find the resultant of two forces acting at a point, making an obtuse angle between them by scale drawing.</li> </ul>	<ul style="list-style-type: none"> <li>• Pencils</li> <li>• Pencil eraser</li> <li>• Chalk/white board</li> <li>• Ruler</li> <li>• Engineering science text books</li> </ul>	<p>2. Is the student able to find the resultant of two forces acting at a point, in the same direction and on same plane by scale drawing?</p> <p>3. Is the student able to find the resultant of two forces acting at a point, in the opposite directions, by means of drawing?</p> <p>4. Is the student able to find the resultant of two forces acting at a point, making an acute angle between them scale drawing?</p>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>e) Find the resultant of two forces acting at a point, making a right angle between them scale drawing.</p> <p>f) Find the resultant of two forces acting at a point, making an obtuse angle between them by scale drawing.</p> <p>g) Resolve a force into horizontal component and vertical component by scale drawing.</p>	<p>- Resolve a force into horizontal component and vertical component by scale drawing.</p> <p>(ii) The teacher should monitor and facilitate students in performing the tasks given in part (i).</p> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (i).</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in resolving a force into horizontal component and vertical component by an accurate scale drawing.</p>		<p>5. Is the student able to find the resultant of two forces acting at a point, making a right angle between them by scale drawing?</p> <p>6. Is the student able to find the resultant of two forces acting at a point, making an obtuse angle between them by scale drawing?</p> <p>7. Is the student able to resolve a force into horizontal component and vertical component by scale drawing?</p>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
5.0 PROPERTIES OF MATTER	5.1 Structure of Matter	<p>The student should be able to:</p> <p>a) Explain the concept of matter.</p> <p>b) Explain the nature of matter.</p> <p>c) Explain the kinetic theory of matter</p> <p>d) Classify three states of matter.</p>	<p>(i) The teacher to use questions to guide students to explain the concept of matter.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify examples of matter.</li> <li>- Justify the particulate nature of matter by applying Brownian motion in liquid and gases.</li> <li>- Discuss the kinetic theory of matter.</li> </ul> <p>(iii) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Demonstrate the movement of particles in smoke and coloured substances using a microscope and torch.</li> <li>- Classify three states of matter using yes/no cards.</li> <li>- Classify the three states of matter.</li> </ul>	<ul style="list-style-type: none"> <li>• Various objects</li> <li>• Coloured substances e.g. KMnO<sub>4</sub>, I<sub>2</sub>, Br<sub>2</sub></li> <li>• Microscope</li> <li>• Pollen grain</li> <li>• Marble</li> <li>• Smoke cell</li> <li>• Light source(torch)</li> <li>• Magnifying lens</li> <li>• Smoke</li> <li>• Solids: stones, wood</li> <li>• Liquids: water, milk, etc.</li> <li>• Gas: Oxygen gas, hydrogen gas.</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of matter?</li> <li>2. Is the student able to explain the nature of matter?</li> <li>3. Is the student able to explain the kinetic theory of matter?</li> <li>4. Is the student able to classify three states of matter?</li> </ol>	2



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii). (v) Students to present their responses for sharing and discussion. (vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii). (vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-vi).			
	5.2 Adhesion and Cohesion	The student should be able to: a) Explain the concepts of adhesion and cohesion. b) Identify applications of adhesion and cohesion in daily life.	(i) The teacher to use thumb up/ thumb down technique to guide the students to answer questions related to adhesion and cohesion. (ii) The teacher to use questions to guide students to: - Explain the concepts of adhesion and cohesion	<ul style="list-style-type: none"> <li>• Glass tubes with narrow bores of different diameters</li> <li>• Kerosene lamp with wick</li> <li>• Blotting paper</li> <li>• Towel</li> <li>• Tape</li> </ul>	1. Can the student explain the concepts of adhesion and cohesion? 2. Can the student Identify applications of adhesion and cohesion in daily life?	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<ul style="list-style-type: none"> <li>- Identify applications of adhesion and cohesion in daily life.</li> </ul> (iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).	<ul style="list-style-type: none"> <li>• Glue</li> <li>• Water</li> <li>• Needle</li> <li>• Ink</li> <li>• Paper</li> <li>• Engineering science text books</li> </ul>		
	5.3 Surface Tension	The student should be able to: a) Explain the concept of surface tension. b) Identify the applications of surface tension.	(i) The teacher to use brainstorming questions to guide students to: <ul style="list-style-type: none"> <li>- Explain the concept of surface tension.</li> <li>- Identify the applications of surface tension</li> </ul> (ii) The teacher to organise students in groups and guide them to discuss the applications of surface tension. (iii) Students to present their responses for sharing and discussion.	<ul style="list-style-type: none"> <li>• Mosquito larva</li> <li>• Soap</li> <li>• Needle</li> <li>• Water</li> <li>• Beaker/trough</li> <li>• Thread</li> <li>• Pond skater</li> <li>• Engineering science text books</li> </ul>	1. Can the student explain the concept of surface tension? 2. Is the student able to identify the application of surface tension?	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).			
	5.4 Capillarity	The student should be able to: a) Explain the concept of capillarity. b) Identify the applications of capillarity in daily life. c) Carry out an experiment on capillarity.	(i) The teacher to organise students in groups to guide them to: - Explain the concept of capillarity. - Identify the applications of capillarity in daily life. (ii) The teacher to create activities for students to: - Carry out an experiment on capillarity - Carry out an experiment to show the rise of water in glass tubes with narrow bores of different diameters. (iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).	<ul style="list-style-type: none"> <li>• Glass tubes with narrow bores of different diameters</li> <li>• Kerosene lamp with wick</li> <li>• Blotting paper</li> <li>• Towel</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of capillarity?</li> <li>2. Can the student identify the applications of capillarity in daily life?</li> <li>3. Can the student carry out an experiment on capillarity?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>			
	5.5 Osmosis	<p>The student should be able to:</p> <p>a) Explain the concept of osmosis.</p> <p>b) Identify the applications of osmosis in daily life.</p> <p>c) Carry out an experiment for verifying the concept of osmosis.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the concept of osmosis.</li> <li>- Identify the applications of osmosis in daily life.</li> </ul> <p>(ii) The teacher to create activities and arrange students to carry out an experiment for verifying the concept of osmosis.</p> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p>	<ul style="list-style-type: none"> <li>• Irish potato with scoup</li> <li>• Beaker with water</li> <li>• Sugar</li> <li>• Table salt</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of osmosis?</li> <li>2. Is the student able to identify the applications of osmosis in daily life?</li> <li>3. Can the student carry out an experiment for verifying the concept of osmosis?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii).</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	5.6 Diffusion	<p>The student should be able to:</p> <p>a) Explain the concepts of diffusion.</p> <p>b) Identify the applications of diffusion in daily life.</p> <p>c) Carry out an experiment for verifying the concept of diffusion.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the concepts of diffusion.</li> <li>- Identify the applications of diffusion in daily life.</li> </ul> <p>(ii) The teacher to create activities and arrange students to carry out an experiment for verifying the concepts of diffusion.</p> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p>	<ul style="list-style-type: none"> <li>• Beaker with water</li> <li>• Perfume</li> <li>• Smoke</li> <li>• Coloured crystals</li> <li>• Bunsen burner</li> <li>• Copper sulphate solution</li> <li>• Chlorine</li> <li>• Air</li> <li>• Gas</li> <li>• Glass lid</li> </ul>	<p>1. Is the student able to explain the concepts of diffusion?</p> <p>2. Is the student able to identify the applications of diffusion in daily life?</p> <p>3. Can the student carry out an experiment for verifying the concepts of diffusion?</p>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii).</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
<b>6.0 LINEAR MOTION</b>	6.1 Distance and	<p>The student should be able to:</p> <p>a) Explain the concept of distance and displacement.</p> <p>b) Distinguish concepts of distance and displacement.</p> <p>c) State the SI unit of distance and displacement.</p>	<p>(i) The teacher to use questions to guide students to explain the concept of distance and displacement.</p> <p>(ii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Tape measure</li> <li>• Manila sheet</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Masking tape</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student explain the concept of distance and displacement?</li> <li>2. Can the student distinguish concepts of distance and displacement?</li> <li>3. Is the student able to state the SI unit of distance and displacement?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.2 Speed and Velocity	<p>The student should be able:</p> <p>a) Distinguish the concepts of speed and velocity.</p> <p>b) State the SI units of speed and velocity</p> <p>c) Determine the average velocity of a body.</p> <p>d) Calculate the average velocity of a body.</p>	<p>(i) The teacher to use questions to guide students to discuss the concepts of speed and velocity.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify SI units of speed and velocity.</li> <li>- Distinguish the concepts of speed and velocity.</li> </ul> <p>(iii) The teacher to create activities for students to calculate average velocity of a body.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii).</p>	<ul style="list-style-type: none"> <li>• Timer</li> <li>• Measuring tape.</li> <li>• Reference books</li> <li>• Engineering science text books</li> <li>• Computer</li> <li>• Speedometer</li> <li>• Measuring tape.</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to distinguish between speed and velocity?</li> <li>2. Can the student state the SI units of speed and velocity?</li> <li>3. Can the student determine the average velocity of a body?</li> <li>4. Can the student calculate the average velocity of a body?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).			
	6.3 Acceleration	The student should be able to: a) Interpret velocity against time graph. b) Explain the concepts of acceleration. c) Explain the concepts of retardation. d) Determine the acceleration and retardation of a body.	(i) The teacher to use brainstorming questions to guide students to interpret velocity time graph. (ii) The teacher to use questions to guide students to explain the concepts of acceleration and retardation. (iii) The teacher to create activities for students to: - Determine the rate of change in velocity with time. - Determine the acceleration and retardation of a body. (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).	<ul style="list-style-type: none"> <li>• Velocity time graph on manila sheet/ flip chart</li> <li>• Trolleys</li> <li>• Ticker-tape timer</li> <li>• Velocity- time graph</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to interpret the velocity-time graph?</li> <li>2. Is the student able to explain the concepts of acceleration and retardation?</li> <li>3. Is the student able to determine the acceleration and retardation of a body?</li> </ol>	2



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>			
	6.4 Equations of Uniformly Accelerated Motion	<p>The student should be able to:</p> <p>a) Explain the concepts uniformly of accelerated motion.</p> <p>b) Derive equations of uniformly accelerated motion.</p> <p>c) Use equations of uniformly accelerated motion in daily life.</p>	<p>(i) The teacher to use brainstorming questions to explain the concepts of uniformly accelerated motion.</p> <p>(ii) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Derive equations of uniformly accelerated motion.</li> <li>- Use equations of uniformly accelerated motion in daily life.</li> <li>- Solve problems related to equations of uniformly accelerated motion in daily life.</li> </ul>	<ul style="list-style-type: none"> <li>• Kinematics reference books</li> <li>• Velocity – time graphs for uniformly accelerated motion</li> <li>• Bank of kinematics equations</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concepts of uniformly accelerated motion?</li> <li>2. Is the student able to derive and use the equations of uniformly accelerated motion?</li> <li>3. Can the student use equations of uniformly accelerated motion in daily life?</li> </ol>	4

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Solve problems related to equations of uniformly accelerated motion in daily life.	(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii). (iv) Students to present their work for sharing and discussion. (v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (iii). (vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).		4. Can the student apply the equation of uniformly accelerated motion in daily life?	
	6.5 Motion Under Gravity	The student should be able to: a) Explain the concept of gravitational force. b) Determine acceleration due to gravity. c) Explain the applications of gravitational force in daily life.	(i) The teacher to use brainstorming questions to guide students to explain the concept of gravitational force. (ii) The teacher to organise students in groups and use questions to guide them to: - Share ideas on a body thrown vertically upwards and a falling body. - Discuss how to determine acceleration due to gravity.	<ul style="list-style-type: none"> <li>• Stones</li> <li>• Balls</li> <li>• Fruits</li> <li>• Pendulum bob</li> <li>• Inextensible string</li> <li>• Metre rules</li> <li>• Retort stand</li> <li>• Corks</li> <li>• Graph papers</li> </ul>	1. Is the student able to explain the concept of gravitational force? 2. Can the student determine the acceleration due gravity?	3

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<ul style="list-style-type: none"> <li>- Determine the acceleration due to gravity, experimentally.</li> <li>- Explain applications of gravitational force in daily life.</li> </ul> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Reference books</li> <li>• Computer projector</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	3. Is the student able to explain the applications of gravitational force in daily life?	
	6.6 Newton's First Law of Motion	The student should be able to: a) State Newton's first law of motion b) Mention examples for the Newton's first law of motion. c) Define the law of inertia.	(i) The teacher to use questions to guide students to: <ul style="list-style-type: none"> <li>- State Newton's first law of motion.</li> <li>- Mention examples for the Newton's first law of motion.</li> <li>- Define the law of Inertia.</li> <li>- Show example of inertia.</li> <li>- Show the effects of inertia</li> </ul>	<ul style="list-style-type: none"> <li>• A body at rest</li> <li>• A moving body</li> <li>• Pendulum bob</li> <li>• Stop watch</li> <li>• String</li> <li>• Cork</li> <li>• Metre rule</li> <li>• Two students with different weights</li> </ul>	1. Can the student state Newton's first law of motion? 2. Is the student able to mention the examples of the Newton's first law of motion?	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Describe the functionalities of Newton's first laws.	(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to describe the functionalities of Newton's first laws.  (iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).	<ul style="list-style-type: none"> <li>• Trolley</li> <li>• Various masses (Objects)</li> </ul>	3. Can the student define the law of Inertia?  4. Is the student able to describe the functionalities of Newton's first laws?	2
	6.7 Newton's Second Law of Motion	The student should be able to: a) State Newton's second law of motion. b) Explain the concept of linear momentum. c) State the SI units of linear momentum. d) Explain the relationship between momentum and force.	(i) The teacher to use questions to guide students to: - State Newton's second law of motion. - Explain the concept of linear momentum. (ii) The teacher to organise students in groups and use questions to guide students to: - State the SI unit of linear momentum. - Explain the concept of Second law of motion in terms of momentum. - Explain the relationship between momentum and force.	<ul style="list-style-type: none"> <li>• A body at rest</li> <li>• A moving body</li> <li>• Pendulum bob</li> <li>• Stop watch</li> <li>• String</li> <li>• Cork</li> <li>• Metre rule</li> <li>• Two students with different weights</li> <li>• Trolley</li> </ul>	1. Is the student able to state Newton's second law of motion?  2. Is the student able to explain the concept of linear momentum?  3. Is the student able to state the SI units of linear momentum?	4

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>e) State the relationship between the velocity and mass of a body moving in a straight line.</p> <p>f) Describe the functionalities of Newton's second law.</p> <p>g) Carry out activities to determine the functionalities of Newton's second law.</p>	<p>(iii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- State the relationship between the velocity and mass of a body moving in a straight line.</li> <li>- Describe the functionalities of Newton's second law.</li> </ul> <p>(iv) The teacher to design activity and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Determine the linear momentum of a given mass and velocity.</li> <li>- Conduct frictional force experiment when a body starts motion on a rough surface.</li> <li>- Demonstrate action of the Newton's second law of motion, by using two students, one with heavy weight and other one with low weight to run in front of a class.</li> </ul>	<ul style="list-style-type: none"> <li>• Various masses (Objects)</li> <li>• Computer projector</li> <li>• Trolley</li> <li>• 10kg, 50 kg masses</li> <li>• Timer</li> <li>• Meter rule</li> <li>• A moving object</li> <li>• A toy gun</li> <li>• Pebble</li> <li>• 20 kg of sand</li> <li>• Rope</li> <li>• Various masses (Objects)</li> <li>• Balloon</li> </ul>	<p>4. Is the student able to explain the relationship between momentum and force?</p> <p>5. Is the student able to state the relationship between the velocity and mass of a body moving in a straight line?</p> <p>6. Can the student describe the functionalities of Newton's second law?</p> <p>7. Can the student carry out activities to determine the functionalities of Newton's second law?</p>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(v) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	6.8 Newton's Third Law of Motion	<p>The student should be able to:</p> <p>a) State Newton's third law of motion.</p> <p>b) Differentiate between balanced force and balanced action force.</p> <p>c) Describe the differences between balanced force and balanced action force.</p> <p>d) Identify action and reaction force pairs.</p>	<p>(i) The teacher to use questions to guide students to state Newton's third law of motion.</p> <p>(ii) The teacher to organise students in groups and use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Differentiate between balanced force and balanced action force.</li> <li>- Identify action and reaction force pairs.</li> <li>- Distinguish between action and reaction forces.</li> </ul>	<ul style="list-style-type: none"> <li>• A body at rest</li> <li>• A moving body</li> <li>• Pendulum bob</li> <li>• Stop watch</li> <li>• String</li> <li>• Cork</li> <li>• Metre rule</li> <li>• Two students with different weights</li> <li>• Trolley</li> <li>• Various masses (Objects)</li> <li>• Computer projector</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student state Newton's third law of motion?</li> <li>2. Is the student able to differentiate between balanced force and balanced action force?</li> <li>3. Can the student describe the differences between balanced force and balanced action force?</li> </ol>	4

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) Distinguish between action and reaction forces. f) Demonstrate the Newton's third law of motion. g) Describe the functionalities of Newton's third law.	(iii) The teacher to design activity and guide students in groups to demonstrate the Newton's third law of motion using a backward stroke of a gun releasing bullet when fired. (iv) The teacher to use questioning strategies (what, why and how questions) to guide students to: - Describe the differences between balanced force and balanced action force - Describe the functionalities of Newton's third-laws. (v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).	<ul style="list-style-type: none"> <li>• Trolley</li> <li>• 10kg, 50 kg masses</li> <li>• Timer</li> <li>• A toy gun</li> <li>• Pebble</li> <li>• 20 kg of sand</li> <li>• Rope</li> <li>• Balloon</li> <li>• Bicycle pump</li> <li>• Air</li> </ul>	4. Is the student able to identify action and reaction force pairs? 5. Can the student distinguish between action and reaction forces? 6. Is the student able to demonstrate the Newton's third law of motion? 7. Can the student describe the functionalities of Newton's third laws?	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>7.0 WORK, ENERGY AND POWER</b>	7.1 Work	<p>The student should be able to:</p> <p>a) Explain the concept of work.</p> <p>b) State the SI units of work.</p> <p>c) State the equation of work done.</p> <p>d) Solve problems on work done numerically and graphically.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of the term work.</li> <li>- Explain the concept of work.</li> <li>- State the SI unit of work.</li> </ul> <p>(ii) In groups, students to:</p> <ul style="list-style-type: none"> <li>- Discuss about the equation of work done.</li> <li>- Illustrate the formula of work done and solve it graphically and numerically</li> <li>- State the equation of work done.</li> </ul> <p>(iii) The teacher to create activities for students to solve the problems on work done numerically and graphically.</p> <p>(iv) The teacher should monitor and facilitate students in solving the problems on work done numerically and graphically.</p> <p>(v) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-iv).</p>	<ul style="list-style-type: none"> <li>• Measuring tape</li> <li>• Load (weight)</li> <li>• Beam balance</li> <li>• Posters</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Graph papers</li> <li>• Pencils</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of work?</li> <li>2. Can the student state the SI units of work?</li> <li>3. Can the student state the equation of work done?</li> <li>4. Can the student solve the problems on work done numerically and graphically?</li> </ol>	1



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.2 Energy	<p>The student should be able to:</p> <p>a) Explain the concept of energy.</p> <p>b) State the SI unit of energy.</p> <p>c) Explain the relationship between matter and energy.</p> <p>d) Identify different forms of energy.</p> <p>e) Explain differences between potential energy and kinetic energy</p>	<p>(i) The teacher to use brainstorming questions to guide students to explain the terms energy.</p> <p>(ii) The teacher to organise students in groups and use questions to guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the relationship between matter and energy.</li> <li>- Mention different forms of energy.</li> </ul> <p>(iii) The teacher to use questioning strategies to guide students to differentiate the concepts of potential and kinetic energy.</p> <p>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Posters</li> <li>• Marker pens</li> <li>• Manila sheet</li> <li>• Chalk/white board</li> <li>• Laptop</li> <li>• Projector</li> <li>• A stationary object</li> <li>• Water flowing in a pipe</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of energy and its SI units?</li> <li>2. Is the student able to state the SI unit of energy?</li> <li>3. Can the student explain the relationships between matter and energy?</li> <li>4. Is the student able to identify different forms of energy?</li> <li>5. Is the student able to distinguish between potential and kinetic energy?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.3 Forms of Energy	<p>The student should be able to:</p> <p>a) Identify forms of energy.</p> <p>b) Explain the applications of each form of energy in daily life.</p>	<p>(i) The teacher to use questions to guide students to list different forms of energy namely;</p> <ul style="list-style-type: none"> <li>- Mechanical energy (Kinetic energy and Potential energy)</li> <li>- Heat energy</li> <li>- Light energy</li> <li>- Sound energy</li> <li>- Chemical energy</li> <li>- Electrical energy</li> <li>- Nuclear energy</li> <li>- Wind energy</li> <li>- Hydro electric energy</li> <li>- Sea wave energy</li> </ul> <p>(ii) The teacher to organize group discussion for students to explain the application of each form of energy in daily life.</p> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Posters</li> <li>• Computer</li> <li>• Projector</li> <li>• Kerosene</li> <li>• Diesel</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student mention forms of energy?</li> <li>2. Can the student explain the applications of each form of energy in daily life?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.4 Principle of Conservation of Energy	<p>The student should be able to:</p> <p>a) State the principle of conservation of energy.</p> <p>b) Explain transformation of energy from one form to another.</p> <p>c) Describe the applications of different forms of energy.</p>	<p>(i) In groups, students to brainstorm on the principle of conservation of energy.</p> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain principles of energy conservations</li> <li>- Describe the applications of different forms of energy.</li> </ul> <p>(iii) The teacher to use questioning strategies (what, why and how questions) to guide students to explain transformation of energy from one form to another.</p> <p>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Posters</li> <li>• Computer</li> <li>• Projector</li> <li>• Flip chart</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student state the principle of conservation of energy?</li> <li>2. Can the student explain transformation of energy from one form to another?</li> <li>3. Can the student explain applications of the forms of energy?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.5 Power	<p>The student should be able to:</p> <p>a) Define the term power.</p> <p>b) State the SI units of power.</p> <p>c) Solve problems on power.</p> <p>d) Explain the relationship between energy and power.</p>	<p>(i) The teacher to use brainstorming questions to guide students to define the term power</p> <p>(ii) The teacher to use questions to guide students to state the SI units of power.</p> <p>(iii) The teacher to organise students in groups and guide them to explain the relationship between energy and power.</p> <p>(iv) The teacher to create activities for students to solve problems on power.</p> <p>(v) The teacher should monitor and facilitate students in solving problems on power.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>	<ul style="list-style-type: none"> <li>• Posters</li> <li>• Tape measure</li> <li>• Load</li> <li>• Tap water</li> <li>• Plane paper</li> <li>• Chalk/white board</li> <li>• Computer</li> <li>• Projector</li> <li>• Cells</li> <li>• Generator</li> </ul>	<p>1. Can the student define the term power?</p> <p>2. Can the student state the SI units of power</p> <p>3. Can the student solve problems on power?</p> <p>4. Can the student explain the relationship between energy and power?</p>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
8.0 SOUND WAVES: (PART ONE)	8.1 Introduction to Sound Waves	<p>The student should be able to:</p> <p>a) Explain the meaning of sound</p> <p>b) Define sound wave.</p> <p>c) Identify the behaviour of sound wave.</p> <p>d) Explain how sound is produced.</p> <p>e) Perform an experiment which illustrates how sound is produced</p> <p>f) Identify the behaviours of sound waves.</p>	<p>(i) The teacher to use brainstorming questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of sound.</li> <li>- Define the term sound wave.</li> </ul> <p>(ii) The teacher to use questions to guide students explain how sound is produced.</p> <p>(iii) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Demonstrate how sound is produced.</li> <li>- Perform an experiment which illustrates how sound is produced</li> <li>- Perform an experiment to investigate the behaviours of sound waves (i.e. reflection, refraction, diffraction and interference)</li> <li>- The teacher should monitor and facilitate students in performing the tasks given in part (iii).</li> </ul>	<ul style="list-style-type: none"> <li>• Tuning fork</li> <li>• Drum</li> <li>• Guitar</li> <li>• Electric bell</li> <li>• Graph board</li> <li>• Graph paper</li> <li>• Bench</li> <li>• Tap water</li> <li>• Ripple tank</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of sound?</li> <li>2. Is the student able to define sound wave?</li> <li>3. Is the student able to Identify the behaviour of sound wave?</li> <li>4. Is the student able to explain how sound is produced?</li> <li>5. Can the student perform an experiment which illustrates how sound is produced?</li> <li>6. Is the student able to identify the behaviours of sound waves?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).			
	8.2 Sources of Sound	<p>The student should be able to:</p> <p>a) Identify various sounding bodies.</p> <p>b) Explain how sound is transmitted from one point to another.</p> <p>c) Demonstrate how sound is transmitted.</p>	<p>(i) The teacher to use questions to guide students to identify various sounding bodies.</p> <p>(ii) The teacher to organise students in groups and guide them to explain how sound is transmitted from one point to another.</p> <p>(iii) The teacher to create activities for students to demonstrate how sound is transmitted.</p> <p>(iv) The teacher should monitor and facilitate student in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>	<ul style="list-style-type: none"> <li>• Locally made phone</li> <li>• Stop watch</li> <li>• Tape measure</li> <li>• Rarefactions and compressions drawn on a flip chart</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to identify various sounding bodies?</p> <p>2. Can the student explain how sound is transmitted from one point to another?</p> <p>3. Is the student able to demonstrate how sound is transmitted?</p>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	8.3 Velocity of Sound in Air	<p>The students should be able to:</p> <p>a) Explain the meaning of velocity of sound.</p> <p>b) Explain the factors affecting velocity of sound in air</p> <p>c) Define terms frequency, velocity, wavelength, amplitude and period of a sound wave</p> <p>d) Explain the relationship between velocity, frequency and wave length.</p> <p>e) Explain the relationship between frequency and period of a sound-wave.</p>	<p>(i) In groups, students to brainstorm the meaning of velocity of sound.</p> <p>(ii) The teacher to use questions to guide students to explain the factors affecting the velocity of sound in air.</p> <p>(iii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Define terms frequency, velocity, wave length, amplitude, and period of a sound wave.</li> <li>- Explain the relationship between frequency velocity and wave length.</li> <li>- Explain the relationship between frequency and period of a sound wave.</li> <li>- Solve problems on sound.</li> </ul> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher to create activities for students to solve problems on sound.</p> <p>(vi) The teacher should monitor and facilitate student in solving problems on sound.</p>	<ul style="list-style-type: none"> <li>• Locally made phone</li> <li>• Stop watch</li> <li>• Tape measure</li> <li>• Tuning fork</li> <li>• A string</li> <li>• A drum</li> <li>• Computer</li> <li>• Projector</li> <li>• Flip chart</li> <li>• Vibrating string</li> <li>• Guitar</li> <li>• Violin</li> <li>• Posters</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of velocity of sound?</li> <li>2. Is the student able to explain factors affecting velocity of sound?</li> <li>3. Is the student able to define terms frequency, velocity, wave length, amplitude, and period of a sound wave?</li> <li>4. Is the student able to explain the relationship between velocity, frequency and wavelength?</li> </ol>	3

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Solve problems on sound.	(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).		5. Is the student able to explain the relationship between frequency and period of a sound wave? 6. Is the student able to solve problems on sound?	
	8.4 Reflection of Sound	The student should be able to: a) Define the concept of reflection of sound. b) State the laws of reflection of sound. c) Describe the applications of law of reflection of sound. d) Describe the application of reflection of sound wave	(i) The teacher to use questions to guide students to: - Define the concept of reflection of sound. - State the laws of reflection of sound. - The teacher to organize students in groups and guide them to: - Describe the applications of laws of reflection of sound. - Describe the applications of reflection of sound wave . (ii) Students to present their responses for sharing and discussion.	<ul style="list-style-type: none"> <li>• Wide and tall wall</li> <li>• Source of sound</li> <li>• Sound observing material</li> <li>• Stop watch</li> <li>• Hard surface</li> <li>• Block</li> <li>• Tape measure</li> <li>• Tall building</li> <li>• Depth of pond</li> <li>• Depth of seas</li> <li>• Cliffs</li> </ul>	1. Is the student able to define the concept of reflection of sound? 2. Is the student able to state the laws of reflection of sound? 3. Is the student able to describe the applications of law of reflection of sound?	2



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).		4. Is the student able to describe the applications of reflection of sound wave?	
	8.5 Echo	The student should be able to: a) Explain the meaning of echo. b) Explain the causes of echo. c) Describe an experiment which illustrates echo. d) Identify applications of echo e) Calculate distances using the formula $S = \frac{vt}{2}$ f) Explain how the effects of sound can be minimized	(i) The teacher to use questions to guide students to: - Explain the meaning of echo. - Explain the causes of echo. (ii) The teacher to organize students in groups and guide them to: - Describe an experiment which illustrates echo. - Identify applications of echo. (iii) The teacher to use questioning strategies (what, why and how questions) to guide students to: - Explain the effects of sound in buildings. - Explain how the effects of sound can be minimized' (iv) The teacher design an activity to guide the students to solve problems using the formula: $S = \frac{vt}{2}$	<ul style="list-style-type: none"> <li>• Wide and tall wall</li> <li>• Source of sound</li> <li>• Sound observing material</li> <li>• Stop watch</li> <li>• Hard surface</li> <li>• Block</li> <li>• Tape measure</li> <li>• Hard surface</li> <li>• Tall building</li> <li>• Depth of pond</li> <li>• Depth of sea</li> <li>• Cliffs</li> </ul>	1. Is the student able to explain the meaning of echo? 2. Is the student able to describe an experiment which illustrates echo? 3. Is the student able to explain the causes of echo? 4. Is the student able to identify applications of echo? 5. Can the student calculate distances using the formula $S = \frac{vt}{2}$ ?	3

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(v) Students to present their responses for sharing and discussion. (vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).		6. Is the student able to explain how the effects of sound can be minimized?	
		The student should be able to: a) Explain the concept of reverberation. b) Explain how reverberation is produced. c) Explain the advantages and disadvantages of reverberation d) Explain the effects of sound reverberation in buildings. e) Explain how the effects of sound reverberation can be minimized	(i) The teacher to use questions to guide students to: - Explain the concept of reverberation - Explain how reverberation is produced. (ii) The teacher to use questioning strategies (what, why and how questions) to guide students to: - Explain the advantages and disadvantages of reverberation. - Explain how the effects of sound reverberation can be minimized.	<ul style="list-style-type: none"> <li>• Wide and tall wall</li> <li>• Source of sound</li> <li>• Sound observing material</li> <li>• Stop watch</li> <li>• Hard surface</li> <li>• Block</li> <li>• Tape measure</li> <li>• Tall building</li> <li>• Depth of pond</li> <li>• Depth of seas</li> <li>• Cliffs</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the concept of reverberation? 2. Is the student able to explain how reverberation is produced? 3. Is the student able to explain the advantages and disadvantages of reverberation? 4. Is the student able to explain the effects of sound reverberation in buildings?	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Identify the difference between reverberation and echo.	<p>(iii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain how reverberation is produced.</li> <li>- Explain the effects of sound in buildings.</li> <li>- Identify the difference between reverberation and echo</li> </ul> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>		<p>5. Is the student able to explain how the effects of sound reverberation can be minimized?</p> <p>6. Can the student identify the difference between reverberation and echo?</p>	
<b>9.0 LIGHT (OPTICS): PART ONE</b>	9.1 Introduction to Light	<p>The student should be able to:</p> <p>a) Explain the meaning of light.</p> <p>b) Identify the sources of light.</p>	<p>(i) In pairs, students to brainstorm on the meaning of light.</p> <p>(ii) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of light.</li> </ul>	<ul style="list-style-type: none"> <li>• Charts,</li> <li>• kerosene lamp</li> <li>• Electric bulb</li> <li>• Candles</li> <li>• Matches</li> <li>• Piece of paper</li> </ul>	1. Is the student able to explain the meaning of light?	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Distinguish luminous from non-luminous bodies.</p> <p>d) Explain the concept of rays and beams of light.</p> <p>e) Verify that light travels in a straight line.</p> <p>f) Identify transparent, translucent and opaque materials.</p>	<ul style="list-style-type: none"> <li>- Mention the sources of light.</li> <li>- Explain the concept of rays and beams of light.</li> </ul> <p>(iii) The teacher to use questioning strategies (what, why and how questions) to guide students to differentiate the luminous bodies from non-luminous.</p> <p>(iv) The teacher to organize students in groups and guide them to;</p> <ul style="list-style-type: none"> <li>- Discuss the concept of rays and beams of light.</li> <li>- Identify transparent, translucent and opaque materials.</li> <li>- Describe transparent, translucent and opaque materials.</li> <li>- Verify that light travels in a straight line.</li> </ul> <p>(v) The teacher to guide students to demonstrate how light travels in a straight line.</p>	<ul style="list-style-type: none"> <li>• Source of light</li> <li>• Piece of card board</li> <li>• White screen</li> <li>• Tennis ball</li> <li>• Oiled paper</li> <li>• Ray box</li> <li>• Glass block</li> <li>• Paper</li> <li>• Ruler</li> <li>• Pins</li> <li>• Optical pins</li> <li>• Plane mirrors</li> <li>• Thumb pins</li> <li>• Protractor</li> <li>• Opaque materials,</li> <li>• Transparent materials,</li> <li>• Translucent material</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>2. Is the student able to identify sources of light?</li> <li>3. Is the student able to distinguish luminous from non-luminous bodies?</li> <li>4. Is the student able to explain the concept of rays and beams of light?</li> <li>5. Is the student able to verify that light travels in a straight line?</li> <li>6. Is the student able to identify transparent, translucent and opaque materials?</li> </ol>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).			
	9.2 Reflection of Light	The student should be able to: a) Explain the concept of reflection of light. b) Differentiate regular from irregular (or diffuse) reflection.	(i) The teacher to use questions to guide students to: - Explain the concept of reflection of light. - Discuss how regular and irregular (or diffuse) reflection occur. (ii) The teacher to organize students in groups and guide them to differentiate regular from irregular (or diffuse) reflection. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).	<ul style="list-style-type: none"> <li>• Kerosene lamp</li> <li>• Electric bulb</li> <li>• Candles</li> <li>• Matches</li> <li>• Piece of paper</li> <li>• Source of light</li> <li>• Piece of card board</li> <li>• White screen</li> <li>• Tennis ball</li> <li>• Oiled paper</li> <li>• Ray box</li> <li>• Glass block</li> <li>• Paper</li> <li>• Ruler</li> <li>• Pins</li> <li>• Optical pins</li> <li>• Plane mirrors</li> <li>• Thumb pins</li> <li>• Protractor</li> <li>• Shining rough surface</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of reflection of light?</li> <li>2. Is the student able to differentiate between regular and irregular (or diffuse) reflection?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	9.3 Reflection of Light from a Plane Mirror	<p>The student should be able to:</p> <p>a) Explain the meaning of reflection of light from a plane mirror</p> <p>b) Explain the properties of images formed by a plane mirror.</p> <p>c) Determine the number of images formed in mirrors placed at an angle between them.</p> <p>d) Explain the applications of plane mirrors.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of reflection of light from a plane mirror</li> <li>- Explain the properties of images formed by a plane mirror.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the properties of images formed by a plane mirror.</li> <li>- Explain the applications of plane mirrors.</li> </ul> <p>(iii) The teacher to create activities for student to:</p> <ul style="list-style-type: none"> <li>- Demonstrate how reflection of light from a plane mirror takes place</li> <li>- Determine number of images formed in plane mirrors placed at an angle between them.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p>	<ul style="list-style-type: none"> <li>• Plane mirrors</li> <li>• Candle</li> <li>• Kerosene lamp</li> <li>• Shining plane surface</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student explain the meaning of reflection of light from a plane mirror?</li> <li>2. Is the student able to explain the properties of images formed by a plane mirrors?</li> <li>3. Is the student able to determine number of images formed in plane mirrors placed at an angle between them?</li> <li>4. Can the student explain the applications of plane mirrors?</li> </ol>	2

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(v) With the help of preprepared assessment guideline, the teacher should guide students to assess activities done on determining the number of images formed in mirrors placed at an angle between them.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	9.4 The pin-hole camera	<p>The student should be able to:</p> <p>a) Explain the concept of pin-hole camera.</p> <p>b) Explain the principle of action of a pin hole camera.</p> <p>c) Explain the properties of images formed by a pin-hole camera.</p>	<p>(i) The teacher to use questions to guide students to explain the concept of pin-hole camera.</p> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the properties of images formed by a pin-hole camera.</li> <li>- Explain the applications of the pin-hole camera.</li> </ul>	<ul style="list-style-type: none"> <li>• Pin-hole camera models</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student explain the concept pin-hole camera?</li> <li>2. Is the student able to explain the principle of action of a pin-hole camera?</li> <li>3. Is the student able to explain the properties of image formed by a pin-hole camera?</li> </ol>	1

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Explain the applications of the pin-hole camera.	<p>(iii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the principles of action of a pin hole camera</li> <li>- Explain the properties of image formed by a pin-hole camera.</li> </ul> <p>(iv) Students to present their responses for sharing and discussion</p> <p>(v) The teacher to create activities for students to draw a pin-hole camera and illustrate its construction.</p> <p>(vi) The teacher should monitor and facilitate students in performing the tasks given in part (v).</p> <p>(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>		4. Is the student able to explain the applications of the pin-hole camera?	



TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	9.5 Shadows and eclipses	<p>The student should be able to:</p> <p>a) Explain how shadows are formed from various sources of light.</p> <p>b) Define the concepts of umbra and penumbra</p> <p>c) Perform experiment which illustrates the formation of umbra and penumbra.</p> <p>d) Explain how the eclipse of the sun and moon are formed.</p> <p>e) Draw diagrams which illustrate partial eclipse and total eclipse.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain how shadows are formed from various sources of light.</li> <li>- Define the concepts of umbra and penumbra</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain how the eclipses of the sun and moon are formed.</li> <li>- Explain how shadows are formed.</li> </ul> <p>(iii) The teacher to design activities for students to:</p> <ul style="list-style-type: none"> <li>- Perform experiment which illustrates an umbra and penumbra.</li> <li>- Show how shadows are formed from different sources of light.</li> <li>- Demonstrate how the eclipses of sun and moon are formed.</li> <li>- Draw diagrams which illustrate partial eclipse and total eclipse.</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• kerosene lamp</li> <li>• Electric bulb</li> <li>• Candles</li> <li>• Matches</li> <li>• Piece of paper</li> <li>• Source of light</li> <li>• Piece of card board</li> <li>• String nail</li> <li>• White screen</li> <li>• Tennis ball</li> <li>• Oiled paper</li> <li>• Ray box</li> <li>• Glass block</li> <li>• Paper</li> <li>• Ruler</li> <li>• Pins</li> <li>• Optical pins</li> <li>• Plane mirrors</li> <li>• Thumb pins</li> <li>• Protractor</li> <li>• Source of light</li> <li>• Ball</li> <li>• Graph paper</li> <li>• Plane paper</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain how shadows are formed from various sources of light?</li> <li>2. Is the student able to define the concepts of umbra and penumbra?</li> <li>3. Can the student perform experiment which illustrates the formation of umbra and penumbra?</li> <li>4. Is the student able to explain how the eclipses of the sun and moon are formed?</li> </ol>	3

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(v) Students to present their responses/work for sharing and discussion.</p> <p>(vi) With the help of pre-prepared assessment guideline, the teacher should guide students to assess activities performed in part (ii).</p> <p>(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>	<ul style="list-style-type: none"> <li>Engineering science text books</li> </ul>	5. Is the student able to draw diagrams which illustrate the partial eclipse and total eclipse?	
<b>10.0 FRICTION</b>	10.1 Concept of Friction	The student should be able to: a) Define the term friction. b) State the laws of friction. c) Identify types of friction.	<p>(i) The teacher to use brainstorming questions to guide students to define the term friction.</p> <p>(ii) The teacher to use questions to guide students to: - State the laws of friction. - Mention types of friction. - Explain factors on which friction depends.</p>	<ul style="list-style-type: none"> <li>Spring</li> <li>Block of wood</li> <li>Rough surface</li> <li>Smooth surface</li> <li>Motor car tyre with treads</li> <li>Bicycle tyre</li> <li>Break system of bicycle</li> </ul>	<p>1. Is the student able to define the term friction?</p> <p>2. Is the student able to state the laws of friction?</p>	5

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Explain factors on which friction depends.</p> <p>d) Identify advantages and disadvantages of friction.</p> <p>f) Explain how to minimize and maximize friction</p> <p>g) Explain relationship between frictional force and the normal reaction force.</p> <p>h) State relationship between frictional force(F) and the normal reaction force</p> <p>i) Calculate the coefficient of friction</p>	<p>(iii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify the advantages and disadvantage of friction.</li> <li>- Explain how to minimize and maximize friction.</li> <li>- Explain relationship between frictional force and the normal reaction force.</li> <li>- Explain relationship between frictional force (F) and the normal reaction force.</li> </ul> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher to design activities for students to:</p> <ul style="list-style-type: none"> <li>- Demonstrate on how to minimize and improve friction.</li> <li>- Calculate the coefficient of friction.</li> </ul> <p>(vi) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p>	<ul style="list-style-type: none"> <li>• Trolley</li> <li>• Weights</li> <li>• Rollers</li> <li>• Grease</li> <li>• Bearings</li> <li>• Speedy materials</li> <li>• Spring balance</li> <li>• Bench</li> <li>• Cotton strings</li> <li>• Chalk/white board</li> </ul>	<p>3. Is the student able to identify types of friction?</p> <p>4. Is the student able to explain factors on which friction depends?</p> <p>5. Is the student able to mention advantages and disadvantages of friction?</p> <p>6. Is the student able to explain how to minimize and maximize the friction on objects?</p> <p>7. Is the student able to explain relationship between frictional force and the normal reaction force?</p>	

TOPIC	SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(vii) With the help of pre-prepared assessment guideline, the teacher should guide students to assess activities performed on part (iii).</p> <p>(viii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>		<p>8. Is the student able to explain relationship between frictional force(F) and the normal reaction force</p> <p>9. Is the student able to calculate the coefficient of friction?</p>	

## FORM II

### CLASS LEVEL COMPETENCIES

By the end of form two course, students should have developed competencies in:

- a) using principles of moments in daily life;
- b) classifying simple machines;
- c) interpreting the principle of fluid mechanics in every-day life;
- d) developing principles of thermal energy in heat manipulation; and
- e) integrating concepts and principles of electricity in maintaining and repairing appliances.

### CLASS LEVEL OBJECTIVES

By the end of form Two course, students should be able to:

- a) states the principles of moments;
- b) classify simple machines;
- c) apply the principle of fluid mechanics in every-day life;
- d) develop principles of thermal energy in heat manipulation; and
- e) develop concepts and principles of electricity in maintaining and repairing appliances.

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>1.0 TURNING FORCES</b>	1.1 Stability of Equilibrium	The student should be able to: a) Define the term equilibrium. b) Explain the three states (types) of equilibrium.	(i) The teacher to use brainstorming questions to guide students to define the term equilibrium. (ii) The teacher to use questions to guide students to explain the three states (types) of equilibrium. (iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).	<ul style="list-style-type: none"> <li>• Cones</li> <li>• Ball</li> <li>• Bunsen burner</li> <li>• Objects with broad bases</li> <li>• Metre rule</li> <li>• Wooden rods</li> <li>• Metal rods</li> <li>• Knife edge</li> <li>• Objects of known masses</li> <li>• Beam balance</li> <li>• See-saw</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to define the term equilibrium? 2. Is the student able to explain the three states (types) of equilibrium?	1
	1.2 Centre of Gravity	The students should be able to: a) Explain the meaning of centre of gravity. b) Determine the centre of gravity of regular lamina. c) Determine the centre of gravity of irregular lamina.	(i) The teacher to use brainstorming questions to guide students to explain the meaning of centre of gravity. (ii) The teacher to organise students in groups and guide them to: - Determine the centre of gravity of a regular lamina. - Determine the centre of gravity of irregular lamina.	<ul style="list-style-type: none"> <li>• Plumb-line</li> <li>• Lamina of different shapes (circular, square, rectangular, triangular)</li> <li>• Metre rule</li> <li>• Ruler</li> <li>• Marker pens</li> <li>• Flip chart</li> </ul>	1. Is the student able to explain the meaning of centre of gravity? 2. Is the student able to determine the centre of gravity of a regular lamina?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iii) The teacher should monitor and facilitate the tasks given in part (ii). (iv) Students to present their responses for sharing and discussion. (v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).	<ul style="list-style-type: none"> <li>Engineering science text books</li> </ul>	3. Is the student able to determine the centre of gravity of irregular lamina?	
	1.3 Moment of a force	The student should be able to: a) Define moment of a force. b) State the SI units of moment of a force. c) Identify examples of moment of force. d) Explain the meaning of the line of action of moment of a force.	(i) The teacher to use questions to guide students to: - State the SI units of moment of a force - Mention examples of moment of force - Explain the meaning of the line of action of a force (ii) The teacher to organise students in groups and guide them to determine the perpendicular distance from a point to the line of action of a force.	<ul style="list-style-type: none"> <li>A swinging door</li> <li>Sea saw</li> <li>Beam balance</li> <li>The steel yards</li> <li>Engineering science text books</li> </ul>	1. Is the student able to define moment of a force? 2. Is the student able to state the SI units moment of a force? 3. Is the student able to identify examples of moment of force? 4. Is the student able to explain the meaning of the line of action of a force?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) Determine the perpendicular distance from a point to the line of action of a force.	(iii) Students to present their responses for sharing and discussion. (iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).		5. Is the student able to determine the perpendicular distance from a point to the line of action of a force?	
	1.4 Principle of Moments	The student should be able to: a) State the principle of moments. b) Perform an experiment to verify the principle of moments. c) Give examples where the principle of moments is used in daily life. d) Solve problems using the principle of moments.	(i) The teacher to use questioning strategies(what, why and how questions) to guide students to state the principle of moments. (ii) The teacher to arrange students in groups and guide them to mention examples where the principle of moment of moments is used in daily life. (iii) The teacher to create activities to guide students to: - Perform an experiment to verify the principle of moments. - Solve problems using the principle of moments.	<ul style="list-style-type: none"> <li>• Beam balance</li> <li>• See-saw</li> <li>• A swing</li> <li>• Graph papers</li> <li>• Plane papers</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to state the principle of moments? 2. Is the student able to perform an experiment to verify the principle of moments? 3. Is the student able to give examples where the principle of moments of moment is used in daily life?	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the help of pre-prepared assessment guideline, the teacher should guide students to assess activities performed on part (iii).</p> <p>(v) The teacher should monitor and facilitate the tasks given in part (iii) and (iv).</p> <p>(vi) Students to present their responses for sharing and discussion.</p> <p>(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>		4. Is the student able to solve problems using the principle of moments?	
	1.5 Conditions for Equilibrium of Parallel Forces	<p>The student should be able to:</p> <p>a) State the two conditions for equilibrium when a body is acted upon by a number of parallel forces.</p>	<p>(i) The teacher to design activities for students to:</p> <ul style="list-style-type: none"> <li>- Perform an experiment to investigate the conditions for equilibrium when a number of parallel forces act on a horizontal beam resting on two supports.</li> </ul>	<ul style="list-style-type: none"> <li>• Plane papers</li> <li>• Knife edge</li> <li>• Wooden beams</li> <li>• Metal beams</li> <li>• Metre rule</li> <li>• Gram masses</li> <li>• Spring balance</li> <li>• Beam balances</li> </ul>	1. Is the student able to state the two conditions for equilibrium when a body is acted upon by a number of parallel forces?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		b) Solve problems involving the conditions for equilibrium of parallel forces	<ul style="list-style-type: none"> <li>- Solve problems involving the conditions for equilibrium of parallel forces.</li> <li>(ii) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed in part (i).</li> <li>(iii) The teacher should monitor and facilitate the tasks given in part (i) and (ii).</li> <li>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering science text books</li> </ul>	2. Is the student able to solve problems involving the conditions for equilibrium of parallel forces?	2
	1.6 Couple and Torque	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>a) Define the term couple.</li> <li>b) Define the term torque.</li> <li>c) Mention examples of couple.</li> </ul>	<ul style="list-style-type: none"> <li>(i) The teacher to use brainstorming questions to guide students to: <ul style="list-style-type: none"> <li>- Define the term couple.</li> <li>- Define the concept of torque.</li> </ul> </li> <li>(ii) The teacher to use questions to guide students to: <ul style="list-style-type: none"> <li>- Mention examples of couples.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Spanner</li> <li>• Car steering wheel</li> <li>• Oar</li> <li>• Hammer</li> <li>• Bicycle pedals</li> <li>• Bicycle</li> </ul>	<ul style="list-style-type: none"> <li>1. Is a student able to define the term couple?</li> <li>2. Is a student able to mention examples of couple?</li> </ul>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		c) Mention examples of torque. d) Solve problems on torque.	- Mention examples of torques. (iii) The teacher to create activities for students to solve problems on torque. (iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).	<ul style="list-style-type: none"> <li>• Handle bar</li> <li>• Motorcycle handlebar</li> <li>• Door</li> <li>• Engineering science text books</li> <li>• Exercise books</li> </ul>	3. Is the student able to define the concept torque? 4. Is the student able to mention examples of torque? 5. Is the student able to solve problems on torque?	2
<b>2.0 SIMPLE MACHINES: (PART ONE)</b>	2.1 Meaning of Simple Machine	The student should be able to: a) Give the meaning of simple machines. b) Identify different simple machines.	(i) The teacher to use brainstorming questions for students to give the meaning simple machines (ii) The teacher to use questions and answer methods to guide students to list various simple machines. (iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i) and (ii).	<ul style="list-style-type: none"> <li>• Lever</li> <li>• Pulleys</li> <li>• Screws</li> <li>• Jack</li> <li>• Inclined plane</li> <li>• Single fixed pulley</li> <li>• Single movable pulley</li> <li>• Block and tackle pulley system</li> <li>• Weston's differential pulley</li> <li>• Screw jack</li> <li>• Wheel and differential axle</li> <li>• Hydraulic press</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to give the meaning of simple machines? 2. Is the student able to identify different simple machines?	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.2 Levers	<p>The student should be able to:</p> <p>a) Identify the three classes of levers.</p> <p>b) Mention examples for each class of levers.</p> <p>c) Determine mechanical advantage, velocity ratio and efficiency of a lever</p> <p>d) Identify the applications of levers in every day real life</p>	<p>(iv) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Identify the three classes of levers.</li> <li>- Mention examples for each class of levers.</li> </ul> <p>(v) The teacher to organize the students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Determine mechanical advantage, velocity ratio and efficiency of a lever</li> <li>- Identify the applications of levers in everyday life.</li> </ul> <p>(vi) Students to present their responses for sharing and discussion.</p> <p>(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Scissors</li> <li>• Claw-hammer</li> <li>• Coal tong</li> <li>• Nut-crackers</li> <li>• Wheel barrow</li> <li>• Crow bar</li> <li>• Wire cutter</li> <li>• Fishing rod</li> <li>• Oar in water</li> <li>• Biceps muscle and forearm</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify the three classes of levers?</li> <li>2. Is the student able to mention examples for each class of levers?</li> <li>3. Is the student able to determine mechanical advantage, velocity ratio and efficiency of a lever?</li> <li>4. Is the student able to identify the applications of levers in everyday life?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.3 Pulleys	<p>The student should be able to:</p> <p>a) Identify different pulley systems</p> <p>b) Determine mechanical advantage, velocity ratio and efficiency of different pulley systems</p> <p>c) Solve problems involving mechanical advantage and velocity ratio of pulley systems.</p> <p>d) Identify the applications of pulley systems in daily life</p>	<p>(i) The teacher to use questions to facilitate the students to identify different pulley systems, namely:</p> <ul style="list-style-type: none"> <li>- Single fixed pulley</li> <li>- Single movable pulley</li> <li>- Block and tackle pulley system</li> <li>- Weston’s differential pulleys.</li> </ul> <p>(ii) In groups, the teacher to guide students to:</p> <ul style="list-style-type: none"> <li>- Discuss how to determine mechanical advantage, velocity ratio and efficiency of pulley systems.</li> <li>- Determine mechanical advantage, velocity ratio and efficiency of pulley systems</li> <li>- Identify the applications of pulley systems in daily life</li> </ul> <p>(iii) Students to present their responses for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Single fixed pulley</li> <li>• Single movable pulley</li> <li>• Block and tackle pulley system</li> <li>• Weston’s differential pulleys</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify different pulley systems?</li> <li>2. Is the student able to determine mechanical advantage, velocity ratio and efficiency of pulleys system?</li> <li>3. Is the student able to solve problems involving mechanical advantage and velocity ratio of different pulley system?</li> <li>4. Is a student able to identify the applications of pulley systems in daily life?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) The teacher to create activities for students to solve problems involving mechanical advantage, velocity ratio and efficiency of pulley systems.</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks given in part (iv).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	2.4 Inclined planes	<p>The student should be able to:</p> <p>a) Explain the concept of inclined plane.</p> <p>b) Determine mechanical advantage, velocity ratio and efficiency of an inclined plane.</p>	<p>(i) The teacher to use questions to guide students to explain the concept of inclined plane.</p> <p>(ii) The teacher to organise students in groups and guide them to;</p> <p>- Explain why it is easier to push a heavy load up an inclined plane than to lift it vertically.</p>	<ul style="list-style-type: none"> <li>• Inclined plane</li> <li>• Heavy loads</li> <li>• Engineering science text books</li> <li>• Internet</li> <li>• Ladder</li> <li>• Building steps or stairways</li> </ul>	<p>1. Is the student able to explain the concept of an inclined plane?</p> <p>2. Is the student able to determine mechanical advantage, velocity ratio and efficiency of an inclined plane?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Solve problems involving mechanical advantage, velocity ratio and efficiency of an inclined plane.</p> <p>d) Determine the use of inclined planes in daily life</p>	<ul style="list-style-type: none"> <li>- Discuss how to determine the mechanical advantage, velocity ratio and efficiency of an inclined plane.</li> <li>(iii) Students to present their responses for sharing and discussion.</li> <li>(iv) The teacher to create activities for students to:               <ul style="list-style-type: none"> <li>- Determine mechanical advantage, velocity ratio and efficiency of an inclined plane.</li> <li>- Solve problems involving mechanical advantage, velocity ratio and efficiency of an inclined plane.</li> </ul> </li> <li>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities done on inclined planes.</li> <li>(vi) The teacher should monitor and facilitate students in performing the tasks given in part (iv) and (v).</li> </ul>		<p>3. Is the student able to solve problems involving efficiency of a machine?</p> <p>4. Can the student determine the use of inclined planes in daily life?</p>	

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			(vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).			
	2.5 Screw Jack	The student should be able to: a) Describe the structure of the screw jack. b) Determine the mechanical advantage, velocity ratio and efficiency of a screw jack. c) Use the screw jack in every day life.	(i) The teacher to use questions to guide the student to describe the structure of the screw jack. (ii) The teacher to organize the students in groups and guide them to: - Discuss on how to determine the mechanical advantages of velocity ratio and efficiency of a screw jack. - Discuss the various situations where the screw jack is used. (iii) The teacher to design activities and guide students to use the screw jack. (iv) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess activities done on screw jack.	<ul style="list-style-type: none"> <li>• Heavy load</li> <li>• Screw jack</li> <li>• Engineering science text books</li> <li>• Reference books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student describe the structure of the screw jack?</li> <li>2. Can the student determine the mechanical advantages, velocity ratio and efficiency of a screw jack?</li> <li>3. Is the student able to apply the screw jack in everyday life?</li> </ol>	1



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			<p>(v) The teacher should monitor and facilitate students in performing the tasks given in part (iii) and (iv).</p> <p>- Discuss the various situations where the screw jack is used.</p> <p>(vi) The teacher to design activities and guide students to use the screw jack.</p> <p>(vii) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess activities done on screw jack.</p> <p>(viii) The teacher should monitor and facilitate students in performing the tasks given in part (iii) and (iv).</p> <p>(ix) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-iv).</p>			

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	2.6 Wheel and Axle	<p>The students should be able to:</p> <p>a) Describe the structure of a wheel and axle</p> <p>b) Determine the mechanical advantage, velocity ratio and efficiency of a wheel and axle</p> <p>c) Use the wheel and axle in daily life</p>	<p>(i) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the structure of a wheel and axle</li> <li>- Determine the mechanical advantage, velocity ratio and efficiency of a wheel and axle</li> <li>- Explain how to use the wheel and axle in daily life.</li> </ul> <p>(ii) Students to present their responses for sharing and discussion.</p> <p>(iii) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Determine the mechanical advantage, velocity ratio and efficiency of a wheel and axle.</li> <li>- Use the wheel and axle in daily life.</li> </ul> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess activities done on wheel and axle.</p>	<ul style="list-style-type: none"> <li>• Wheel-and-axle</li> <li>• Bicycle</li> <li>• Heavy loads</li> <li>• Windlass</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to describe the structure of a wheel and axle?</li> <li>2. Is the student able to determine mechanical advantage, velocity ratio and efficiency of a wheel and axle?</li> <li>3. Is the student able to use the wheel and axle in daily life?</li> </ol>	1

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			<p>(v) The teacher should monitor and facilitate students in performing the tasks given in part (iii) and (iv).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	2.7 Wheel and Differential Axle	<p>The students should be able to:</p> <p>a) Describe the structure of a wheel and differential axle.</p> <p>b) Determine the mechanical advantage, velocity ratio and efficiency of a wheel and differential axle.</p> <p>c) Use the wheel and differential axle in daily life.</p>	<p>(i) The teacher to arrange students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Determine the structure of a wheel and differential axle.</li> <li>- Determine the mechanical advantage of velocity ratio and efficiency of a wheel and differential axle.</li> <li>- Discuss the use of the wheel and differential axle in daily life.</li> </ul> <p>(ii) Students to present their responses for sharing and discussion.</p> <p>(iii) The teacher to create activities for students to:</p>	<ul style="list-style-type: none"> <li>• Wheel-and-differential axle</li> <li>• Heavy loads</li> <li>• Windlass</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to describe the structure of a wheel and differential axle?</li> <li>2. Is the student able to determine the mechanical advantage, velocity ratio and efficiency of a wheel and differential axle?</li> <li>3. Is the student able to use the wheel and differential axle in daily life?</li> </ol>	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<ul style="list-style-type: none"> <li>- Determine the mechanical advantage, velocity ratio and efficiency of a wheel and differential axle.</li> <li>- Use the wheel and differential axle in daily life.</li> </ul> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities done on wheel and differential axle.</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks given in part (iii) and (iv).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	2.8 Hydraulic Press	The students should be able to: a) Describe the structure of a hydraulic press.	(i) The teacher to organize students in groups and guide them to: - Study the main features of the hydraulic press and describe its structure	<ul style="list-style-type: none"> <li>• Model of hydraulic press</li> <li>• Hydraulic jack systems</li> </ul>	1. Is the student able to describe the structure of a hydraulic press?	1

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		b) Determine the mechanical advantage, velocity ratio and efficiency of a hydraulic press. c) Use the hydraulic press in daily life	<ul style="list-style-type: none"> <li>- Discuss how to determine the mechanical advantage, velocity ratio and efficiency of a hydraulic press.</li> <li>(ii) Students to present their responses for sharing and discussion.</li> <li>(iii) The teacher to create activities for students to:               <ul style="list-style-type: none"> <li>- Determine the mechanical advantage, velocity ratio and efficiency of a hydraulic press.</li> <li>- Use the hydraulic press in daily life.</li> </ul> </li> <li>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities done on hydraulic press.</li> <li>(v) The teacher should monitor and facilitate students in performing the tasks given in part (iii) and (iv).</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering science text books</li> </ul>	2. Is the student able to determine the mechanical advantage, velocity ratio and efficiency of a hydraulic press?  3. Is the student able to use the hydraulic press in daily life?	

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			(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).			
<b>3.0 FLUID MECHANICS</b>	3.1 Pressure	The students should be able to: a) Define the term pressure. b) State the SI units of pressure. c) Explain the application of pressure in daily life. d) Explain the relationship between Pressure (P), Force (F) and Area (A). e) Solve problems on pressure. f) Calculate pressure when rectangular solids rest on different sides.	(i) The teacher to use brainstorming questions to guide the students to define the term pressure. (ii) The teacher to organize students in groups and guide them to: - State the SI units of pressure - Explain the relationship between Pressure, Force and Area. (iii) The teacher to create activities and guide students in groups to: - Calculate pressure when rectangular solids rest on different sides. - Solve problems on pressure using the relationship between Pressure and Area.	<ul style="list-style-type: none"> <li>• Rectangular blocks</li> <li>• Bucket of water</li> <li>• Cylindrical solid object</li> <li>• Bench</li> <li>• Spring balance</li> <li>• Regular object of known weight</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term pressure?</li> <li>2. Is the student able to state the SI units of pressure?</li> <li>3. Is the student able to explain the relationship between pressure force and area?</li> <li>4. Is the student able to solve problems involving pressure?</li> <li>5. Is the student able to explain the application of pressure in daily life?</li> </ol>	1

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			<p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to assess activities done on pressure.</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks given in part (iii) and (iv).</p> <p>(vi) Students to present their responses for sharing and discussion.</p> <p>(vii) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-v).</p>		6. Is the student able to calculate pressure when rectangular solids rest on different sides?	
	3.2 Atmospheric pressure	The student should be able to: a) Define the term atmosphere. b) Explain the meaning of atmospheric pressure.	(i) The teacher to use brainstorming questions to guide students to: - Define the concepts of atmosphere. - Explain the meaning of atmospheric pressure.	<ul style="list-style-type: none"> <li>• Syringe</li> <li>• Bicycle pump</li> <li>• Manometer</li> <li>• Barometer</li> <li>• Lift pump</li> <li>• Siphon</li> <li>• Hydraulic press</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to define the term atmosphere?</p> <p>2. Is the student able to explain the meaning of atmospheric pressure?</p>	1

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		c) Explain the application of atmospheric pressure.	(ii) The teacher to organize students in groups and guide them to explain the application of atmospheric pressure. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should use students' responses as feedback to support students to define the concepts of atmospheric pressure and its application.		3. Is the student able to explain the application of atmospheric pressure?	
	3.3 Liquid Pressure	The students should be able to: a) Define liquid pressure. b) Identify the properties of liquid pressure. c) Calculate the pressure in liquids.	(i) The teacher to use brainstorming questions to guide students to define liquid pressure. (ii) The teacher to organise students in groups and guide them to: - Identify properties of liquid pressure. - Discuss about the computation of pressure in liquids.	<ul style="list-style-type: none"> <li>• Syringe</li> <li>• Bicycle pump</li> <li>• Manometer</li> <li>• Barometer</li> <li>• Lift pump</li> <li>• Siphon</li> <li>• Hydraulic press</li> <li>• Ponds</li> <li>• Seas</li> <li>• Bucket of water</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to define liquid pressure? 2. Is the student able to identify the properties of liquid pressure? 3. Is the student able to calculate the pressure in liquids?	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iii) Students to present their responses for sharing and discussion. (iv) The teacher to create activities for students to calculate the pressure in liquids. (v) The teacher should monitor and facilitate students in calculating the pressure in liquids (vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).			
	3.4 Absolute Pressure, Vacuum Pressure, and Gauge pressure	The students should be able to: a) Explain terms of Absolute pressure, Vacuum pressure, and Gauge pressure. b) Calculate absolute pressure and gauge pressure.	(i) The teacher to use questions to guide students to explain the meaning of absolute pressure, vacuum pressure and gauge pressure. (ii) The teacher to organise students in groups and guide them to identify the applications of absolute pressure, vacuum pressure, and gauge pressure.	<ul style="list-style-type: none"> <li>• Bourdon gauge</li> <li>• Bicycle tubes</li> <li>• Car tubes</li> <li>• Gas cylinder</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the meaning of absolute pressure, vacuum pressure, and gauge pressure? 2. Is the student able to calculate absolute pressure and gauge pressure?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		c) Identify the applications of absolute pressure, vacuum pressure, and gauge pressure.	(iii) The teacher to create activities for students to calculate absolute pressure and gauge pressure. (iv) The teacher should monitor and facilitate students in calculating absolute pressure and gauge pressure. (v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).		3. Is the student able to identify the applications of absolute pressure, vacuum pressure, and gauge pressure?	
	3.5 Standard Atmospheric Pressure	The student should be able to: a) Define the standard atmospheric pressure. b) Express standard atmospheric pressure in SI units.	(i) The teacher to use brainstorming questions to guide students to; - Define the term standard pressure. - Give units of standard atmospheric pressure. (ii) The teacher to use questions to guide students to express standard atmospheric pressure in SI units.	<ul style="list-style-type: none"> <li>• Siphon</li> <li>• Syringe</li> <li>• Simple barometer</li> <li>• Atmosphere</li> <li>• Water</li> <li>• Communicating vessel</li> <li>• Fortin barometer</li> <li>• Aneroid barometer</li> <li>• Bicycle tube</li> <li>• Car tubes</li> <li>• Gas cylinder</li> <li>• Various types of manometers</li> </ul>	1. Is the student able to define the term atmospheric pressure? 2. Is the student able to express standard atmospheric pressure in SI units?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iii) The teacher should give students feedback and use students' feedback to support them in defining the term standard atmospheric pressure and stating its SI units.			
	3.6 Measurement of Pressure	The student should be able to; a) Identify instruments for measuring pressure. b) Explain the mode of action of various barometers and manometers c) Explain the mode of action of Bourdon gauge	(i) Teacher to use questions to guide the students to identify the instruments for measuring pressure (ii) The teacher to organize students in groups and guide them to; - explain the mode of action of various barometers and manometers. - explain the mode of action of the bourdon gauge (iii) The teacher to create activities and guide the students in groups to perform experiments on measuring atmospheric pressure using different instruments such as simple barometer, Bourdon gauge, manometer etc).	<ul style="list-style-type: none"> <li>• Bourdon gauge</li> <li>• Bicycle pump</li> <li>• Car tubes</li> <li>• Gas cylinder</li> <li>• Various types of manometer</li> <li>• Barometer</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify the instruments for measuring pressure?</li> <li>2. Is the student able to explain the mode of action of various barometers and manometers?</li> <li>3. Is the student able to explain the mode of action of the Bourdon gauge?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the aid of pre-prepared assessment guidelines, the teacher to guide students to use the guideline to assess and provide feedback to the activities done in part (i-iii).</p> <p>(v) The teacher to monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(vi) The teacher should give feedback and use student's responses as feedback to support students in performing the tasks in part (i-iv).</p>			
	3.7 Applications of Pressure	<p>The student should be able to:</p> <p>a) Explain the applications of pressure on suction pads.</p> <p>b) Describe the applications of pressure on syringe.</p>	<p>(i) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the applications of pressure on suction pads.</li> <li>- Describe the applications of pressure on syringe.</li> <li>- Describe the application areas of various types of pumps.</li> </ul>	<ul style="list-style-type: none"> <li>• Suction pads</li> <li>• Syringe</li> <li>• Various pumps</li> <li>• Siphon</li> <li>• Various valves</li> <li>• A sketch of a simple hydraulic press</li> <li>• Flip chart</li> <li>• Computer</li> <li>• Projector</li> <li>• Hydraulic press</li> <li>• Marker pens</li> </ul>	<p>1. Is the student able to explain the applications of pressure on suction pads?</p> <p>2. Is the student able to describe the applications of pressure on syringe?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) Describe the applications area of various types of pumps. f) Describe siphon principle. g) Describe various types of the valves and their mode of action. f) Describe applications of hydraulic press. g) Explain the principle of construction of a dam. h) Describe a simple water supply system. i) Explain the relationship between pressure, force and area of pistons of hydraulic press.	<ul style="list-style-type: none"> <li>- Describe siphon principle.</li> <li>- Describe the various types of valves and their modes of action.</li> <li>- Describe the applications of hydraulic press.</li> <li>- Explain the principle of construction of a dam.</li> </ul> (ii) The teacher to create activities and guide students to: <ul style="list-style-type: none"> <li>- Illustrate the applications of syringe.</li> <li>- Illustrate the applications of various types of pumps.</li> </ul> (iii) The teacher to use questions to guide students to: <ul style="list-style-type: none"> <li>- Explain the principle of construction of a dam.</li> <li>- Describe a simple water system.</li> <li>- Explain the relationship between pressure, force and area of pistons of hydraulic press</li> </ul>	<ul style="list-style-type: none"> <li>• A dam on manila sheet</li> <li>• Flip chart</li> <li>• Engineering science text books</li> </ul>	3. Is the student able to describe applications area of various types of pumps.? 4. Is the student able to describe siphon principle? 5. Is the student able to describe various types of the valves and their mode of action? 6. Is the student able to describe applications of hydraulic press? 7. Is the student able to explain the principle of construction of a dam.? 8. Is the student able to describe a simple water supply system?	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).		9. Is the student able to explain the relationship between pressure, force and area of pistons of hydraulic press?	
	3.8 Archimedes' principle	The student should be able to: a) State Archimedes' principle b) Perform an experiment which illustrates Archimedes' principles. c) Describe an experiment for measuring relative density using Archimedes' principle d) Solve problems involving Archimedes' principle	(i) The teacher to use questions to guide students to state the Archimedes' principle. (ii) The teacher to organise students in groups and guide them to: - Explain the process of performing an experiment which illustrates Archimedes' principles. - Describe an experiment for measuring relative density using Archimedes' principle. - Explain how to solve problems involving Archimedes' principle. (iii) The teacher to create activities for students to: - Perform an experiment to verify Archimedes' principle.	<ul style="list-style-type: none"> <li>• Ruler</li> <li>• Eureka can</li> <li>• Measuring cylinder</li> <li>• Water</li> <li>• Wood block</li> <li>• Hydrometer</li> <li>• Cork</li> <li>• Wooden piece</li> <li>• Density bottle</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to state the Archimedes' principle?</li> <li>2. Is the student able to perform an experiment which illustrates Archimedes' principle?</li> <li>3. Is the student able to describe an experiment for measuring relative density using Archimedes' principle?</li> <li>4. Is the student able to solve problems involving Archimedes' principle?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<ul style="list-style-type: none"> <li>- Demonstrate an experiment to measure relative density using Archimedes' principle.</li> <li>- Solve problems involving Archimedes' principle.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>			
	3.9 Law of flotation	<p>The student should be able to:</p> <p>a) State the law of flotation</p> <p>b) Perform an experiment to verify the law of flotation.</p> <p>c) Explain the applications of hydrometer</p>	<p>(i) The teacher to use brainstorming questions to guide students to state the law of flotation</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the applications of hydrometer</li> <li>- Explain how to perform an experiment to verify the law of flotation.</li> </ul>	<ul style="list-style-type: none"> <li>• Hydrometer</li> <li>• Spring balance</li> <li>• Solid objects</li> <li>• String</li> <li>• Water</li> <li>• Cork</li> <li>• Density bottle</li> <li>• Container</li> <li>• Measuring cylinder</li> <li>• Eureka can</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to state the law of flotation?</li> <li>2. Is the student able to perform an experiment to verify the law of flotation?</li> <li>3. Is the student able to explain the applications of hydrometer?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Measure the density of a liquid using a hydrometer.</p> <p>e) Explain the meaning of relative density.</p> <p>f) Perform an experiment to measure the relative density of a liquid.</p>	<ul style="list-style-type: none"> <li>- Explain the meaning of relative density.</li> <li>- Explain how to perform an experiment to measure the relative density of a liquid.</li> <li>- State how to measure the density of liquid using a hydrometer.</li> </ul> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Conduct an experiment to measure the relative density of liquid.</li> <li>- Perform an experiment to verify the law of flotation.</li> <li>- Perform an experiment to measure the relative density of a liquid.</li> </ul> <p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iv).</p>	<ul style="list-style-type: none"> <li>• Beaker</li> <li>• Milk</li> <li>• Sinkers</li> <li>• Meter rule</li> <li>• Sand</li> <li>• Model of a ship</li> <li>• Balloon</li> <li>• Engineering science text books</li> </ul>	<p>4. Is the student able to measure the density of a liquid using a hydrometer?</p> <p>5. Is the student able to explain the meaning of relative density?</p> <p>6. Is the student able to perform an experiment to measure the relative density of a liquid?</p>	



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vi) The teacher should monitor and facilitate students in performing the tasks given in part (iv). (vii) The teacher to give feedback and use the students' responses as feedback to support students in performing the tasks mentioned in part (i-v).			
<b>4.0 HEAT (PART ONE)</b>	4.1 Introduction	The student should be able to: a) Define the term heat b) State the theories of heat c) Explain the effects of heat	(i) The teacher to use brainstorming questions to guide students to: - Define the term heat. - State theories of heat. (ii) The teacher to use questions to guide students to explain the effects of heat. (iii) The teacher should give students feedback and use the feedback to support students in stating theories of heat and explaining the effects of heat.	<ul style="list-style-type: none"> <li>• Candle</li> <li>• Thermometers</li> <li>• Alcohol</li> <li>• Mercury</li> <li>• Engineering science text books</li> <li>• Bunsen burner</li> <li>• Kerosene stove</li> </ul>	1. Is the student able to define the term heat? 2. Is the student able to state the theories of heat? 3. Is the student able to explain the effect of heat?	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.2 Temperature	The student should be able to: a) Define the term temperature b) Explain the relation between temperature and heat.	(i) The teacher to use brainstorming questions to guide students to define the term temperature. (ii) The teacher to use questioning strategies (what, why and how questions) to guide students to explain the relation between temperature and heat. (iii) The teacher to give students feedback and use the feedback to support students to define the term temperature and explain the relationship between temperature and heat.	<ul style="list-style-type: none"> <li>• Thermometers</li> <li>• Alcohol</li> <li>• Mercury</li> <li>• Engineering science text books</li> <li>• Bunsen burner</li> <li>• Kerosene stove</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term temperature?</li> <li>2. Is the student able to explain the relationship between temperature and heat?</li> </ol>	1
	4.3 Instruments for Measuring Temperature	The student should be able to: a) Identify the instrument used to measure temperature. b) Describe uses of thermometers. c) Explain the applications of mercury thermometer.	(i) The teacher to use questions to guide students to identify the instrument used to measure temperature. (ii) The teacher to organise students in groups and guide them to: - Illustrate the applications of mercury thermometer. - Describe uses of thermometers.	<ul style="list-style-type: none"> <li>• Alcohol , clinical mercury</li> <li>• Hot water</li> <li>• Container</li> <li>• A maximum and minimum thermometer</li> <li>• Alcohol thermometer</li> <li>• Mercury thermometer</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify the instrument used to measure temperature?</li> <li>2. Is the student able to describe uses of thermometers?</li> <li>3. Is the student able to explain the applications of mercury thermometer?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the feedback to support students to state and describe instruments used to measure temperature.			
	4.4 Temperature Measurement Points	The student should be able to: a) Define the term fixed temperature points. b) Name three types of temperature scales c) Describe how to graduate a temperature scale. d) Explain the difference between the Celsius scale and the Fahrenheit scale.	(i) The teacher to use questions to guide students to: - Define the term fixed temperature points - Name three types of temperature scales. - State the SI units of temperature (ii) The teacher to organise students in groups and guide them to: - Describe how to graduate a temperature scale. - State the name of the fixed temperature points which are necessary to make a scale. - Explain the difference between the Celsius scale and the Fahrenheit scale.	<ul style="list-style-type: none"> <li>• Alcohol thermometer</li> <li>• Mercury thermometer</li> <li>• Sample of Thermometers with Celsius and Fahrenheit scales</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to define the term fixed temperature points? 2. Is the student able to name three types of temperature scales? 3. Is the student able to describe how to graduate a temperature scale? 4. Is the student able to explain the difference between the Celsius scale and Fahrenheit scales?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>e) State the SI units of temperature</p> <p>f) State the names of the fixed temperature points which are necessary to make a scale.</p>	<p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>		<p>5. Is the student able to state the SI units of temperature?</p> <p>6. Is the student able to state the names of the fixed temperature points which are necessary to make a scale?</p>	
	4.5 Types of Thermometers	<p>The student should be able to:</p> <p>a) Identify different types of thermometers.</p> <p>b) Explain the principle action of thermometers</p> <p>c) Mention ways of improving sensitivity of a thermometer.</p> <p>d) Solve problems on temperature conversion from one temperature scale to another.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Identify different types of thermometers.</li> <li>- Mention ways of improving sensitivity of a thermometer.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the principle action of thermometers.</li> <li>- List ways of improving the sensitivity of a thermometer.</li> </ul>	<ul style="list-style-type: none"> <li>• Thermometer</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to identify different types of thermometers?</p> <p>2. Is the student able to explain the principle action of thermometers?</p> <p>3. Is the student able to mention ways of improving sensitivity of a thermometer?</p> <p>4. Is the student able to solve problems on temperature conversion from one temperature scale to another?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iii) The teacher to create activities and guide students to solve problems on temperature conversion from one temperature scale to another.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii).</p> <p>(v) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>			
	4.6 Conduction	<p>The student should be able to:</p> <p>a) Define the term 'conduction' of heat.</p> <p>b) Identify good and bad conductors of heat.</p> <p>c) Describe an experiment which illustrates heat transfer by conduction.</p>	<p>(i) The teacher to use questions to guide the students to:</p> <ul style="list-style-type: none"> <li>- Define the term 'conduction' of heat.</li> <li>- Identify good and bad conductors of heat.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment which illustrates heat transfer by conduction.</li> </ul>	<ul style="list-style-type: none"> <li>• Copper wire</li> <li>• Piece of wood</li> <li>• Water</li> <li>• Basking in the sun</li> <li>• Radiator</li> <li>• Oil</li> <li>• Source of power</li> <li>• Iron rod</li> <li>• Aluminum rod</li> <li>• Oven</li> </ul>	<p>1. Is the student able to define the term conduction of heat?</p> <p>2. Is the student able to identify good and bad conductors of heat?</p>	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Perform an experiment which illustrates the heat transfer by conduction.	<p>(iii) The teacher to create activities for students to perform an experiment which illustrates heat transfer by conduction.</p> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on heat transfer by conduction.</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iv).</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).</p>	<ul style="list-style-type: none"> <li>• Source of power</li> <li>• Cooking pot</li> <li>• Source of heat</li> <li>• Thermos flask</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Insulators</li> <li>• Plastic</li> <li>• Metallic material</li> <li>• Engineering science text books</li> </ul>	<p>3. Is the student able to describe an experiment which illustrates heat transfer by conduction?</p> <p>4. Is the student able to perform an experiment which illustrates the heat transfer by conduction?</p>	
	4.7 Convection	<p>The student should be able to:</p> <p>a) Define the term 'convection' of heat</p>	<p>(i) The teacher to use questions to guide students to define the term convection of heat</p> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Distinguish between conduction and convection.</li> </ul>	<ul style="list-style-type: none"> <li>• Source of power</li> <li>• Copper wire</li> <li>• Piece of wood</li> <li>• Water</li> <li>• Radiator</li> <li>• Oil</li> </ul>	1. Is the student able to define the term convection of heat?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>b) Describe an experiment which illustrates the convection of heat.</p> <p>c) Distinguish between conduction and convection</p> <p>d) Perform an experiment which illustrates the convection of heat.</p>	<p>- Describe an experiment which illustrates the convection of heat.</p> <p>(iii) The teacher to create activities for students to:</p> <p>- Perform an experiment which illustrates the convection of heat.</p> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on part convention of heat.</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iv) and (v).</p> <p>(vi) Students to present their responses for sharing and discussion.</p> <p>(vii) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-v).</p>	<ul style="list-style-type: none"> <li>• Iron rod</li> <li>• Aluminium rod</li> <li>• Oven</li> <li>• Cooking pot</li> <li>• Source of heat</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Insulators</li> <li>• Plastic</li> <li>• Metallic material</li> </ul>	<p>2. Is the student able to describe an experiment which illustrates the convection of heat?</p> <p>3. Is the student able to distinguish between conduction and convection?</p> <p>4. Is the student able to perform an experiment which illustrates the convection of heat?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.8 Radiation	<p>The student should be able to:</p> <p>a) Define the term 'radiation' of heat.</p> <p>b) Describe an experiment which illustrates heat transfer by radiation</p> <p>c) Distinguish between radiation and convection of heat.</p> <p>d) Distinguish between radiation and conduction.</p> <p>e) Perform an experiment which illustrates the transfer of heat by radiation.</p>	<p>(i) The teacher to use questions to guide students to define the term 'radiation' of heat.</p> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment which illustrates heat transfer by radiation.</li> <li>- Distinguish between radiation and convection.</li> <li>- Distinguish between radiation and conduction.</li> </ul> <p>(iii) The teacher to create activities for students to perform an experiment which illustrates the transfer of heat by radiation.</p> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on heat radiation.</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii).</p>	<ul style="list-style-type: none"> <li>• Source of power</li> <li>• Copper wire</li> <li>• Piece of wood</li> <li>• Water</li> <li>• Basking in the sun</li> <li>• Radiator</li> <li>• Oil</li> <li>• Iron rod</li> <li>• Aluminum rod</li> <li>• Oven</li> <li>• Cooking pot</li> <li>• Source of heat</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Insulators</li> <li>• Plastic</li> <li>• Metallic material</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term 'radiation' of heat?</li> <li>2. Is the student able to describe an experiment which illustrates heat transfer by radiation?</li> <li>3. Is the student able to distinguish between radiation and convection?</li> <li>4. Is the student able to distinguish between radiation and conduction?</li> <li>5. Is the student able to perform an experiment which illustrates the transfer of heat by radiation?</li> </ol>	1



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vi) Students to present their responses for sharing and discussion. (vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-v).			
	4.9 Thermos Flask	a) Draw and label a sectional diagram of thermos flask b) Explain the function of each part of a thermos flask	(i) The teacher to organise students in groups and guide them to: - Draw and label a sectional diagram of a thermos flask. - Explain the function of each part of a thermos flask. (ii) The teacher to monitor and facilitate students in performing tasks in part (i) (iii) The students to present their responses for sharing and discussion. (iv) The teacher to give feedback and use students' responses as feedback to support the students performing the tasks mentioned in part (i) - (ii).	<ul style="list-style-type: none"> <li>• Thermos flask</li> <li>• Insulators</li> <li>• Plastics</li> <li>• Hot water</li> <li>• Source of heat</li> </ul>	1. Is the student able to draw and label a sectional diagram of a thermos flask? 2. Is the student able to explain the function of each part of a thermos flask?	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>5.0 HEAT (PART TWO)</b>	5.1 Introduction to Thermal Expansion	The student should be able to: a) Explain the meaning of thermal expansion. b) Identify examples of thermal expansion in daily life. c) Mention types of thermal expansions.	(i) The teacher to use questions guide students to: - Explain the meaning of the term thermal expansion. - Explain how solid expands. - Mention types of thermal expansion. (ii) The teacher should give students feedback and use the feedback to support students in perform the tasks given.	<ul style="list-style-type: none"> <li>• A chart of metals of various expansivities</li> <li>• Source of heat</li> <li>• Solid materials</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of thermal expansion?</li> <li>2. Is the student able to identify examples of thermal expansion in daily life?</li> <li>3. Is the student able to mention types of thermal expansions?</li> </ol>	2
	5.2 Solid Expansion	The student should be able to: a) Explain the meaning of solid expansion. b) Identify examples of solid expansion in daily life. c) Explain how solid expands.	(i) The teacher to use questions guide students to: - Explain the meaning of solid expansion. - Identify examples of solid expansion in daily life. - Explain how solid expands. (ii) The teacher to create activities and guide students to conduct an experiment to verify the expansion of solids when heated	<ul style="list-style-type: none"> <li>• Solar energy</li> <li>• Ball and ring</li> <li>• Bar breaker</li> <li>• A chart of metals of various expansivities</li> <li>• Source of heat (i.e., firewood, charcoal, kerosine, gas and electricity)</li> <li>• Solid materials</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of solid expansion?</li> <li>2. Is the student able to identify examples of solid expansion in daily life?</li> <li>3. Is the student able to explain how solids expand?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Perform an experiment to verify the expansion of solids when heated.	(iii) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (ii).	• Engineering science text books	4. Is the student able to perform an experiment to verify the expansion of solids when heated?	
	5.3 Liquid Expansion	The student should be able to: a) Explain the meaning of liquid expansion. b) Explain how a liquid expands. c) Perform an experiment to find out how a liquid expands when heated.	(i) The teacher to use questions to guide students to: - Explain the meaning of liquid expansion. - Describe how liquids expand. (ii) The teacher to guide students to perform an experiment to find out how a liquid expands when heated. (iii) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (ii). (iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (ii) and (iii).	• Ice • Cold water • Hot water • Source of heat • Measuring cylinder • Thermometer • Tall glass • Engineering science text books	1. Is the student able to explain the meaning of liquid expansion? 2. Is the student able to explain how a liquids expand? 3. Is the student able to perform an experiment to find out how a liquid expands when heated?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(v) The teacher should give students feedback and use the feedback to support students in explaining and solving problems on liquid expansions.			
	5.4 Gas Expansion	The student should be able to: a) Define the term gas expansion. b) Explain the laws of gases c) State Charles' law, Boyle's law, and Pressure law d) Explain how a gas expands e) Perform an experiment to find out how gas expands when heated. f) Solve problems involving laws of gases.	(i) The teacher to use questions to guide the students to: - Define the term gas expansion - Explain the laws of gases - State Charles' law, Boyle's law, and Pressure law. - Explain how gases expand.  (ii) The teacher to create activities and organize in groups students to: - Perform an experiment to find out how gas expands when heated - Solve problems involving laws of gases.	<ul style="list-style-type: none"> <li>• Graph paper</li> <li>• Ruler</li> <li>• Gas cylinder</li> <li>• Ball</li> <li>• Balloons</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term gas expansion?</li> <li>2. Is the student able to explain the laws of gases?</li> <li>3. Is a student able to state Charles' law, Boyle's law, and Pressure law?</li> <li>4. Is a student able to explain how a gas expands?</li> <li>5. Is the student able to perform an experiment to find out how gas expands when heated?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iii) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on part (ii).</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (ii and (iii)).</p> <p>(v) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-iii).</p>		6. Is a student able to solve problems involving laws of gases?	
	5.5 Measurement of Thermal Expansion	<p>The student should be able to:</p> <p>a) Explain the meaning of measurement of thermal expansion.</p> <p>b) Identify apparatus for measuring thermal expansion.</p>	<p>(i) The teacher to use brainstorming questions to guide the students to explain the meaning of measurement of thermal expansion.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify apparatus for measuring thermal expansion.</li> </ul>	<ul style="list-style-type: none"> <li>• Ball and ring</li> <li>• Bar breaker</li> <li>• Bunsen burner</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the meaning of the measurement of thermal expansion?</p> <p>2. Is the student able to identify apparatus for measuring thermal expansion?</p>	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Describe methods of measuring thermal expansion.</p> <p>d) Explain the real life applications of thermal expansion.</p>	<p>- Describe methods of measuring thermal expansion.</p> <p>- Explain the real life applications of thermal expansion.</p> <p>(iii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>		<p>3. Is the student able to describe methods of measuring thermal expansion?</p> <p>4. Can a student explain the real life application of thermal expansion?</p>	
	5.6 Linear Expansion	<p>The student should be able to:</p> <p>a) Define the term coefficient of linear expansion.</p> <p>b) State the SI units of the coefficient of linear expansion.</p> <p>c) Perform an experiment to measure the coefficient of linear expansion.</p> <p>d) Solve problems in linear expansions.</p>	<p>(i) The teacher to use questions to guide students to:</p> <p>- Define the coefficient of linear expansion</p> <p>- State the SI units of the coefficient of linear expansion.</p> <p>(ii) The teacher to create activities and guide students to:</p> <p>- Perform an experiment to measure the coefficient of linear expansion.</p> <p>- Solve problems in linear expansions.</p>	<ul style="list-style-type: none"> <li>• Ball and ring</li> <li>• Bar breaker</li> <li>• Heater</li> <li>• Chart with values of different linear expansivities</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to define the coefficient of linear expansion?</p> <p>2. Is the student able to state the SI units of coefficient of linear expansion?</p> <p>3. Is the student able to perform an experiment to measure the coefficient of linear expansion?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iii) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on linear expansions.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (ii) and (iii).</p> <p>(v) Students present their work for sharing and discussion.</p> <p>(vi) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-iv).</p>		4. Can the student solve the problems of linear expansions?	
	5.7 Areal Expansion (Superficial expansion)	The student should be able to: a) Define the term coefficient of areal (superficial) expansion.	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define the term coefficient of areal (superficial) expansion.</li> <li>- Identify the units of the coefficient of areal (superficial) expansion.</li> </ul>	<ul style="list-style-type: none"> <li>• Chart with values of different linear expansivities</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to define the term areal (superficial) expansion?</p> <p>2. Is the student able to state the SI units of the coefficient of areal (superficial) expansion?</p>	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) State the SI units of the coefficient of areal (superficial) expansion.</p> <p>d) Solve problems involving areal expansion.</p>	<p>- State the SI units of the coefficient of areal (superficial) expansion.</p> <p>(ii) The teacher to create activities and guide students to solve problems involving areal expansion.</p> <p>(iii) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on areal expansions.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (ii) and (iii).</p> <p>(v) Students to present their work for sharing and discussion.</p> <p>(vi) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-iv).</p>		<p>3. Is the student able to solve problems involving areal expansion?</p>	



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	5.8 Volume Expansion (Cubical expansion)	<p>The student should be able to:</p> <p>a) Define the coefficient of volume expansion</p> <p>b) State the SI units of the coefficient of volume expansion</p> <p>c) Explain the relation between density and the coefficient of expansion</p> <p>d) Explain the peculiar (anomalous) expansion of water.</p> <p>e) Identify the applications of volume expansion in real life.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define the coefficient of volume expansion</li> <li>- Name the SI units of the coefficient of volume expansion.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the relation between the density and the coefficient of expansion</li> <li>- Explain the peculiar (anomalous) expansion of water</li> <li>- Identify the applications of volume expansion in real life.</li> </ul> <p>(iii) Students present their responses for sharing and discussion.</p> <p>(iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>	<ul style="list-style-type: none"> <li>• Chart with values of different linear expansivities</li> <li>• Thermometer</li> <li>• Source of heat (i.e., fire, kerosine, gas)</li> <li>• Graph paper</li> <li>• Ruler</li> <li>• Ice</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the coefficient of volume expansion?</li> <li>2. Is the student able to state the SI units of the coefficient of volume expansion?</li> <li>3. Is the student able to explain the relation between the density and the coefficient of expansion?</li> <li>4. Is the student able to explain the peculiar (anomalous) expansion of water?</li> <li>5. Can the student identify the applications of volume expansion in real life?</li> </ol>	1

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	5.9 Applications of Thermal Expansion	<p>The student should be able to:</p> <p>a) Identify the applications of thermal expansion.</p> <p>b) Explain the importance of thermal expansion.</p> <p>c) Perform an experiment to determine the coefficient of volume expansion</p> <p>d) Solve problems on volume expansion</p>	<p>(i) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify the applications of thermal expansion.</li> <li>- Explain the importance of thermal expansion.</li> </ul> <p>(ii) The teacher to create activities and organize students in groups to:</p> <ul style="list-style-type: none"> <li>- Conduct an experiment to determine the coefficient of volume expansion</li> <li>- Solve problems on volume expansion.</li> <li>- Show the relation between density and coefficient of expansion.</li> <li>- Illustrate the peculiar (anomalous) expansion of water.</li> </ul> <p>(iii) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on applications of thermal expansions.</p>	<ul style="list-style-type: none"> <li>• Chart with values of different linear expansivities</li> <li>• Electricity</li> <li>• Fire wood</li> <li>• Source of heat (i.e., fire, kerosine, gas)</li> <li>• Charcoal</li> <li>• Thermometer</li> <li>• Graph paper</li> <li>• Ruler</li> <li>• Ice</li> <li>• Engineering science text books</li> <li>• Reference books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify the application of thermal expansion?</li> <li>2. Can the student explain the importance of thermal expansion?</li> <li>3. Is the student able to perform an experiment to determine the coefficient of volume expansion?</li> <li>4. Is the student able to solve problems on volume expansion?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (ii) and (iii).</p> <p>(v) Students to present their work for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to state and solve problems on thermal expansion.</p>			
<b>6.0 ELECTRICITY</b>	6.1 Static Electricity	<p>The student should be able to:</p> <p>a) Explain the structure of an atom</p> <p>b) Differentiate between positive and negative charges by testing</p> <p>c) Explain how a body can be electrified</p> <p>d) Perform experiments which illustrate electrification through friction and induction</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Brainstorm about the structure of an atom.</li> <li>- Define the term potential difference</li> <li>- Explain the meaning of electric potential</li> <li>- State Coulomb's law.</li> <li>- State the SI unit of electric charge.</li> </ul>	<ul style="list-style-type: none"> <li>• Electric cells</li> <li>• A chart of a structure of an atom</li> <li>• Gold leaf electroscope</li> <li>• Glass block</li> <li>• Capacitor</li> <li>• Insulator</li> <li>• Source of electricity</li> <li>• Dry batteries</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the structure of an atom?</li> <li>2. Is the student able to differentiate between positive and negative charges by testing?</li> <li>3. Is the student able to explain how a body can be electrified?</li> </ol>	5

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) State Coulomb's law. f) State the SI unit of electric charge. g) Define potential difference. h) Explain the meaning of electric potential. i) Define and name the SI units of potential difference	<ul style="list-style-type: none"> <li>- Define and name the SI units of potential difference</li> <li>(ii) The teacher to organise students in groups and guide them to:               <ul style="list-style-type: none"> <li>- Differentiate between positive and negative charges by testing.</li> <li>- Explain how a body can be electrified.</li> </ul> </li> <li>(iii) The teacher to create activities and guide students to:               <ul style="list-style-type: none"> <li>- Show positive and negative charges by testing</li> <li>- Conduct experiments which illustrate electrification through friction and induction</li> </ul> </li> <li>(iv) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on electric charges and potentials.</li> <li>(v) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii) and (iv).</li> </ul>		4. Is the student able to perform experiment which illustrate electrification through friction and induction?  5. Is the student able to state the Coulomb's law?  6. Is the student able to state the SI units of electric charge?  7. Is the student able to explain the meaning of electric potential?  8. Is a student able to define potential difference?  9. Is the student able to state the SI units of potential difference?	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.2 Current Electricity	The student should be able to: a) Define the term current electricity. b) Distinguish between static electricity and current electricity	(i) The teacher to use questions to guide students to: - Define the term current electricity. (ii) The teacher to organize students in groups and use questions to guide them to state the difference between static electricity and current electricity. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).	<ul style="list-style-type: none"> <li>• Dynamos</li> <li>• Electroscope</li> <li>• Ammeter</li> <li>• Voltmeter</li> <li>• Galvanometer</li> <li>• Cells</li> <li>• Copper wire</li> <li>• Battery</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term current electricity?</li> <li>2. Is the student able to distinguish between static electricity and current electricity?</li> </ol>	1
	6.3 Electric Current	The student should be able to: a) Define the term electric current. b) State its SI units of electric current.	(i) The teacher to use questions to guide students to: - Define the term electric current - State SI units of electric current. (ii) The teacher to organize students in groups and use questions to guide them to:	<ul style="list-style-type: none"> <li>• Ammeter</li> <li>• Cell</li> <li>• Wire</li> <li>• Resistors</li> <li>• Galvanometer</li> <li>• Battery</li> <li>• Voltmeter</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term electric current?</li> <li>2. Is the student able to state the SI units of electric current?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) State the relationship between electric current, charge and time.</p> <p>d) Calculate electric current.</p> <p>e) State the factors affecting electric current.</p>	<p>- State the relationship between electric current, charge and time.</p> <p>- State the factors affecting electric current.</p> <p>(iii) The teacher to create activities and guide students to calculate electric current.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (i)-(ii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>		<p>3. Is the student able to state the relationship between electric current, charge and time?</p> <p>4. Is the student able to calculate electric current?</p> <p>5. Is the student able to state the factors affecting electric current?</p>	
	6.4 Voltage	<p>The student should be able to:</p> <p>a) Explain the meaning of voltage.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain meaning of voltage</li> <li>- Define the term voltage and state its SI units.</li> </ul>	<ul style="list-style-type: none"> <li>• Ammeter</li> <li>• Cell</li> <li>• Resistors</li> <li>• Wire</li> <li>• Galvanometer</li> </ul>	<p>1. Is the student able to explain the meaning of voltage?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		b) Define the term voltage and state its SI units. c) Define the term electromotive force and state its SI units. d) Perform an experiment to illustrate factors affecting an electric current. e) Indicate the direction of flow of electrons and current f) Explain the use of voltmeters and ammeters. g) Identify the effects of electric current. h) Perform an experiment to illustrate the heating, magnetic and chemical effects of an electric current.	<ul style="list-style-type: none"> <li>- Define the term electromotive force</li> <li>- State the unit of electromotive force.</li> </ul> (ii) The teacher to organize students in groups and use questions to guide them to: <ul style="list-style-type: none"> <li>- Explain the use of voltmeters and ammeters.</li> <li>- Identify the effects of electric current.</li> <li>- Describe an experiment which verifies Ohm's law.</li> <li>- Elaborate application of voltmeters and ammeters.</li> </ul> (iii) The teacher to create activities and guide students in groups to: <ul style="list-style-type: none"> <li>- Conduct an experiment to illustrate the factors which affect an electric current.</li> <li>- Demonstrate the direction of flow of electrons and current</li> <li>- Perform an experiment to illustrate the heating, magnetic and chemical effects of an electric current.</li> </ul>	<ul style="list-style-type: none"> <li>• Battery</li> <li>• Voltmeter</li> <li>• Engineering science text books</li> </ul>	2. Is the student able to define voltage and state its SI units? 3. Is the student able to define electromotive force and state its SI units? 4. Is the student able to perform an experiment to illustrate the factors which affect an electric current? 5. Is the student able to indicate the direction of flow of electrons and current? 6. Is the student able to explain the use of voltmeters and ammeters? 7. Is the student able to identify the effects of electric current?	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		i) Make a simple electric circuit.	<ul style="list-style-type: none"> <li>- Conduct an experiment to explain the heating, magnetic and chemical effects of current.</li> <li>- Make a simple electric circuit.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>		<p>8. Is the student able to perform an experiment to illustrate the heating, magnetic and chemical effects of an electric current?</p> <p>9. Is the student able to make a simple electric circuit?</p>	
	6.5 Ohm's Law	<p>The student should be able to</p> <p>a) State Ohm's law</p> <p>b) Describe an experiment which verifies Ohm's law.</p>	<p>(i) The teacher to use questions to guide students to state Ohm's law.</p> <p>(ii) The teacher to organize students in groups and use questions to guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment which verifies Ohm's law.</li> </ul>	<ul style="list-style-type: none"> <li>• Ammeter</li> <li>• Cell</li> <li>• Resistors</li> <li>• Wire</li> <li>• Galvanometer</li> <li>• Battery</li> </ul>	<p>1. Is the student able to state Ohm's law?</p> <p>2. Is the student able to describe an experiment which verifies Ohm's law?</p>	4



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Conduct an experiment which verifies Ohm's law.</p> <p>d) State the conditions under which Ohm's law is valid.</p> <p>e) Solve problems involving the use of Ohm's law.</p>	<p>(iii) The teacher to create activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- State the conditions under which Ohm's law is valid</li> <li>- Conduct an experiment which verifies Ohm's law.</li> <li>- Solve problems involving the use of Ohm's law</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to state Ohm's law and its applications.</p>	<ul style="list-style-type: none"> <li>• Voltmeter</li> <li>• Engineering science text books</li> </ul>	<p>3. Is the student able to conduct an experiment which verifies Ohm's law?</p> <p>4. Is the student able to state the conditions under which Ohm's law is valid?</p> <p>5. Is the student able to solve problems involving the use of Ohm's law?</p>	
	6.6 Electric Circuits	<p>The student should be able to:</p> <p>a) Define an electric circuit.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define an electric circuit</li> <li>- Name the essential components of a simple electric circuit.</li> </ul>	<ul style="list-style-type: none"> <li>• Switch</li> <li>• Wire</li> <li>• Manila sheet</li> <li>• Flip chart</li> <li>• Marker pens</li> </ul>	<p>1. Is the student able to define an electric circuit?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		b) Identify essential components of a simple electric circuit c) Draw a complete electric circuit d) Draw the circuits and symbols for a conductor, resistor, cell and switch. e) Determine the effective electromotive force and current when the cells are arranged in series or in parallel. f) Calculate the internal resistance, electromotive force and current when cells are connected to external resistor in electrical circuits.	(ii) The teacher to organize students in groups and use questions to guide them to: - Explain how to determine the effective electromotive force and current when cells are arranged in series or in parallel - Describe how to calculate internal resistance, electromotive force and current when cells are connected to external resistance in electric circuit. - Discuss the effective electromotive force and current when the cells are arranged in series or in parallel. (iii) The teacher to create activities and organize students in groups to: - Draw circuits and symbols for conductor, resistor, cell and switch. - Draw a complete electric circuit	<ul style="list-style-type: none"> <li>• Ruler</li> <li>• Rheostat</li> <li>• Voltmeter</li> <li>• Source of power</li> <li>• Ammeter</li> <li>• Resistors</li> <li>• Cells</li> <li>• Battery</li> <li>• Engineering science text books</li> </ul>	2. Is the student able to list essential components of a simple electric circuit? 3. Is the student able to draw a complete electric circuit? 4. Is the student able to draw the circuits, symbols for a conductor resistor, cell and switch? 5. Is the student able to determine the effective electromotive force and current when cells are arranged in series or in parallel? 6. Is the student able to Calculate the internal resistance, electromotive force and current when cells are connected to an external resistor in electrical circuits?	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<ul style="list-style-type: none"> <li>- Connect the components to make a complete simple circuit.</li> <li>- Calculate the internal resistance, electromotive force and current when cells are connected to an external resistor in electrical circuits.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii).</p> <p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on electric circuit and current.</p> <p>(vi) Students to present their work for sharing and discussion.</p> <p>(vii) The teacher should give students feedback and use the students' responses as feedback to support students to identify, explain and solve problems on electric circuit and current.</p>			

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.7 Resistance	<p>The student should be able to:</p> <p>a) Define the term resistance.</p> <p>b) Describe the process of calculating the effective resistance when resistors are in series and parallel.</p> <p>c) Calculate the effective resistance when resistors are in series and parallel.</p>	<p>(i) The teacher to use questions to guide students to define the term resistance.</p> <p>(ii) The teacher to organize students in groups and guide them to describe process of calculating effective resistance when resistors are in series and parallel.</p> <p>(iii) The teacher to create activities and guide students in groups to calculate the effective resistance when resistors are in series and in parallel.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (iii).</p> <p>(v) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on calculating the effective resistance when resistors are in series and parallel.</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> <li>• Resistors</li> <li>• Ammeter</li> <li>• Voltmeter</li> <li>• Rheostat</li> <li>• Switch</li> <li>• Wire</li> <li>• Cells</li> <li>• Source of power</li> </ul>	<p>1. Is the student able to define the term resistance?</p> <p>2. Is the student able to describe the process of calculating the effective resistance when resistors are in series and parallel?</p> <p>3. Is the student able to calculate effective resistance when resistors are in series and in parallel?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vi) Students to present their work for sharing and discussion. (vii) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).			
	6.8 Electric Cells	The student should be able to: a) Explain the meaning of electric cells. b) Define the terms primary and secondary cells c) Describe the construction of primary and secondary cells. d) Identify the functions of the components of primary and secondary cells.	(i) The teacher to use questions to guide students to: - Explain the meaning of electric cells. - Define the terms primary and secondary cells. (ii) The teacher to organize students in groups and use questions to guide them to describe the construction of primary and secondary cells. (iii) The teacher to use questioning strategies (what, why and how questions) to guide students to: - Identify the functions of the components of primary and secondary cells.	<ul style="list-style-type: none"> <li>• Cells</li> <li>• Coils</li> <li>• Galvanometer</li> <li>• Ammeter</li> <li>• Primary cells</li> <li>• Secondary cells</li> <li>• Circuits in series and parallel arrangement</li> <li>• Bulbs</li> <li>• Wires</li> <li>• Source of power</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the meaning of electric cells? 2. Is the student able to define the terms primary and secondary cells? 3. Is the student able to describe the construction of primary and secondary cells? 4. Is the student able to explain the function of components of primary and secondary cells?	3

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) Explain the advantages and disadvantages of parallel and series as arrangements of cells.	<ul style="list-style-type: none"> <li>- Explain the advantages and disadvantages of series and parallel arrangements of cells.</li> <li>(iv) Students to present their responses for sharing and discussion.</li> <li>(v) The teacher should give students feedback and use the students' responses as feedback to support students to explain the meaning, functions, advantage and disadvantage of electric cells.</li> <li>(vi) The teacher to give feedback and use students' responses as feedback to support students to perform the tasks mentioned in part (i-iv).</li> </ul>		5. Is the student able to explain the advantages and disadvantages of parallel and series as arrangements of cells?	

## FORM III

### CLASS LEVEL COMPETENCIES

By the end of the form three course, students should have developed competence in:

- a) applying concepts and principles of turning forces in real situation;
- b) making up items that require angular and periodic motion principles for the functioning;
- c) using simple machines to simplify work;
- d) applying the concept of strength materials in daily life activities;
- e) applying the concepts and laws of heat in different materials; and
- f) developing principles of thermal energy in heat manipulations.

### CLASS LEVEL OBJECTIVES

By the end of form three course, students should be able to:

- a) explain the concepts and principles of turning forces;
- b) develop knowledge on angular motion;
- c) identify the effects and uses of periodic motion;
- d) explain principles of simple machines;
- e) develop knowledge on strength of materials; and
- f) develop principles of thermal energy in heat manipulation.

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>1.0 FORCES: (PART TWO)</b>	1.1 Vector Treatment of Forces	The student should be able to: a) Explain the meaning of vector. b) Classify the physical quantities into scalars and vectors. c) Distinguish between scalar and vector quantities.	(i) The teacher to use brainstorming questions to guide student to explain the meaning of vector. (ii) The teacher to organize students in groups and guide them to: - Classify the physical quantities into scalars and vectors. - Distinguish between scalar and vector quantities. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the students' responses as feedback to support students to state, classify and distinguish scalar and vector quantities.	<ul style="list-style-type: none"> <li>• Chart showing physical quantities (scalars and vectors)</li> <li>• Graph papers</li> <li>• Ruler</li> <li>• Mathematical set</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of vector?</li> <li>2. Is the student able to classify the physical quantities into scalars and vectors?</li> <li>3. Is the student able to distinguish between scalar and vector quantities?</li> </ol>	2
	1.2 Resolving Vectors by Graphical and Analytical Methods	The student should be able to: a) Add vectors using graphical and analytical methods.	(i) The teacher to arrange students in groups and guide students to: - Explain on how to add vectors by graphical and analytical methods.	<ul style="list-style-type: none"> <li>• Graph papers</li> <li>• Ruler</li> <li>• Mathematical set</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to add vectors using graphical method?</li> </ol>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>b) State the triangle, parallelogram and polygon laws of forces.</p> <p>c) Find the resultant of vectors by using triangle, parallelogram and polygon laws of forces (vectors).</p>	<p>- State the triangle, parallelogram and polygon laws of forces.</p> <p>(ii) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Add vectors by graphical and analytical methods</li> <li>- Find the resultant of vectors by using triangle, parallelogram and polygon laws of forces (vectors)?</li> </ul> <p>(iii) With the aid of pre-prepared assessment guideline, the teacher to guide students to use the guideline to assess the activities performed on part (ii).</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks mentioned in part (ii) and (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Engineering science text books</li> </ul>	<p>2. Is the student able to state the triangle, parallelogram, polygon laws of forces?</p> <p>3. Is the student able to find the resultant of vectors by using triangle, parallelogram and polygon laws of forces (vectors)?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vi) The teacher should give students feedback and use the students' responses as feedback to support students to state and find direction of a vector graphically and analytically.			
	1.3 Relative motion	The student should be able to: a) Explain the concept of relative motion. b) Calculate the relative velocity of two bodies. c) Apply the concept of relative motion in daily life.	(i) The teacher to use questions to guide students to explain the concept of relative motion. (ii) The teacher to organize students in groups and guide students to discuss the concept of relative velocity of two objects moving in the same direction and in the opposite direction. (iii) The teacher to create activities and guide students in groups to: - Find the relative velocities of two bodies by drawing or calculation. - Use the concept of relative motion in daily life.	<ul style="list-style-type: none"> <li>• Graph papers</li> <li>• Ruler</li> <li>• Mathematical set</li> <li>• Tape measure</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Two bicycle tyres</li> <li>• Timer</li> <li>• Tape measure</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of relative motion?</li> <li>2. Is the student able to calculate relative velocity of two bodies?</li> <li>3. Is the student able to apply the concept of relative motion in daily life?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iii).</p> <p>(v) The teacher should monitor and facilitate students in performing the tasks mention on part (iii) and (iv).</p> <p>(vi) Students to present their responses for sharing and discussion.</p> <p>(vii) The teacher should give students feedback and use the students' responses as feedback to support students to state and apply the concept of relative motion in daily life.</p>			
	1.4 Resultant and Equilibrant Forces	<p>The student should be able to:</p> <p>a) Define the term resultant force.</p> <p>b) Define the term equilibrant force.</p>	<p>(i) The teacher to use brainstorming questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define the term resultant force and equilibrant force.</li> <li>- Define term equilibrium force.</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Ruler</li> <li>• Protractor</li> </ul>	<p>1. Is the student able to define the term resultant force?</p> <p>2. Is the student able to define the term equilibrant force?</p>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Distinguish resultant force from equilibrant force.</p> <p>d) Solve problems involving resultant force and equilibrant force.</p>	<p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to state the difference between resultant force from equilibrant force.</p> <p>(iii) The teacher should give students feedback and use the students' responses as feedback to support the students to distinguish the terms resultant and equilibrant force.</p>		<p>3. Can the student distinguish resultant from equilibrant force?</p> <p>4. Can the student solve problems involving resultant force and equilibrant force?</p>	
<b>2.0 ANGULAR MOTION</b>	2.1 Concept of Angular Motion and Angular Displacement	<p>The student should be able to:</p> <p>a) Define the term angular motion.</p> <p>b) Give examples of angular motion.</p> <p>c) Define the term angular displacement.</p> <p>d) State the SI unit of angular motion.</p> <p>e) State the SI unit of angular displacement.</p>	<p>(i) The teacher to use questions to guides students to brainstorm the meaning of the term:</p> <ul style="list-style-type: none"> <li>- Angular motion.</li> <li>- Angular displacement</li> </ul> <p>(ii) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Give examples of angular motion in daily life.</li> <li>- State the SI unit of angular displacement.</li> </ul> <p>(iii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Describe the angular motion and name its unit.</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Multimedia projector</li> <li>• Bicycle wheels</li> <li>• Wheels</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencil</li> <li>• Protractor</li> <li>• Ruler</li> </ul>	<p>1. Is the student able to define angular motion?</p> <p>2. Is the student able to give examples of angular motion in daily life?</p> <p>3. Is the student able to define the term angular displacement and state its SI units?</p> <p>4. Is the student able to state the SI unit of angular displacement?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Explain the relation between a degree and a radian.	<ul style="list-style-type: none"> <li>- Explain the relation between a degree and a radian.</li> <li>(iv) The teacher should give students feedback and use the students' responses as feedback to support students in explaining the concepts of angular motion and displacement and their SI units.</li> </ul>		<ul style="list-style-type: none"> <li>5. Is the student able to state the SI units of angular motion?</li> <li>6. Is the student able to explain the relation between a degree and a radian?</li> </ul>	
	2.2 Angular velocity	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>a) Define angular velocity.</li> <li>b) State the SI unit of angular velocity.</li> <li>c) Explain the relation between linear velocity and angular velocity.</li> <li>d) Solve problems on angular motion.</li> </ul>	<ul style="list-style-type: none"> <li>(i) The teacher to use questions to guide students to: <ul style="list-style-type: none"> <li>- Define the term angular velocity.</li> <li>- State the SI unit of angular velocity</li> </ul> </li> <li>(ii) The teacher to organize students in groups and guide them to explain the relation between linear velocity and angular velocity.</li> <li>(iii) The teacher to create activities and guide students to solve problems on angular motion.</li> <li>(iv) The teacher should monitor and facilitate students to solve problems on angular motion.</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencil</li> <li>• Protractor</li> <li>• Ruler</li> <li>• Engineering science text books</li> </ul>	<ul style="list-style-type: none"> <li>1. Is the student able to define angular velocity?</li> <li>2. Is the student able to state the SI units of angular velocity?</li> <li>3. Is the student able to explain the relation between linear velocity and angular velocity?</li> <li>4. Is the student able to solve problems on angular motion?</li> </ul>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(v) The teacher should give students feedback and use the students' responses as feedback to support students to state the term angular velocity and solve problems on angular motion.			
	2.3 Angular Acceleration	The student should be able to: a) Define the term angular acceleration. b) State the SI unit of angular acceleration. c) Explain the relation between linear acceleration and angular acceleration. d) Explain the applications of linear acceleration and angular acceleration.	(i) The teacher to use questions to guide students to: - Define the term angular acceleration. - State the SI unit of angular acceleration. (ii) The teacher to organise students in groups and guide them to: - Explain the relation between linear acceleration and angular acceleration. - Explain the applications of linear acceleration and angular acceleration. (iii) The teacher should give students feedback and use the students' responses as feedback to support students to explain the term angular acceleration and their applications.	<ul style="list-style-type: none"> <li>• Wheels</li> <li>• Flip chart</li> <li>• Ruler</li> <li>• Marker pens</li> <li>• Protractor</li> <li>• Pencil</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term angular acceleration?</li> <li>2. Is the student able to state the SI units of angular acceleration?</li> <li>3. Is the student able to explain the relation between linear acceleration and angular acceleration?</li> <li>4. Is the student able to explain the applications of linear acceleration and angular acceleration?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.4 Equations of Uniformly Accelerated Angular Motion	<p>The student should be able to:</p> <p>a) Explain the term accelerated angular motion.</p> <p>b) State the equations of uniformly accelerated angular motion</p> <p>c) Solve problems on accelerated angular motion.</p>	<p>(i) The teacher to use questions to guide students to explain the term accelerated angular motion.</p> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- State the equation of uniformly accelerated angular motion.</li> <li>- Explain how to solve problems on accelerated angular motion.</li> </ul> <p>(iii) The teacher to create activities and guide students in groups to solve problems on accelerated angular motion.</p> <p>(iv) The teacher should monitor and facilitate students in solving problems on accelerated angular motion.</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>	<ul style="list-style-type: none"> <li>• Wheels</li> <li>• Flip chart</li> <li>• Ruler</li> <li>• Marker pens</li> <li>• Protractor</li> <li>• Pencil</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the term accelerated angular motion?</li> <li>2. Is the student able to state the equation of uniformly accelerated angular motion?</li> <li>3. Is the student able to solve problems on accelerated angular motion?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.5 Circular Motion	<p>The student should be able to:</p> <p>a) Explain the meaning of the term circular motion.</p> <p>b) State SI units of circular motion</p> <p>c) Describe the circular motion</p> <p>d) Solve problems on circular motion</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of term circular motion.</li> <li>- State SI units of circular motion.</li> <li>- Describe circular motion</li> </ul> <p>(ii) The teacher to create activities and guide students in groups to solve problems on circular motion.</p> <p>(iii) The teacher should monitor and facilitate students in solving problems on circular motion.</p> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher should give students feedback and use the students' responses as feedback to support students in explaining term circular motion and solve problem on circular motion.</p>	<ul style="list-style-type: none"> <li>• Clock</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencils</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of the term circular motion?</li> <li>2. Is the student able to state SI units of circular motion?</li> <li>3. Is the student able to describe circular motion?</li> <li>4. Is the student able to solve problems on circular motion?</li> </ol>	4



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.6 Centripetal Forces	<p>The student should be able to:</p> <p>a) Explain the meaning of the term centripetal forces.</p> <p>b) Solve problems on centripetal forces.</p>	<p>(i) The teacher to use questions to guide students to: - Explain the meaning of the term centripetal force.</p> <p>(ii) The teacher to create activities and guide students in groups to solve problems on centripetal forces.</p> <p>(iii) The teacher should monitor and facilitate students in solving problems on centripetal forces.</p> <p>(iv) Students to present their responses for sharing and discussion</p> <p>(v) The teacher should give students feedback and use the students' responses as feedback to support students in explaining term centripetal forces and solve problem on centripetal forces.</p>	<ul style="list-style-type: none"> <li>• Wheels</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to define the term centripetal force?</p> <p>2. Is the student able to solve problems on centripetal forces?</p>	4
	2.7 Centrifugal Forces	<p>The student should be able to:</p> <p>a) Explain the meaning of the term centrifugal force.</p>	<p>(i) The teacher to use questions to guide students to: - Explain the meaning of the term centrifugal force and give its unit.</p>	<ul style="list-style-type: none"> <li>• Blender</li> <li>• Fruits</li> <li>• Source of power</li> <li>• Centrifuge</li> <li>• Milk</li> </ul>	<p>1. Is the student able to define the term centrifugal force?</p> <p>2. Is the student able to solve problems on centrifugal forces?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Solve problems on centrifugal forces.</p> <p>d) Cite examples of centrifugal forces and where they are applied.</p>	<p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain how to solve problems on centrifugal forces.</li> <li>- Give examples of centrifugal forces in real life situations.</li> </ul> <p>(iii) The teacher to create activities and guide students in groups to solve problems on centrifugal forces.</p> <p>(iv) The teacher should monitor and facilitate students in solving problems on centrifugal forces.</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iii).</p>		<p>3. Is the student able to cite examples of centrifugal forces and where they are applied?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.8 Centripetal Acceleration	<p>The student should be able to:</p> <p>a) Explain the meaning of the term centripetal acceleration.</p> <p>b) State the SI units of centripetal acceleration.</p> <p>c) Solve problems on centripetal acceleration.</p> <p>d) Cite examples of centripetal acceleration and where they are applied.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of term centripetal acceleration.</li> <li>- State the SI units of centripetal acceleration.</li> <li>- Name the unit of centripetal acceleration.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain how to solve problems on centripetal acceleration.</li> <li>- Cite examples of centripetal acceleration and where they are applied.</li> </ul> <p>(iii) The teacher to create activities and guide students in groups to solve problems on centripetal acceleration.</p> <p>(iv) The teacher should monitor and facilitate students in solving problems on centripetal acceleration.</p>	<ul style="list-style-type: none"> <li>• Wheel Balance</li> <li>• Juice</li> <li>• Blender</li> <li>• String</li> <li>• Stone</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the centripetal acceleration?</li> <li>2. Is the student able to state the SI of centripetal acceleration?</li> <li>3. Is the student able to solve problems on centripetal acceleration?</li> <li>4. Is the student able to cite examples of centripetal acceleration and where they are applied?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use students' responses as feedback to support students in performing the tasks mentioned in part (i-iv).</p>			
	2.9 Torque	<p>The student should be able to:</p> <p>a) Explain the meaning of the term torque and state its SI units.</p> <p>b) Describe the equation of the work done by torque.</p> <p>c) Explain the SI units of work done by torque.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of the term torque and state its SI units.</li> <li>- State the unit of torque.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the equation of work done by torque.</li> <li>- Explain the SI units of work done by torque.</li> <li>- Identify the applications of torque.</li> <li>- Show how to solve problems on torque.</li> </ul>	<ul style="list-style-type: none"> <li>• Wheel and axle</li> <li>• Bolt</li> <li>• Claw hammer</li> <li>• Spanner</li> <li>• Nail</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of the term torque and state its SI units?</li> <li>2. Is the student able to state the equation of the work done by torque?</li> <li>3. Is the student able to state the SI units of work done by torque?</li> <li>4. Is the student able to solve problems on torque?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Solve problems on torque.</p> <p>e) Identify the applications of torque.</p>	<p>(iii) The teacher to create activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Give the SI units of work done by torque.</li> <li>- Solve problems on torque.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students on explaining term torque and solving problem on torque.</p>		5. Is the student able to identify the applications of torque?	
<b>3.0 PERIODIC MOTION</b>	3.1 The Concept of Periodic Motion	<p>The student should be able to:</p> <p>a) Explain the meaning of the term periodic motion.</p>	<p>(i) The teacher to use brainstorming question to guide students to explain the meaning of the term periodic motion.</p> <p>(ii) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Give the examples of periodic motion.</li> </ul>	<ul style="list-style-type: none"> <li>• Pendulum</li> <li>• Striking stick</li> <li>• Drum</li> <li>• Speaker</li> <li>• Microphone</li> <li>• Source of power</li> </ul>	<p>1. Is the student able to define periodic motion?</p> <p>2. Is the student able to name examples of periodic phenomena?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Name examples of periodic motion.</p> <p>d) Identify the instruments and methods for measuring periodic motion.</p>	<p>- Identify the instruments and methods for measuring periodic motion.</p> <p>(iii) The teacher should give feedback and use the students' responses as feedback to support students in performing the tasks given on part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Guitar</li> <li>• Tuning fork</li> <li>• Engineering science text books</li> </ul>	<p>3. Is the student able to identify the instruments and methods for measuring periodic motion?</p>	
	3.2 Oscillations	<p>The student should be able to:</p> <p>a) Define the term oscillation (vibration).</p> <p>b) Identify measures of oscillations.</p> <p>c) Explain the uses of oscillations.</p> <p>d) Measure oscillations motion.</p> <p>e) Explain functions of oscillations.</p>	<p>(i) The teacher to use brainstorming questions to guide students to define the term oscillation.</p> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify measures of oscillations.</li> <li>- Explain the uses of oscillations.</li> <li>- Describe the processes of measuring oscillation motion.</li> </ul> <p>(iii) The teacher to create activities and guide students in groups to measure oscillations motion.</p>	<ul style="list-style-type: none"> <li>• Oscillators</li> <li>• Striking stick</li> <li>• Drum</li> <li>• Speaker</li> <li>• Microphone</li> <li>• Source of power</li> <li>• Guitar</li> <li>• Tuning fork</li> <li>• Pendulum bob</li> <li>• Strings</li> <li>• Retort stand</li> </ul>	<p>1. Is the student able to define the term oscillation (vibration)?</p> <p>2. Is the student able to identify measures of oscillations?</p> <p>3. Is the student able to explain the uses of oscillations?</p> <p>4. Is the student able to measure oscillations motion?</p> <p>5. Is the student able to explain functions of oscillations?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii) (v) Students to present their responses for sharing and discussion. (vi) The teacher should give students feedback and use the students' responses as feedback to support students in performing the tasks given in part (i-iii).			
	3.3 Simple Pendulum	The student should be able to: a) Define a term a simple pendulum. b) Describe the mode of action of a simple pendulum	(i) The teacher to use brainstorming questions to guide students to define a term simple pendulum. (ii) The teacher to organise students in groups and guide them to describe the mode of action of a simple pendulum. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the feedback to support students in performing the tasks given on part (i) and (ii).	<ul style="list-style-type: none"> <li>• Spiral spring</li> <li>• Simple pendulum</li> <li>• Watch/clock</li> <li>• Ruler</li> <li>• Graph paper</li> <li>• Table</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencil</li> <li>• Clamp</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to define a term a simple pendulum?  2. Is the student able to describe the mode of a simple pendulum?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.4 Periodic Time	<p>The student should be able to:</p> <p>a) Define the term periodic time.</p> <p>b) State the SI units of periodic time.</p> <p>c) Measure the periodic time of a simple pendulum.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define the term periodic time.</li> <li>- State the SI unit of periodic time.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to explain how to measure the periodic time of simple pendulum.</p> <p>(iii) The teacher to design activities and guide students to measure the periodic time of a simple pendulum.</p> <p>(iv) The teacher should give students feedback and use the feedback to support students in performing the tasks given on part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Graph paper</li> <li>• Table</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencil</li> <li>• Spiral spring</li> <li>• Simple pendulum</li> <li>• Watch/clock</li> <li>• Ruler</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define periodic time?</li> <li>2. Is the student able to state the SI units of periodic time?</li> <li>3. Is the student able to measure the periodic time of a simple pendulum?</li> </ol>	6
	3.5 Importance of Periodic Motion	<p>The student should be able to:</p> <p>a) Define the term periodic motion.</p> <p>b) Explain the importance of periodic motion.</p>	<p>(i) The teacher to use questions to guide students to define the term periodic motion.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain the importance of periodic motion.</li> </ul>	<ul style="list-style-type: none"> <li>• Timer</li> <li>• Earth's rotation</li> <li>• String of a guitar</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term periodic motion?</li> <li>2. Is the student able to explain the important of periodic motion?</li> </ol>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		c) Identify the applications of periodic motion.	<ul style="list-style-type: none"> <li>- Identify the applications of periodic motion</li> <li>(iii) Students to present their responses for sharing and discussion.</li> <li>(iv) The teacher should give students feedback and use the feedback to support students in performing the tasks given on part(i) and (ii).</li> </ul>		3. Is the student able to identify the applications of periodic motion?	
<b>4.0 PROJECTILE MOTION</b>	4.1 The Concept of Projectile Motion	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>a) Define the term projectile motion.</li> <li>b) List examples of projectile motion</li> <li>c) Illustrate graphically the drawing of projectile motion.</li> <li>d) State the force that acts on a projectile motion.</li> </ul>	<ul style="list-style-type: none"> <li>(i) The teacher to use brainstorming questions to guide students to: <ul style="list-style-type: none"> <li>- Define the term projectile motion.</li> <li>- List the examples of projectile motion.</li> </ul> </li> <li>(ii) The teacher to organise students in groups and guide them to state the force that acts on a projectile motion</li> <li>(iii) The teacher to create activities for students to illustrate the drawing of projectile motion graphically.</li> <li>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Multimedia projector</li> <li>• Football</li> <li>• Graph papers</li> <li>• Pencils</li> <li>• Protractor</li> <li>• An arrow</li> <li>• Speaker</li> <li>• Light stone</li> <li>• Catapult</li> </ul>	<ul style="list-style-type: none"> <li>1. Is the student able to define projectile motion?</li> <li>2. Is the student able to list examples of projectile motion?</li> <li>3. Is the student able to illustrate the drawing of projectile motion graphically?</li> <li>4. Is the student able to state the force that acts on a projectile motion?</li> </ul>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(v) The teacher should give students feedback and use the students' responses as feedback to support students in performing the tasks on part (i-iii).			
	4.2 Projectile Range and Height	<p>The student should be able to:</p> <p>a) Explain range of projectile.</p> <p>b) Explain height of projectile.</p> <p>c) Derive the equation of the range of projectile.</p> <p>d) Derive the equation of the height of the projectile</p> <p>e) Analyse the equations of the height and range of the projectile.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain range of projectile.</li> <li>- Explain height of projectile</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Derive the equation of the range of projectile.</li> <li>- Derive the equation of the height of the projectile</li> <li>- Analyze the equations of the height and range of the projectile.</li> </ul> <p>(iii) The teacher to create activities for students to solve problems on projectile motions.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p>	<ul style="list-style-type: none"> <li>• Timer</li> <li>• Measuring tape</li> <li>• Graph paper</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencils</li> <li>• A kicked football</li> <li>• A thrown ball</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define range of projectile?</li> <li>2. Is the student able to derive the equation of the range?</li> <li>3. Is the student able to define height of projectile?</li> <li>4. Is the student able to derive the equations of the height of the projectile?</li> <li>5. Is the student able to analyze the equation of the height and range of the projectile?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Solve problems on projectile motions	(v) Students to present their responses for sharing and discussion. (vi) The teacher should give students feedback and use the students' responses as feedback to support students to explain height, range and equation of projectile.		6. Is the student able to solve problems on projectile motions?	
	4.3 Time of Flight	The student should be able to: a) Define the term time of flight. b) Derive the equation of the time of flight. c) Solve problems on the time of flight.	(i) The teacher to use questions to guide students to define the term time of flight (ii) The teacher to organise students in groups and guide them to derive the equation of the time of flight (iii) The teacher to create activities and guide students in groups to practice solving problems on the time of flight. (iv) Students to present their responses for sharing and discussion. (v) The teacher should give students feedback and use the students' responses as feedback to support students to derive equation and solve problems on the time of flight.	<ul style="list-style-type: none"> <li>• Ball</li> <li>• Stones</li> <li>• Stop watch</li> <li>• Measuring tape</li> </ul>	1. Is the student able to define the term time of flight? 2. Is the student able to derive the equation of the time of flight? 3. Is the student able to solve problems on the time of flight?	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>5.0 SIMPLE MACHINES: (PART TWO)</b>	5.1 Law of Machine	The student should be able to: a) State the law of a machine. b) Derive the law of a machine. c) Solve problems on law of machines.	(i) The teacher to organize students to state the law of a machine. (ii) The teacher to organise students in groups and guide them to derive the law of a machine. (iii) The teacher to create activities and guide students in groups to solve problems on law of machines. (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii). (v) The teacher should give students feedback and use the students' responses as feedback to support students to state and derive the law of machine.	<ul style="list-style-type: none"> <li>• Levers</li> <li>• Pulleys</li> <li>• Lifting jack</li> <li>• Screw jack</li> <li>• Wheel and axle</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to state the law of a machine?</li> <li>2. Is the student able to derive the law of a machine?</li> <li>3. Is the student able to solve problems on law of machines?</li> </ol>	4
	5.2 Gear drive	The student should be able to: a) Explain the meaning of gear. b) Identify types of gear drive.	(i) The teacher to use questions to guide students to explain the meaning of the word gear. (ii) The teacher to organize students in groups and guide them to: - Identify types of gear drives. - Name examples of the applications of gear drives.	<ul style="list-style-type: none"> <li>• Gear box for <ul style="list-style-type: none"> <li>- Motor vehicle</li> <li>- Motor cycle</li> <li>- Bike/ bicycle</li> </ul> </li> <li>• Gear drives</li> <li>• Gear wheel</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of gear?</li> <li>2. Is the student able to identify types of gear drive?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Name examples of the applications of gear drive.</p> <p>d) Solve problems on gear drive.</p>	<p>(iii) The teacher to create activities for students to solve problems on gear drive.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) The teacher should give students feedback and use the students' responses as feedback to support students in explaining the meaning, types of gear drive and solve problem on gear drive.</p>	<ul style="list-style-type: none"> <li>• Final drive</li> <li>• Rack and pinion</li> <li>• Engineering science text books</li> </ul>	<p>3. Is the student able to name examples of the applications of gear drive?</p> <p>4. Is the student able to solve gear drive problems?</p>	
	5.3 Belt drive	<p>The student should be able to:</p> <p>a) Explain the meaning of belt drive.</p> <p>b) Identify three kinds of belts and pulleys in common use.</p> <p>c) Describe three kinds of belts and pulleys in common use.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of belt drive.</li> <li>- Identify three kinds of belts and pulleys in common use.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Identify the applications of belt drives.</li> <li>- Explain how to solve problems on belt drive.</li> </ul>	<ul style="list-style-type: none"> <li>• Conveyor belt</li> <li>• Car engines</li> <li>• Machine with belt drive</li> <li>• Belts</li> <li>• Pulleys</li> <li>• Wind mills</li> </ul>	<p>1. Is the student able to explain the meaning of belt drive?</p> <p>2. Is the student able to identify three kinds of belts and pulleys in common use?</p> <p>3. Is the student able to describe three kinds of belts and pulleys in common use?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Identify the applications of belt drives</p> <p>e) Solve problems on belt drive</p>	<p>(iii) The teacher to create activities and guide students to solve problems on belt drive.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students in performing the tasks on part (i-iii).</p>		<p>4. Is the student able to identify the applications of belt drives?</p> <p>5. Is the student able to solve problems on belt drive?</p>	
	5.4 Chain drives	<p>The student should be able to:</p> <p>a) Explain the meaning of chain drives.</p> <p>b) Identify examples of the applications of chain drives.</p> <p>c) Solve problems on chain drives.</p>	<p>(i) The teacher to use questions to guide students to explain the meaning of chain drives.</p> <p>(ii) The teacher to organize students in groups and guide them to give examples of the applications of chain drives.</p> <p>(iii) The teacher to create activities and guide students to solve problems on chain drives.</p>	<ul style="list-style-type: none"> <li>• Chain drives</li> <li>• Chain</li> <li>• Machine with chain drives</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the meaning of chain drives?</p> <p>2. Can the student give examples of the applications of chain drives?</p> <p>3. Is the student able to solve problems on chain drives?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to explain the meaning and application of chain drives.</p>			
<b>6.0 STRENGTH OF MATERIALS</b>	6.1 Mechanical Properties of Materials	<p>The student should be able to:</p> <p>a) Explain the meaning of the strength of a material.</p> <p>b) Define the term tenacity.</p> <p>c) Give examples of tenacity</p> <p>d) Describe an experiment which illustrates tenacity</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Brainstorm on the meaning of the term strength of material</li> <li>- Define the term tenacity.</li> <li>- Give examples of tenacity.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrate tenacity.</p> <p>(iii) The teacher to create activities and guide students to test a material and state if it has properties of tenacity.</p>	<ul style="list-style-type: none"> <li>• Cast iron</li> <li>• Carbon</li> <li>• Copper</li> <li>• Steel</li> <li>• Texts books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of strength of a material?</li> <li>2. Is the student able to define the term tenacity?</li> <li>3. Is the student able to give examples of tenacity?</li> <li>4. Is the student able to describe an experiment which illustrates tenacity?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) Test a material and state if it has properties of tenacity.	(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii). (v) Students to present their responses for sharing and discussion. (vi) The teacher should give feedback and use the students' responses as feedback to support students to test and state the properties of tenacity.		5. Is the student able to test a material and state if it has properties of tenacity?	
	6.2 Brittleness	The student should be able to: a) Explain the meaning of brittleness. b) Give examples of brittle materials. c) State the use of brittleness materials. d) Describe an experiment which illustrates brittleness.	(i) The teacher to use questions to guide students to: - Brainstorm on the meaning of the term brittleness - Give examples of brittle materials. (ii) The teacher to organize students in groups and guide them to: - State the use of brittleness materials. - Describe an experiment which illustrates brittleness.	<ul style="list-style-type: none"> <li>• Cast iron</li> <li>• Carbon</li> <li>• Copper</li> <li>• Steel</li> <li>• Glass</li> </ul>	1. Is the student able to explain the meaning of brittleness? 2. Is the student able to give examples of brittle materials? 3. Is the student able to state the use of brittleness materials?	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		c) Test a material and state if it has properties of brittleness.	<p>(iii) The teacher to create activities and guide students in groups to test a material and state if it has properties of brittleness.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students in testing and stating the properties of brittleness.</p>		<p>4. Is the student able to describe an experiment which illustrates brittleness?</p> <p>5. Is the student able to test a material and state if it has properties of brittleness?</p>	
	6.3 Ductility	<p>The student should be able to:</p> <p>a) Explain the meaning of ductility.</p> <p>b) Give example of ductile materials.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of ductility.</li> <li>- Give examples of ductile materials.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrates ductility.</p>	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Cast iron</li> <li>• Aluminium</li> <li>• Copper</li> <li>• Alloy</li> <li>• Carbon</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the meaning of ductility of a material?</p> <p>2. Is the student able to give examples of ductile materials?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Describe an experiment which illustrate ductility.</p> <p>d) Test a material and state if it has properties of ductility.</p>	<p>(iii) The teacher to create activities and organize students in groups to test material and state if it has properties of ductility.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii)</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of ductility.</p>		<p>3. Is the student able to describe an experiment which illustrates ductility?</p> <p>4. Is the student able to test material and state if it has properties of ductility?</p>	
	6.4 Elasticity.	<p>The student should be able to:</p> <p>a) Explain the meaning of elasticity.</p> <p>b) Give examples of elasticity materials.</p> <p>c) Describe an experiment which illustrates elasticity.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of elasticity.</li> <li>- Give the example of elasticity.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrate elasticity.</p>	<ul style="list-style-type: none"> <li>• Aluminum</li> <li>• Copper</li> <li>• Alloy</li> <li>• Cast iron</li> <li>• Steel</li> <li>• Carbon</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the meaning of elasticity?</p> <p>2. Is the student able to give examples of elasticity materials?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Test material and state if it has properties of elasticity.	<p>(iii) The teacher to create activities and organize students in groups to test material and state if it has properties of elasticity.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of elasticity.</p>		<p>3. Is the student able to describe an experiment which illustrate elasticity?</p> <p>4. Is the student able to test material and state if it has properties of elasticity?</p>	
	6.5 Plasticity and Elongation	<p>The student should be able to:</p> <p>a) Explain the meaning of plasticity and elongation.</p> <p>b) Give examples of plasticity and elongation materials.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of plasticity and elongation.</li> <li>- Give the example of plasticity and elongation.</li> </ul>	<ul style="list-style-type: none"> <li>• Posters with pictures showing tensile testing</li> <li>• Tensile machine</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the meaning of plasticity and elongation?</p> <p>2. Is the student able to give examples of plasticity and elongation?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Describe an experiment which illustrate the measurement of plasticity and elongation.</p> <p>d) Test material and state if it has properties of plasticity and elongation.</p>	<p>(ii) The teacher to organize students in in groups and guide them to describe an experiment which illustrates plasticity and elongation.</p> <p>(iii) The teacher to create activities and organize students in groups to test material and state if it has a properties of plasticity and elongation.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of plasticity and elongation.</p>		<p>3. Is the student able to describe an experiment which illustrates plasticity and elongation?</p> <p>4. Is the student able to test material and state if it has properties of plasticity and elongation?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.6 Hardness.	<p>The student should be able to:</p> <p>a) Explain the term hardness.</p> <p>b) Give examples of hardness.</p> <p>c) Describe an experiment which illustrate hardness.</p> <p>d) Test material and state if it has properties of hardness.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of hardness.</li> <li>- Give the example of hardness.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrates hardness.</p> <p>(iii) The teacher to create activities and organize students in groups to test material and state if it has a properties of hardness.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of hardness.</p>	<ul style="list-style-type: none"> <li>• Brinell machine</li> <li>• Work piece</li> <li>• Rockwell machine</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the term hardness?</li> <li>2. Is the student able to give examples of hardness?</li> <li>3. Is the student able to describe an experiment which illustrates hardness?</li> <li>4. Is the student able to test material and state if it has properties of hardness?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.7 Softness	<p>The student should be able to:</p> <p>a) Explain the meaning of the term softness.</p> <p>b) Give examples of soft materials</p> <p>c) Describe an experiment which illustrates properties of softness.</p> <p>d) Test material and state if it has properties of softness.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of softness.</li> <li>- Give examples of soft materials.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrates properties of softness</p> <p>(iii) The teacher to create activities and organize students in groups to test a material and state if it has a properties of softness.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of softness.</p>	<ul style="list-style-type: none"> <li>• Spongy</li> <li>• Bar soap</li> <li>• Soft wood</li> <li>• Hard wood</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of the term softness?</li> <li>2. Is the student able to give examples of soft materials?</li> <li>3. Is the student able to describe an experiment which illustrates softness?</li> <li>4. Is the student able to test material and state if it has properties of softness?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.8 Malleability	<p>The student should be able to:</p> <p>a) Explain the meaning of malleability.</p> <p>b) Give examples of malleable material.</p> <p>c) Describe an experiment which illustrates malleability.</p> <p>d) Test material and state if it has properties of malleability.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of malleability.</li> <li>- Give examples of malleable material.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrates malleability.</p> <p>(iii) The teacher to create activities and organize students in groups to test material and state if it has a properties of malleability.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of malleability.</p>	<ul style="list-style-type: none"> <li>• Brinell machine</li> <li>• Rockwell machine</li> <li>• Work piece</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of malleability?</li> <li>2. Is the student able to give examples of malleable material?</li> <li>3. Is the student able to describe an experiment which illustrates malleability?</li> <li>4. Is the student able to test a material and state if it has properties of malleability?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.9 Toughness	<p>The student should be able to:</p> <p>a) Explain the meaning of toughness.</p> <p>b) Give examples of toughness.</p> <p>c) Describe an experiment which illustrates toughness.</p> <p>d) Test material and state if it has properties of toughness.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of toughness.</li> <li>- Give examples of toughness.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrate toughness.</p> <p>(iii) The teacher to create activities and organize students in groups to test material and state if it has a properties of toughness.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of toughness.</p>	<ul style="list-style-type: none"> <li>• Rockwell machine</li> <li>• Brinell testing machine</li> <li>• Materials with toughness properties</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of toughness?</li> <li>2. Is the student able to give examples of toughness?</li> <li>3. Is the student able to describe an experiment which illustrates toughness?</li> <li>4. Is the student able to test material and state if it has properties of toughness?</li> </ol>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.10 Flexibility	<p>The student should be able to:</p> <p>a) Explain the meaning of flexibility.</p> <p>b) Give examples of flexibility.</p> <p>c) Describe an experiment which illustrates flexibility.</p> <p>d) Test a material and state if it has properties of flexibility.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of flexibility.</li> <li>- Give examples of flexibility</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to describe an experiment which illustrates flexibility.</p> <p>(iii) The teacher to create activities and organize students in groups to test a material and state if it has a properties of flexibility.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to test and state the properties of flexibility.</p>	<ul style="list-style-type: none"> <li>• Electrical cables</li> <li>• Other flexible materials</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student explain the meaning of flexibility?</li> <li>2. Can the student give examples of flexibility?</li> <li>3. Can the student describe an experiment which illustrates flexibility?</li> <li>4. Can the student test material and state if it has properties of flexibility?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	6.11 Forces Applied to Solid Materials	<p>The student should be able to:</p> <p>a) Describe the effects of tensile forces on a material.</p> <p>b) Define tensile stress and tensile strain.</p> <p>c) State the SI units of tensile stress and tensile strain.</p> <p>d) Describe the effects of compressive forces on a material.</p> <p>e) State Hooke's law.</p> <p>f) Sketch a graph which shows how the extension varies with the applied load.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define tensile stress and tensile strain</li> <li>- State the SI units of tensile stress and tensile strain</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the effects of compressive forces on a material.</li> <li>- Describe the effects of tensile forces on a material.</li> </ul> <p>(iii) The teacher to use questions to guide students to state Hooke's law.</p> <p>(iv) The teacher to create activities and organize students in groups to:</p> <ul style="list-style-type: none"> <li>- Sketch a graph which shows how the extension varies with the applied load.</li> <li>- Plot a graph of load-extension to show the elasticity limit, yield point, and maximum load and the fracture.</li> </ul>	<ul style="list-style-type: none"> <li>• Leaf spring</li> <li>• Coil spring</li> <li>• Marker pens</li> <li>• Flip chart</li> <li>• Graph papers</li> <li>• Pencil</li> <li>• Wire</li> <li>• Catapult</li> <li>• Engineering science text books</li> <li>• Helical spring</li> <li>• Slinky spring</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to describe effect of tensile force on a material?</li> <li>2. Is the student able to define tensile stress and tensile strain?</li> <li>3. Is the student able to state the SI units of tensile stress and tensile strain?</li> <li>4. Is the student able to describe the effect of compressive forces on a material?</li> <li>5. Is the student able to state Hooke's law?</li> <li>6. Is the student able to sketch a graph which shows how the extension varies with the applied load?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		g) Plot a load extension graph and show the elasticity limit, yield point, maximum load and fracture.	(v) The teacher should monitor and facilitate students in performing the tasks given in part (iv). (vi) Students to present their responses for sharing and discussion. (vii) The teacher should give students feedback and use the students' responses as feedback to support students to describe and state materials and forces applied to solid materials.		7. Is the student able to plot a load extension graph and show the elasticity limit, yield point, maximum load and fracture?	
	6.12 Young's Modulus of Elasticity	The student should be able to: a) Define the term Young's modulus of elasticity. b) Describe an experiment designed to determine the Young's modulus of elasticity.	(i) The teacher to use questions to guide students to: - Brainstorm the term Young's modulus of elasticity. - Explain the meaning of the term factor of safety. (ii) The teacher to organize students in groups and guide them to describe an experiment designed to determine the Young's modulus of elasticity. (iii) The teacher to create activities and guide students in groups to:	<ul style="list-style-type: none"> <li>• Meter rule</li> <li>• Masses</li> <li>• Graph papers</li> <li>• Pencils</li> <li>• Rubber</li> <li>• Spiral spring</li> <li>• Flip chart</li> <li>• Wire</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to define the term Young's Modulus of elasticity? 2. Is the student able to describe an experiment designed to determine Young's Modulus of elasticity?	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Explain the meaning of the term factor of safety.</p> <p>d) Solve problems involving Hooke's law, Young's modulus and factor of safety.</p> <p>e) Solve problems involving percentage elongation and percentage reduction in area.</p>	<p>- Solve problems involving Hooke's law, Young's modulus and factor of safety</p> <p>- Solve problems involving percentage elongation and percentage reduction in area.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students in describing, stating and testing modulus of elasticity.</p>		<p>3. Is the student able to explain the meaning of the term factor of safety?</p> <p>4. Is the student able to solve problems involving Hooke's law, Young's Modulus and factor of safety?</p> <p>5. Is the student able to solve problems involving percentage elongation and percentage reduction in area?</p>	
<b>7.0 HEAT: (PART THREE)</b>	7.1 Measurement of heat	<p>The student should be able to:</p> <p>a) Define the term heat capacity.</p> <p>b) State the SI units of heat capacity.</p>	<p>(i) The teacher to use questions to guide students to:</p> <p>- Brainstorm the term heat capacity</p> <p>- State the units of heat capacity.</p>	<ul style="list-style-type: none"> <li>• Heater</li> <li>• Thermometer</li> <li>• Beaker</li> <li>• Water</li> <li>• Copper rod</li> <li>• Iron rod</li> </ul>	<p>1. Is the student able to define the term heat capacity?</p> <p>2. Is the student able to state the SI units of heat capacity?</p>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) State the SI units of specific heat capacity.</p> <p>d) Perform an experiment to determine the specific heat capacity of a solid.</p> <p>e) Perform an experiment to determine the specific heat capacity of a substance by a method of mixture based on the principle of mixture.</p>	<p>- State the SI units of specific heat capacity.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <p>- Describe how to conduct an experiment to determine the specific heat capacity of solid.</p> <p>- Describe how to conduct an experiment to determine the specific heat capacity of a substance by a method of mixture based on the principle of mixture.</p> <p>(iii) The teacher to create activities and guide students in groups to:</p> <p>- Perform an experiment to determine the specific heat capacity of a solid.</p> <p>- Perform an experiment to determine the specific heat capacity of a substance by a method of mixture based on the principle of mixture.</p>	<ul style="list-style-type: none"> <li>• Calorimeter</li> <li>• test tube</li> <li>• Solid material</li> <li>• Source of heat (i.e., charcoal, firewood, gas, electricity)</li> <li>• Engineering science text books</li> </ul>	<p>3. Is the student able to state the SI units of specific heat capacity?</p> <p>4. Is the student able to perform an experiment to determine the specific heat capacity of a solid?</p> <p>5. Is the student able to perform an experiment to determine specific heat capacity by the method of mixture based on principle of mixture?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii)</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the students' responses as feedback to support students to describe, state and test measurement of heat.</p>			
	7.2 Calorific Values	<p>The student should be able to:</p> <p>a) Define the calorific value of a fuel.</p> <p>b) State the SI unit of calorific value.</p> <p>c) Explain the meaning of calorific value of food.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the calorific value of fuel.</li> <li>- State the SI unit of calorific value.</li> <li>- Give the meaning of calorific value of food</li> </ul> <p>(ii) The teacher should give students feedback and use the students' responses as feedback to support students to explain and state the meaning and SI units of calorific values.</p>	<ul style="list-style-type: none"> <li>• Fuels</li> <li>• A chart with a list calorific values of fuels</li> <li>• Food stuff</li> <li>• A chart with a list of calorific value of food stuff</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the calorific value of a fuel?</li> <li>2. Is the student able to state the SI units of calorific value?</li> <li>3. Is the student able to explain the meaning of calorific value of food stuff?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.3 Change of State	<p>The student should be able to:</p> <p>a) Explain the kinetic theory of matter.</p> <p>b) Name and explain the three states of matter in relation to the kinetic theory of matter.</p> <p>c) Plot and interpret the heating and cooling curves.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the kinetic theory of matter</li> <li>- Name and explain the three states of matter in relation to the kinetic theory of matter</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to show how to plot and interpret the heating and cooling curves.</p> <p>(iii) The teacher to create activities and guide students in groups to plot and interpret the heating and cooling curves.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) The teacher to give students feedback and use the students' responses as feedback to support students to explain, state, and practice theories of matter.</p>	<ul style="list-style-type: none"> <li>• Source of heat (i.e., charcoal, firewood, gas, electricity)</li> <li>• Cooking pot</li> <li>• Water</li> <li>• Pressure cooker</li> <li>• Source of power</li> <li>• Graph paper</li> <li>• Pencil</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the kinetic theory of matter?</li> <li>2. Is the student able to name and explain the three states of matter in relation to the kinetic theory of matter?</li> <li>3. Is the student able to plot and interpret the heating and cooling curves?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.4 Melting and Boiling Point	<p>The student should be able to:</p> <p>a) Define the term melting points.</p> <p>b) Define the term boiling points.</p> <p>c) Determine melting and boiling point of different types of substances from cooling and heating curves.</p>	<p>(i) The teacher to use brainstorming questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Define the term melting points.</li> <li>- Define the term boiling points.</li> </ul> <p>(ii) The teacher to create activities and guide students into groups to determine melting and boiling point of different types of substances from cooling and heating curves.</p> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their work for sharing and discussion.</p> <p>(v) The teacher should give students feedback and use the students' responses as feedback to support students in performing the tasks in part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Thermometer</li> <li>• Oil</li> <li>• Ice block</li> <li>• Graph paper</li> <li>• Water</li> <li>• Heater</li> <li>• Beaker</li> <li>• Salt</li> <li>• Source of heat (i.e., charcoal, firewood, gas, electricity)</li> <li>• Engineering text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term melting point?</li> <li>2. Is the student able to define the term boiling point?</li> <li>3. Is the student able to determine melting and boiling point of different types of substances from cooling and heating curves?</li> </ol>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	7.5 Hot water system	<p>The student should be able to:</p> <p>a) Explain the components of a hot water system.</p> <p>b) Draw a labelled diagram of a domestic hot water system.</p> <p>c) Explain how the domestic hot water system works.</p>	<p>(i) The teacher to use questions to guide students to explain the main components of a hot water system.</p> <p>(ii) The teacher to organize students in groups and guide them to explain how the domestic hot water system works</p> <p>(iii) The teacher to create activities for students to draw a labelled domestic hot water system.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) The teacher should give students feedback and use the students' responses as feedback to support students in performing the tasks in part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Pencils</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the components of a hot water system?</li> <li>2. Is the student able to draw a labeled diagram of a domestic hot water system?</li> <li>3. Is the student able to explain how the domestic hot water system work?</li> </ol>	2

## FORM IV

### CLASS LEVEL COMPETENCIES

By the end of Form Four course, students should have developed competence in:

- a) interpreting the images formed in different aspects for specific purposes;
- b) demonstrating the importance of musical sounds in daily life;
- c) demonstrating the effects and uses of electricity and magnetism; and
- d) operating the machines which are electronically driven

### CLASS LEVEL OBJECTIVES

By the end of Form Four Course, students should be able to:

- a) explain the laws and principles of light (optics);
- b) make different musical instruments;
- c) manage the use of t electricity and magnetism; and
- d) explain basic building units for electronic circuits.

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>1.0 LIGHT (OPTICS): PART TWO</b>	1.1 Reflection of Light	<p>The student should be able to:</p> <p>a) Explain the meaning of the term reflection.</p> <p>b) Explain how a plane mirror is made.</p> <p>c) Draw a diagram which illustrates how rays of light reflect on a plane mirror.</p> <p>d) State the law of reflection.</p> <p>e) Describe an experiment which verifies the law of reflection.</p> <p>f) Conduct experiment which verifies the law of reflection.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Brainstorm on the meaning of the term reflection.</li> <li>- State the law of reflection</li> </ul> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain how a plane mirror is made.</li> <li>- Describe the applications of reflection of light in daily life.</li> <li>- Describe experiment which verifies the law of reflection.</li> <li>- Describe an experiment to locate the image of an object as seen in a plane mirror.</li> </ul> <p>(iii) The teacher to create to guide students to:</p> <ul style="list-style-type: none"> <li>- Draw a diagram which shows how rays of light are reflected on a plane mirror.</li> <li>- Conduct experiment which verifies the law of reflection.</li> </ul>	<ul style="list-style-type: none"> <li>• Mirrors</li> <li>• Torch</li> <li>• Sun</li> <li>• Card board</li> <li>• Optical pins</li> <li>• A ray</li> <li>• Graph paper</li> <li>• Plane paper</li> <li>• Pencils</li> <li>• Rubber</li> <li>• Multimedia projector</li> <li>• A simple periscope</li> <li>• Optical level</li> <li>• Theodolites</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of the term reflection?</li> <li>2. Is the student able to explain how a plane mirror is made?</li> <li>3. Is the student able to draw a diagram which illustrates how rays of light reflect on a plane mirror?</li> <li>4. Is the student able to state the law of reflection?</li> <li>5. Is the student able to describe experiment which verifies the law of reflection?</li> <li>6. Is the student able to describe an experiment to locate the image of object as seen in a plane mirror?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		g) Describe an experiment to locate the image of an object as seen in a plane mirror. h) Conduct experiment on locating the image of an object as seen in a plane mirror. i) Identify the applications of reflection of light in daily life	- Conduct experiment on locating the image of an object as seen in a plane mirror. (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii). (v) Student to present their responses for sharing and discussion. (vi) The teacher should give feedback and uses feedback to support students in performing the tasks given in part (i-iii).		7. Is the student able to conduct an experiment on locating the image of an object as seen in a plane mirror? 8. Is the student able to identify the applications of reflection in daily life?	
	1.2 Optical Instruments	The students should be able to: a) Identify optical instruments. b) Describe how a periscope works c) Describe the principle of action of an optical level	(i) The teacher to use questions to guide students to identify optical instruments. (ii) The teacher to organise students in groups and guide them to: - Describe the principle of action of an optical level. - Describe how a periscope works. (iii) Students to present their responses for sharing and discussion.	<ul style="list-style-type: none"> <li>• Concave mirror</li> <li>• Periscope</li> <li>• Convex mirror</li> <li>• Optical level</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to identify optical instruments? 2. Is the student able to describe how a periscope works? 3. Is the student able to describe the principle of action of an optical level?	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(iv) The teacher should give feedback and uses feedback to support students in performing the tasks given in part (i) and (ii).			
	1.3 Curved Mirrors	The student should be able to: a) State the meaning of curved mirrors. b) Identify the types of a curved mirrors. c) Describe features of a curved mirror. d) Differentiate between concave and convex mirrors.	(i) The teacher to use questions to guide students to: - State the meaning of curved mirrors - Identify the types of curved mirrors. (ii) The teacher to organise students in groups and guide them to: - Describe features of a curved mirror. - Differentiate between concave and convex mirrors. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give feedback and uses feedback to support students in performing the tasks given in part (i) and (ii).	<ul style="list-style-type: none"> <li>• Convex mirror</li> <li>• Concave mirror</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to state the meaning of curved mirrors?</li> <li>2. Is the student able to identify the types of a curved mirrors?</li> <li>3. Is the student able to describe features of a curved mirror?</li> <li>4. Is the student able to differentiate between concave and convex mirrors?</li> </ol>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	1.4 Concave and Convex mirrors	<p>The student should be able to:</p> <p>a) Explain the term centre of curvature, principal axis, principal focus, radius of curvature and focal length.</p> <p>b) Differentiate between concave and convex mirrors.</p> <p>c) Describe the nature and size of images formed by concave and convex mirrors.</p> <p>d) Explain the cause of blurred images formed by convex mirrors.</p>	<p>(i) The teacher to use questions to guide students to explain the terms optical centre, principal axis, principle focus, radius of curvature and focal length.</p> <p>(ii) The teacher to organize students in groups and guide students to:</p> <ul style="list-style-type: none"> <li>- Explain principal axis, principal focus, radius of curvature, centre of curvature and focal length.</li> <li>- Describe the nature and size of images formed by concave and convex mirrors.</li> </ul> <p>(iii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Differentiate between concave and convex mirrors</li> <li>- Explain the cause of blurred images formed by convex mirrors.</li> </ul> <p>(iv) The teacher should give feedback and uses feedback to support students to describe the nature and size of images formed by concave and convex mirrors</p>	<ul style="list-style-type: none"> <li>• Convex mirror</li> <li>• Concave mirror</li> <li>• Ruler</li> <li>• Pencil</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of the terms centre of curvature, principal axis, principal focus, radius of curvature and focal length?</li> <li>2. Is the student able to differentiate between concave and convex mirrors?</li> <li>3. Is the student able to describe the nature and size of images formed by concave and convex mirrors?</li> <li>4. Is the student able to explain the cause of blurred images formed by convex mirrors?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	1.5 Applications of Concave and Convex Mirrors	<p>The student should be able to:</p> <p>a) State the mirror formula and its applications.</p> <p>b) Calculate the focal length, image distances and object distances from concave and convex mirrors</p> <p>c) Identify the uses of concave mirror</p>	<p>(i) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Identify the mirror formula and its application.</li> <li>- Identify the applications of concave mirror.</li> </ul> <p>(ii) The teacher to create activities and guide students to calculate the focal length, image distances and object distances from concave and convex mirrors.</p> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) With the aid of pre-prepare assessment guideline, the teacher should guide students to use the assessment guideline to assess the activities performed on part (ii).</p> <p>(vi) The teacher should give feedback and uses feedback to support students in performing the tasks given in part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Convex mirror</li> <li>• Concave mirror</li> <li>• Ruler</li> <li>• Pencil</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to state the mirror formula and its application?</li> <li>2. Is the student able to calculate the focal length, image distances and object distances from concave and convex mirrors?</li> <li>3. Is the student able to identify the uses of concave mirror ?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	1.6 Refraction of light	<p>The student should be able:</p> <p>a) Explain the meaning of refraction of light.</p> <p>b) Describe an experiment which illustrates the refraction of light.</p> <p>c) State Snell's laws of refraction</p> <p>d) Describe an experiment which verifies the laws of refraction.</p> <p>e) Conduct an experiment which illustrates the refraction of light.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of refraction of light.</li> <li>- State Snell's laws of refraction.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment which illustrates the refraction of light.</li> <li>- Describe an experiment which verifies the laws of refraction.</li> </ul> <p>(iii) The teacher to create activities and guide students to:</p> <ul style="list-style-type: none"> <li>- Conduct an experiment which illustrates the refraction of light.</li> <li>- Conduct an experiment which verifies the laws of refraction.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p>	<ul style="list-style-type: none"> <li>• Glass prism</li> <li>• Glass block</li> <li>• Water</li> <li>• Beaker</li> <li>• Coin</li> <li>• Pin</li> <li>• Plane papers</li> <li>• Optical pins</li> <li>• Ray of light</li> <li>• Protractor</li> <li>• Ruler</li> <li>• Pencil</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of refraction of light?</li> <li>2. Is the student able to describe an experiment which illustrates the refraction of light?</li> <li>3. Is the student able to state Snell's law of refraction?</li> <li>4. Is the student able to describe an experiment which verifies the laws of refractions?</li> <li>5. Is the student able to conduct an experiment which illustrates the refraction of light?</li> <li>6. Is the student able to conduct an experiment which verifies the laws of refractions?</li> </ol>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Conduct an experiment which verifies the laws of refraction	(v) Students to present their responses for sharing and discussion. (vi) The teacher should give feedback and uses feedback to support students to state the application of refraction of light.			
	1.7 Refractive Indices of Different Media	The student should be able to: a) Define refractive index of a medium. b) Determine the refractive indices of transparent materials experimentally c) Explain why total internal refraction occurs	(i) The teacher to use questions to guide students to give the meaning of refractive index. (ii) The teacher to organize students in groups and guide them to: - Determine the refractive indices of transparent materials experimentally. - Describe an experiment which illustrates total internal refraction. (iii) The teacher to create activities for students to conduct experiment which illustrates total internal refraction. (iv) The teacher should monitor and facilitate students in performing the tasks given in part.	<ul style="list-style-type: none"> <li>• Protractor</li> <li>• Glass block</li> <li>• Ruler</li> <li>• Source of light</li> <li>• Pencil</li> <li>• Optical pins</li> <li>• Plane papers</li> <li>• Drawing board</li> <li>• Prisms</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define refraction index?</li> <li>2. Is the student able to determine the refractive indices of transparent materials experimentally?</li> <li>3. Is the student able to explain why total internal refraction occurs?</li> <li>4. Is the student able to describe an experiment which illustrates total internal refraction?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Describe an experiment which illustrates total internal refraction. e) Conduct experiment which illustrates total internal refraction.	(v) Students to present their responses for sharing and discussion. (vi) The teacher should give feedback and uses feedback to support students to identify and state the refractive index of light on different media.		5. Is the student able to conduct experiment which illustrates total internal refraction?	
	1.8 Critical Angle and Refractive Index	The student should be able to: a) Explain the meaning of critical angle. b) Explain the relationship between critical angle and refractive index. c) Identify examples of total internal reflection.	(i) The teacher to use question to guide students to: - Explain the meaning of critical angle - List examples of total internal reflection (ii) The teacher to use questioning strategies (what, why and how questions) to guide students to state the relationship between critical angle and refractive index. (iii) The teacher should give feedback and uses feedback to support students to explain and state the relationship between critical angle and refractive index.	<ul style="list-style-type: none"> <li>• Glass block</li> <li>• Protractor</li> <li>• Source of light</li> <li>• Plane paper</li> <li>• Pencil</li> <li>• Ruler</li> <li>• Drawing board</li> <li>• Optical pins</li> <li>• Prism</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the meaning of critical angle? 2. Is the student able to state the refraction between critical angle and refractive index? 3. Is the student able to list examples of total internal reflection?	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	1.9 Construction of Ray diagrams	<p>The student should be able to:</p> <p>a) Describe a glass prism.</p> <p>b) Explain the meaning of the angle of deviation.</p> <p>c) Describe the application of glass prisms.</p> <p>d) Explain importance of glass prisms</p> <p>e) Construct the ray diagram showing how a ray of light can be deviated through <math>90^\circ</math> and <math>180^\circ</math> degree.</p>	<p>(i) The teacher to use question to guide students to:</p> <ul style="list-style-type: none"> <li>- Describe a glass prism.</li> <li>- Explain the meaning of the angle of deviation.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain importance of glass prisms.</li> <li>- Describe the application of glass prisms.</li> </ul> <p>(iii) The teacher to create activities for students to construct the ray diagram to show how a ray of light can be deviated through <math>90^\circ</math> and <math>180^\circ</math> degree</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(v) The teacher should give feedback and use the feedback to support students to describe the ray diagrams and their importance.</p>	<ul style="list-style-type: none"> <li>• Graph papers</li> <li>• Protractor</li> <li>• Ruler</li> <li>• Pencil</li> <li>• Plane paper</li> <li>• Graph papers</li> <li>• Prism</li> <li>• A ray of light</li> <li>• Optical pins</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to describe a glass prism?</li> <li>2. Is the student able to explain the meaning of the angle of deviation?</li> <li>3. Is the student able to describe the applications of glass prisms?</li> <li>4. Is the student able to explain importance of glass prisms?</li> <li>5. Is the student able to construct the diagram showing how a ray of light can be deviated through <math>90^\circ</math> and <math>180^\circ</math> degree?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	1.10 Lenses	<p>The student should be able to:</p> <p>a) Explain the meaning of lens.</p> <p>b) Identify the types of lenses.</p> <p>c) Draw diagrams which illustrate the action of lenses on beams of light.</p> <p>Explain the meaning of optical centre and principal axis.</p> <p>e) Describe the principal focus of the lens.</p> <p>f) Describe the nature and size of images formed by convex and concave lenses.</p>	<p>(i) The teacher to use question to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of a lens</li> <li>- Explain the meaning of optical centre and principal axis.</li> <li>- Identify the types of lenses.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the principal focus of the lenses.</li> <li>- Describe the nature and size of images formed by convex and concave lenses.</li> <li>- Describe experiments for determination of focal lengths of convex and concave lenses</li> <li>- Describe how to draw diagram which illustrates the action of lenses on a beam of light.</li> </ul> <p>(iii) The teacher to create activities for students to:</p> <ul style="list-style-type: none"> <li>- Draw diagrams which illustrate the action of lenses on beam of light.</li> </ul>	<ul style="list-style-type: none"> <li>• Convex lens</li> <li>• Concave lens</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Ruler</li> <li>• Manila sheet</li> <li>• Screen</li> <li>• Stand for lens</li> <li>• Object (candle)</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of lens?</li> <li>2. Is the student able to identify the types of lenses?</li> <li>3. Is the student able to draw diagrams which illustrate the action of lenses on beams of light?</li> <li>4. Is the student able to explain the meaning of optical centre and principal axis?</li> <li>5. Is the student able to describe the principal focus of the lens?</li> <li>6. Is the student able to describe the nature and size of images formed by convex and concave lenses?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		g) Locate the optical centre, principal axis and principal focus of the lenses. h) Describe experiments for determination of focal lengths of convex and concave lenses i) Perform an experiment for determination of focal lengths in convex and concave lenses	<ul style="list-style-type: none"> <li>- Locate the optical centre, principal axis and principal focus of the lenses.</li> <li>- Perform an experiment for determination of focal lengths convex and concave lenses.</li> </ul> (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii). (v) Students to present their responses for sharing and discussion. (vi) The teacher should give feedback and use feedback to support students to list and describe lenses.		7. Is the student able to locate the optical centre, principal axis and principal focus of the lenses?  8. Is the student able to describe experiments for determination of focal lengths of convex and concave lenses?  9. Is the student able to perform an experiment for determination of focal lengths of convex and concave lenses?	
	1.11 Magnification of Lenses	The student should be able to: a) Define the term magnification. b) State the units of power of a lens. c) State the thin lens formula.	(i) The teacher to use question to guide students to: <ul style="list-style-type: none"> <li>- Define the term magnification</li> <li>- State the units of power of a lens.</li> <li>- State the thin lens formula.</li> </ul>	<ul style="list-style-type: none"> <li>• Concave lens</li> <li>• Convex lens</li> <li>• Object</li> <li>• Screen</li> <li>• Ruler</li> <li>• Pencil</li> <li>• Stand</li> <li>• Source of light</li> <li>• Flip chart</li> </ul>	1. Is the student able to define the term magnification? 2. Is the student able to state the units of power of a lens? 3. Is the student able to state the thin lens formula?	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Determine the magnification of a convex lens experimentally.</p> <p>e) Apply the thin lens formula in calculating the image distance, focal length, and power of lens and magnification, object distance.</p> <p>f) Describe the construction and mode of action of optical instruments.</p> <p>g) Calculate image distance, focal length and power of a lens, magnification and object distance</p>	<p>(ii) The teacher to organise students in groups and guide them to describe the construction and mode of action of optical instruments.</p> <p>(iii) The teacher to create activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Determine the magnification of a convex lens experimentally.</li> <li>- Apply the thin lens formula in calculating the image distance, focal length, and power of lens magnification, object distance</li> <li>- Calculate image distance, focal length and power of a lens, magnification and object distance.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p>	<ul style="list-style-type: none"> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<p>4. Is the student able to determine the magnification of a convex lens experimentally?</p> <p>5. Is the student able to apply the thin lens formula in calculating the image distance, focal length and power of lens, magnification and object distance?</p> <p>6. Is the student able to describe the construction and the mode of action of optical instruments?</p> <p>7. Is the student able to calculate image distance, focal length and power of a lens, magnification and object distance?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give feedback and use the feedback to support students to define and state formula of lenses magnification.</p>			
	1.12 Visible light spectrum	<p>The student should be able to:</p> <p>a) Explain the meaning of the term spectrum.</p> <p>b) Explain the meaning of dispersion of light.</p> <p>c) Describe an experiment which illustrates the dispersion of light.</p>	<p>(i) The teacher to use question to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of the term spectrum.</li> <li>- Explain the meaning of dispersion of light.</li> <li>- Identify the colours of the visible spectrum.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment which illustrates the dispersion of light.</li> <li>- Describe an experiment designed to produce a pure spectrum of white light on a white screen.</li> </ul>	<ul style="list-style-type: none"> <li>• Rainbow</li> <li>• Multimedia projector</li> <li>• Coloured objects</li> <li>• Coloured filters</li> <li>• Flip chart</li> <li>• White light</li> <li>• Water</li> <li>• Two convex lenses</li> <li>• Screen</li> <li>• Source of light</li> <li>• Prisms</li> <li>• Newton's colour disc</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of the term spectrum?</li> <li>2. Is the student able to explain the meaning of dispersion of light?</li> <li>3. Is the student able to describe an experiment which illustrates the dispersion of light?</li> <li>4. Is the student able to describe an experiment designed to project a pure spectrum of white light on a white screen?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Describe an experiment designed to produce a pure spectrum of white light on a white screen.</p> <p>e) Identify the colours of the visible spectrum.</p> <p>f) Conduct experiment which illustrates the dispersion of light</p>	<p>(iii) The teacher creates activities and guide students in groups to conduct experiment which illustrates the dispersion of light.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the feedback to support students to state and illustrate the dispersion of light.</p>		<p>5. Is the student able to name and identify the colours of the visible spectrum?</p> <p>6. Is the student able to conduct experiment which illustrates the dispersion of light?</p>	
	1.13 Colours	<p>The student should be able to:</p> <p>a) Explain the term colour.</p> <p>b) Identify types of colours.</p> <p>c) Explain the meaning of primary and secondary colours.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the term colour.</li> <li>- Identify types of colours.</li> <li>- Explain the meaning of primary and secondary colours.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to describe an experiment which illustrates the effects of mixing primary colours.</p>	<ul style="list-style-type: none"> <li>• Water sprayer</li> <li>• Hand lens</li> <li>• Primary colours</li> <li>• Screen</li> <li>• Filters</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the term colour?</p> <p>2. Is the student able to identify types of colours?</p> <p>3. Is the student able to explain the meaning of primary and secondary colours?</p>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Describe an experiment which illustrates the effects of mixing primary colours	(iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the feedback to support students to describe colours and their effects.		4. Is the student able to describe an experiment which illustrates the effects of mixing primary colours?	
	1.14 Colour Pigments	The student should be able to: a) Explain the meaning of colour pigments. b) Explain the types of colour pigments. c) Describe the effects of colour pigments on various types of light. d) Explain how the desired colour is obtained by mixing different colour pigments.	(i) The teacher to use questions to guide students to: - Explain the meaning of colour pigments. - Explain types of colour pigments. (ii) The teacher to organise students in groups and guide them to: - Describe the effects of colour pigments on various types of light - Explain how desired colour is obtained by mixing different colour pigments. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the feedback to support students to explain the meaning and effect of colour pigments.	<ul style="list-style-type: none"> <li>• Inorganic pigments</li> <li>• Water</li> <li>• Organic pigment</li> <li>• Salt</li> <li>• Different colours of pigments</li> <li>• Oil</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the meaning of colour pigments? 2. Is the student able to name and explain the types of colour pigments? 3. Is the student able to describe the effects of colour pigments on various types of light? 4. Is the student able to explain how desired colour is obtained by mixing different colour pigments?	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>2.0 SOUND WAVES (PART TWO)</b>	2.1 Musical Sounds	The student should be able to: a) Explain the meaning of musical sounds. b) State the properties of musical sounds. c) Name examples of musical instruments. d) Explain the meaning of musical scales. e) Describe an experiment which illustrates the musical scales (i.e. diatomic scale). f) Define with examples the fundamental notes, fundamental frequency, harmonic, overtone and octave of a sound note.	(i) The teacher to guide students to brainstorm on: - Meaning of musical sounds - Meaning of musical scales (ii) The teacher to organise students in groups and guide them to: - Identify the properties of musical sounds - Give examples of musical sounds. - Describe an experiment to illustrate the musical scales (diatomic scale). (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the feedback to support students to describe musical sounds and scale. (v) The teacher to use questions to guide students to:	<ul style="list-style-type: none"> <li>• Membrane</li> <li>• Drum</li> <li>• Guitar</li> <li>• Whistle</li> <li>• Tuning fork</li> <li>• Can</li> <li>• Model of human eye, ear</li> <li>• Trumpet</li> <li>• Table of audibility range</li> <li>• Piano</li> <li>• Violin</li> <li>• Saxophone</li> <li>• Piece of wood</li> <li>• Accordion</li> <li>• Musical notes</li> <li>• Diatomic scale</li> <li>• Sonometer</li> <li>• Flute</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Microphone</li> <li>• CRO (Cathode Ray Oscilloscope)</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of musical sound?</li> <li>2. Is the student able to identify and explain the properties of musical sounds?</li> <li>3. Is the student able to name examples of musical instruments?</li> <li>4. Is the student able to explain the meaning of musical scales?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>g) Solve problems involving fundamental frequency, harmonics and overtones</p> <p>h) Explain interference of sound waves, which produces beats</p>	<ul style="list-style-type: none"> <li>- Define with examples the fundamental notes (i.e., Do, Re, Mi-Fa, So-la-Ti-Do), fundamental frequency, harmonic, overtone and octave of a sound note.</li> <li>- Solve problems involving fundamental frequency, harmonics and overtones</li> </ul> <p>(vi) The teacher to organize students in groups and guide them to explain how the interference of sound waves produce beats.</p> <p>(vii) Students to present their responses for sharing and discussion.</p> <p>(viii) The teacher should give students feedback and use the feedback to support students to explain the meaning and fundamentals of sound waves and beats.</p>	<ul style="list-style-type: none"> <li>• Sound waves with similar frequencies</li> <li>• Engineering science text books</li> </ul>	<p>5. Is the student able to describe an experiment which illustrates the musical scales (i.e. diatomic scale)?</p> <p>6. Is the student able to define the fundamental notes, fundamental frequency, harmonic, overtone and octave of a sound note?</p> <p>7. Is the student able to solve problems involving fundamental frequency, harmonics and overtones?</p> <p>8. Is the student able to explain interference of sound waves, which produces beats?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	2.2 Resonance	<p>The student should be able to:</p> <p>a) Explain the concept of resonance.</p> <p>b) Describe an experiment which illustrates resonance</p> <p>c) Construct a simple resonance tube</p> <p>d) Measure the velocity of sound by a resonance tube</p> <p>e) State the application of resonance</p>	<p>(i) The teacher to use questions to guide students to brainstorm on the concept of resonance.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- State the application of resonance</li> <li>- Describe an experiment which illustrates resonance.</li> </ul> <p>(iii) The teacher to design activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Prepare a simple resonance tube.</li> <li>- Measure the velocity of light by a resonance tube</li> <li>- Construct a simple resonance tube</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iii)</p>	<ul style="list-style-type: none"> <li>• Turning fork</li> <li>• Resonance tube</li> <li>• Sounding boxes</li> <li>• Stand</li> <li>• Pipe</li> <li>• Metre rule</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the concept of resonance?</li> <li>2. Is the student able to describe an experiment which illustrates resonance?</li> <li>3. Is the student able to construct a simple resonance tube?</li> <li>4. Is the student able to measure the velocity of sound by a resonance tube?</li> <li>5. Is the student able to state the applications of resonance?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(vii) The teacher should give students feedback and use the feedback to support students in performing the tasks given part (i-iii).			
<b>3.0 ELECTRICITY AND MAGNETISM</b>	3.1 Magnets	The student should be able to: a) Explain the meaning of magnet. b) Describe an experiment which illustrates the properties of magnets. c) Explain the theory underlying the concept of magnetic properties. d) Explain the concept of a magnetic field in relation to the magnetic theory.	(i) The teacher to use questions to guide students to brainstorm on the meaning of a magnet. (ii) The teacher to organise students in groups and guide them to: - State the theory underlying the concept of magnetism - Explain the concept of a magnetic field in relation to the magnetic theory - Describe an experiment which illustrates the properties of magnets. (iii) The teacher to create activities and guide students to perform an experiment which illustrates the properties of a magnet. (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).	<ul style="list-style-type: none"> <li>• Iron fillings</li> <li>• Source of electricity</li> <li>• Wire</li> <li>• Compass needle</li> <li>• Card board</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of magnet and concept of magnetic field?</li> <li>2. Is the student able to describe an experiment which illustrates the properties of magnets?</li> <li>3. Is the student able to explain the theory underlying the concept of magnetic properties?</li> <li>4. Is the student able to explain the concept of a magnetic field in relation to magnetic theory?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		e) Perform an experiment which illustrates the properties of a magnet.	(v) Students to present their responses for sharing and discussion. (vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iii). (vii) The teacher should give students feedback and use the feedback to support students in explaining the concept of a magnetic field in relation to the magnetic theory.		5. Is the student able to perform an experiment which illustrates the properties of a magnet?	
	3.2 Magne-tisation and Demagne-tisation	The student should be able to: a) State the laws of magnetism. b) Explain the meaning of the term magnetisation. c) Explain the meaning of the term demagnetisation.	(i) The teacher to use questions to guide students to: - State the laws of magnetism - Explain the meaning of the term magnetisation - Explain the meaning of the term demagnetisation. (ii) The teacher to organize students in groups and guide them to:	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Piece of magnets</li> <li>• Iron nails</li> <li>• Office pins</li> <li>• D. C. source</li> <li>• Wire</li> <li>• Forrous materials</li> </ul>	1. Is the student able to state the laws of magnetism? 2. Is the student able to explain the meaning of the term magnetisation? 3. Is the student able to explain the meaning of the term demagnetisation?	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Describe the experiment which illustrates different methods of demagnetisation.</p> <p>e) Outline and explain the properties of materials suitable for magnetisation.</p> <p>f) Describe the experiment which illustrates different methods of magnetisation.</p>	<p>- Describe an experiment to illustrate different methods of demagnetisation.</p> <p>- Outline the properties of suitable materials for magnetisation.</p> <p>- Describe the experiment which illustrates different methods of magnetisation</p> <p>(iii) Students to present responses for sharing and discussion.</p> <p>(iv) The teacher should give students feedback and use the feedback to support students in explaining the concept magnetisation and demagnetisation and state their properties.</p>	<ul style="list-style-type: none"> <li>• Iron fillings</li> <li>• Solenoid (coil)</li> <li>• Colbalt</li> <li>• Aluminium</li> <li>• Manganese</li> <li>• Magnetite</li> <li>• Nickel</li> <li>• Wire</li> <li>• Engineering science text books</li> </ul>	<p>4. Is the student able to describe the experiment which illustrates different methods of demagnetisation?</p> <p>5. Is the student able to outline and explain the properties of materials suitable for magnetisation?</p> <p>6. Is the student able to describe the experiment which illustrates different methods of magnetisation?</p>	
	3.3 Magnetic Poles	<p>The student should be able to:</p> <p>a) Explain the meaning of the term magnetic north and geographical north.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of magnetic north and geographical north</li> <li>- Define the term magnetic variation.</li> <li>- Explain the meaning of magnetic screening.</li> </ul>	<ul style="list-style-type: none"> <li>• Magnets</li> <li>• Compass</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Magnetic materials</li> <li>• Engineering science text books</li> </ul>	<p>1. Is the student able to explain the meaning of the term magnetic north and geographical north?</p> <p>2. Is the student able to explain the difference between geographical north and magnetic north?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		b) Define the term magnetic variation c) Explain the meaning of magnetic screening d) Explain the difference between geographical north and magnetic north	(ii) The teacher to organize students in groups and guide them to explain the difference between geographical north and magnetic poles. (iii) Students to present their responses for sharing and discussion. (iv) The teacher should give students feedback and use the feedback to support students to explain and differentiate magnetic north and geographical north.		3. Is the student able to define the term magnetic variation? 4. Is the student able to explain the meaning of magnetic screening?	
	3.4 Resistance of a Conductor	The student should be able to: a) Explain the effects of temperature on the resistance of various materials (pure metals, alloys and insulators). b) Define resistivity of a wire.	(i) The teacher to use questions and answer method to guide students to: - Give the meaning of the term resistivity - State the SI units of resistivity (ii) The teacher to use questioning strategies (what, why and how questions) to guide students to:	<ul style="list-style-type: none"> <li>• Insulators</li> <li>• Metre rule</li> <li>• Metals</li> <li>• Alloys</li> <li>• Galvanometer</li> <li>• Voltmeter</li> <li>• Ammeter</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the effects of temperature on various material? 2. Is the student able to define resistivity of a wire? 3. Is the student able to explain the relation between resistance and resistivity?	4



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		d) Explain the relation between resistance and resistivity. e) State the SI units of resistivity. e) Describe an experiment to measure resistivity. f) Solve problems involving resistivity.	<ul style="list-style-type: none"> <li>- Explain the effects of temperature on resistance of various materials (pure metals, alloys and insulators).</li> <li>- Explain the relation between resistance and resistivity</li> <li>- Describe an experiment to measure resistivity.</li> </ul> (iii) The teacher to create activities and guide students to solve problems involving resistivity. (iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii). (v) Students to present their responses for sharing and discussion. (vi) The teacher should give students feedback and use feedback to support students in explaining and solving problems involving resistivity.		4. Is the student able to state the SI units of resistivity? 5. Is the student able to describe an experiment to measure resistivity? 6. Is the student able to solve problems involving resistivity?	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.5 Electrical Energy and Power	<p>The student should be able to:</p> <p>a) Explain the units of electrical energy and power.</p> <p>b) Calculate the heat dissipated by an electric current in a resistor.</p> <p>c) Identify domestic appliances which use the heating effects of an electric current.</p>	<p>(i) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain units of electrical energy and power.</li> <li>- Identify domestic appliances which use the heating effects of an electric current.</li> </ul> <p>(ii) The teacher to create activities and guide students in pairs to calculate the heat dissipated by an electric current in a resistor.</p> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (ii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the feedback to support students to identify and describe electrical energy and power.</p>	<ul style="list-style-type: none"> <li>• Heater</li> <li>• Ammeter</li> <li>• Clock</li> <li>• Electric iron</li> <li>• Cooker</li> <li>• Electric kettle</li> <li>• Filament lamp</li> <li>• Oven</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to name and explain the SI units of electrical energy and power?</li> <li>2. Is the student able to calculate the heat dissipated by an electric current in a resistor?</li> <li>3. Is the student able to identify domestic appliances which use the heating effects of an electric current?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.6 Electrolysis	<p>The student should be able to:</p> <p>a) Explain the term electrolysis.</p> <p>b) State Faraday's laws of electrolysis.</p> <p>c) Define electro-chemical equivalent.</p> <p>d) Describe an experiment for determination of an electro-chemical equivalents.</p> <p>e) Identify the applications of electrolysis.</p> <p>f) Solve problems involving electrolysis.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the term electrolysis.</li> <li>- State Faraday's Law of electrolysis.</li> <li>- Define electro- chemical equivalent.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment for determination of an electro-chemical equivalent.</li> <li>- Identify the application of electrolysis.</li> </ul> <p>(iii) The teacher to create activities for students to solve problems involving electrolysis.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and use the feedback to support students to explain electrolysis and solve problems involving electrolysis.</p>	<ul style="list-style-type: none"> <li>• Battery charger</li> <li>• Lead acid accumulator</li> <li>• CUSO<sub>4</sub></li> <li>• Electrodes</li> <li>• Power supply</li> <li>• Ammeter</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to define the term electrolysis?</li> <li>2. Is the student able to state Faraday's laws of electrolysis?</li> <li>3. Is the student able to define the term electro-chemical equivalent?</li> <li>4. Is the student able to describe an experiment for determination of electro-chemical equivalent?</li> <li>5. Is the student able to solve problems involving electrolysis?</li> <li>6. Is the student able to identify the applications of electrolysis?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.7 Electricity Consumption	<p>The student should be able to:</p> <p>a) Explain the SI units of electrical energy.</p> <p>b) Explain how electrical energy is converted into heat energy in an electric kettle, lamp filament, and electric cooker.</p> <p>c) Identify different applications of electricity.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the SI units of electrical energy</li> <li>- State the SI units of electrical energy</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Explain how electrical energy is converted into heat energy in an electric iron, electric kettle, lamp filament, and electric cooker</li> <li>- Analyze different applications of electricity.</li> </ul> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give students feedback and use the feedback to support students in performing the tasks given in part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Power supply</li> <li>• Ammeter</li> <li>• Battery charger</li> <li>• CUSO<sub>4</sub></li> <li>• Electrodes</li> <li>• Electric iron</li> <li>• Electric kettle</li> <li>• Electric heater</li> <li>• Electric cooker</li> <li>• Lamp filament</li> <li>• Source of power</li> <li>• Voltmeter</li> <li>• Text texts</li> <li>• Reference books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the SI units of electrical energy?</li> <li>2. Is the student able to explain how electrical energy is converted into heat energy in an electric kettle, lamp, filament and electric cooker?</li> <li>3. Is the student able to mention different applications of electricity?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.8 Magnetic field due to an electric current	<p>The students should be able to:</p> <p>a) Explain the meaning of a magnetic field.</p> <p>b) Describe the force set up on a current carrying conductor in a magnetic field.</p> <p>c) State and explain Fleming's right- and left-hand rules.</p> <p>d) Describe experiment which illustrate the magnetic field patterns due to current carrying straight wire and loop.</p>	<p>(i) The teacher to organize students in pair and guide them to think and share on the meaning of a magnetic field.</p> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the force set up on a current carrying conductor in a magnetic field.</li> <li>- State and explain Fleming's right- and left-hand rules.</li> <li>- Describe experiments which illustrate the magnetic field patterns due to current carrying straight wire and loop.</li> </ul> <p>(iii) The teacher to design activities and guide students to perform experiment which illustrate the magnetic field patterns due to current carrying straight wire and loop.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii)</p> <p>(v) Students to present their responses for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Magnets</li> <li>• Iron fillings</li> <li>• Plane paper</li> <li>• Galvanometer</li> <li>• Straight wire</li> <li>• Source power</li> <li>• Iron fillings</li> <li>• DC supply</li> <li>• Wire</li> <li>• Nail</li> <li>• A sketch to show Fleming's left hand rule</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of magnetic field?</li> <li>2. Is the student able to describe experiment which illustrates the magnetic field patterns due to current carrying straight wire and loop?</li> <li>3. Is the student able to describe the force set up on a current carrying conductor in a magnetic field?</li> <li>4. the student able to state and explain the Fleming's right- and left-hand rules?</li> <li>5. Is the students able to perform experiment which illustrate the magnetic field patterns due to current carrying straight wire and loop?</li> </ol>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			<p>(vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iii).</p> <p>(vii) The teacher should give students feedback and uses students' responses as feedback to support students in explaining magnetic field and electric current.</p>			
	3.9 Electro-magnets	<p>The students should be able to:</p> <p>a) Explain the meaning of electro-magnets.</p> <p>b) Identify the use of electro-magnets.</p> <p>c) Describe the construction of a simple electric motor.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Give the meaning of electro-magnets</li> <li>- Identify the uses of electro-magnets</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the construction of a simple electric motor.</li> <li>- Describe the mode of action of electric motors.</li> <li>- Describe a simple experiment which illustrates an electro-magnet.</li> </ul>	<ul style="list-style-type: none"> <li>• Nails (Steel)</li> <li>• DC supply</li> <li>• Coil</li> <li>• Electro-magnets</li> <li>• Electric motor</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Electric motor</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of electro-magnets?</li> <li>2. Is the student able to describe a simple experiment which illustrates an electro-magnet?</li> <li>3. Is the student able to identify the uses of electro-magnets?</li> <li>4. Is the student able to describe the construction of a simple electric motor?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Describe the mode of action of electric motors.</p> <p>e) Sketch of simple construction of electric motor.</p> <p>f) Describe a simple experiment which illustrates an electro-magnet.</p> <p>g) Perform a simple experiment which illustrates an electro-magnet.</p>	<p>(iii) The teacher to create activities and guide students to:</p> <ul style="list-style-type: none"> <li>- Perform a simple experiment which Illustrates an electromagnet</li> <li>- Illustrate the construction of a simple electric motor.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iii).</p> <p>(vii) The teacher should give students feedback and uses students' responses as feedback to support students in explaining the meaning and uses of electro magnets.</p>		<p>5. Is the student able to explain the mode of action of electric-motors?</p> <p>6. Is the student able to sketch of a simple construction of electric motor?</p> <p>7. Is the student able to perform a simple experiment which illustrates an electromagnet?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	3.10 Electro-magnetic Induction	<p>The student should be able to:</p> <p>a) Explain the meaning of induced electromotive force.</p> <p>b) State Faraday's and Lenz's laws of electromagnetic induction.</p> <p>c) Describe an experiment which illustrates induced electromotive force.</p> <p>d) Perform experiment which illustrates induced electromotive force.</p> <p>e) Describe an experiment which verifies Faraday's law of electromagnetic induction.</p>	<p>(i) Teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the meaning of induced electromotive force.</li> <li>- State Faraday's and Lenz's laws of electromagnetic induction.</li> </ul> <p>(ii) The teacher to organize students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe an experiment which illustrates induced electromotive force.</li> <li>- Describe an experiment which verifies Faraday's law of electromagnetic induction</li> </ul> <p>(iii) The teacher to create activities and guide students to:</p> <ul style="list-style-type: none"> <li>- Perform experiment which illustrates induced electromotive force.</li> <li>- Perform an experiment which verifies Faraday's law of electromagnetic induction.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p>	<ul style="list-style-type: none"> <li>• Wire</li> <li>• Magnets</li> <li>• Galvanometer</li> <li>• Source of rotation</li> <li>• Coil</li> <li>• Bar magnet</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of induced electromotive force?</li> <li>2. Is the student able to state Faraday's and Lenz's laws of electromagnetic induction?</li> <li>3. Is the student able to describe an experiment which illustrates induced electromotive force?</li> <li>4. Is the student able to perform experiment which illustrates induced electromotive force?</li> <li>5. Is the student able to describe an experiment which verifies Faraday's law of electromagnetic induction?</li> </ol>	4



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		f) Perform experiment which verifies Faraday's law of electromagnetic induction	(vi) With the aid of pre-prepared assessment guideline, the teacher should guide students to use the guideline to assess the activities performed on part (iii). (vii) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks given in part (i-vi).		6. Is the student able to perform experiment which verifies Faraday's law of electromagnetic induction	
	3.11 Induced Electromotive Force	The student should be able to: a) State the factors that affect the induced electromotive force. b) Explain the concepts of self and mutual induction.	(i) The teacher to organize students into groups and guide them to: - State the factors that affect electromotive force - Discuss about the concept of self and mutual induction. - Compare the flow of AC and DC from coil rotating in a magnetic field. - Show the flow of AC and DC from a coil rotating in a magnetic field.	<ul style="list-style-type: none"> <li>• Source of electricity</li> <li>• Iron ring</li> <li>• Galvanometer</li> <li>• Coil</li> <li>• Simple DC (Dynamo)</li> <li>• Simple AC (alternator)</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to state the factors that affect electromotive force? 2. Is the student able to explain the concept of self and mutual induction? 3. Is the student able to compare the flow of AC and DC from coil rotating in a magnetic field?	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Compare the flow of AC and DC from coil rotating in a magnetic field.</p> <p>d) Show the flow of AC and DC from a coil rotating in a magnetic field.</p>	<p>(ii) Students to present their responses for sharing and discussion.</p> <p>(iii) The teacher should give students feedback and uses students' responses as feedback to support students in performing the activities done on part (i).</p>		<p>4. Is the student able to show the flow of AC and DC from a coil rotating in a magnetic field?</p>	
	3.12 Mode of operation of AC, DC generators and Transformers	<p>The student should be able to:</p> <p>a) Explain the mode of action of AC and DC generators and how to convert AC and DC generators.</p> <p>b) Describe the mode of action of AC and DC generators.</p>	<p>(i) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the mode of action of AC and DC generators and how to convert AC generator to DC generator.</li> <li>- Describe the mode of action of AC and DC generators.</li> </ul> <p>(ii) The teacher to create activities to guide students to:</p> <ul style="list-style-type: none"> <li>- Illustrate the structure and mode of action of a transformer</li> </ul>	<ul style="list-style-type: none"> <li>• Galvanometer</li> <li>• Coil</li> <li>• Simple DC (Dynamo)</li> <li>• Simple AC (alternator)</li> <li>• Chart of a coil rotating in a magnetic field.</li> <li>• Chart of AC and DC generators</li> </ul>	<p>1. Is the student able to explain the mode of action of AC and DC generators and how to convert AC to DC generators?</p> <p>2. Is the student able to describe the mode of action of AC and DC generators?</p> <p>3. Is the student able to construct a simple step up and step-down transformer?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Construct a simple step up and step-down transformer.</p> <p>d) Perform an experiment to build up a simple step down and step up transformers.</p> <p>e) Perform experiment which illustrate the magnetic field patterns due to current carrying straight wire and loop.</p>	<p>- Perform an experiment to build up a simple step down and step up transformers.</p> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks done on part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Wire</li> <li>• Rectangular soft iron ring</li> <li>• Primary coil</li> <li>• Secondary coil</li> <li>• Voltmeter</li> <li>• Engineering science text books</li> </ul>	<p>4. Is the student able to perform an experiment to build up a simple step down and step up transformers?</p>	
<b>4.0 BASIC ELECTRONICS</b>	4.1 Semi-Conductors and Insulators	<p>The student should be able to:</p> <p>a) Explain the term valence and conduction bands</p>	<p>(i) The teacher to use questions to guide students to explain the meaning of the term valence and conduction bands.</p> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p>	<ul style="list-style-type: none"> <li>• Multimedia projector</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Semi-conductors</li> <li>• Conductors</li> <li>• Chart of energy level</li> </ul>	<p>1. Can the student explain the meaning of valence and conduction bands?</p> <p>2. Is the student able to identify conductors and semiconductors basing on their conductivity?</p>	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Distinguish between conductors, semiconductors and insulators by using Fermi – energy level concept</p> <p>d) Describe the effects of temperature on conductivity of conductors, semiconductors and insulators.</p> <p>e) Describe the mechanism of doping intrinsic semi-conductors</p> <p>f) Differentiate between extrinsic and intrinsic semiconductors</p> <p>g) Describe the colour coding system of resistors.</p>	<ul style="list-style-type: none"> <li>- Differentiate conductors, semiconductors and insulators by using the Fermi energy level concept</li> <li>- Describe the effects of temperature on conductivity of conductors, semiconductors and insulators.</li> <li>- Describe how doping of intrinsic semiconductor is conducted.</li> <li>- Differentiate between extrinsic and intrinsic semiconductors</li> </ul> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give students feedback and uses students’ responses as feedback to support students in performing the tasks done on part (i) and (ii).</p>	<ul style="list-style-type: none"> <li>• Insulators</li> <li>• Battery</li> <li>• Galvanometer</li> <li>• Thermometer</li> <li>• Insulators</li> <li>• Marker pens</li> <li>• Engineering science text books</li> </ul>	<p>3. Can the student explain the process of doping of semiconductor material?</p> <p>4. Is the student able to distinguish between extrinsic and intrinsic semiconductor material?</p> <p>5. Is the student able to differentiate between extrinsic and intrinsic semiconductors?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.2 Electronic components	The student should be able to: a) Explain the meaning of electronics b) Identify the basic components in electronics	(i) The teacher to use questions to guide students to guide students to: - Brainstorm about the concept of electronics. - Identify the basic components required in electronics. (ii) The teacher should give students feedback and uses students' responses as feedback to support students in explaining the meaning and identify basic components in electronics.	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Multimedia projector</li> <li>• Posters</li> <li>• Transistors</li> <li>• Resistors</li> <li>• Capacitors</li> <li>• Inductors</li> <li>• LED5</li> <li>• Integrated circuits (IC)</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to Explain the meaning of electronics?</li> <li>2. Is the student able to identify the basic components in electronics?</li> </ol>	4
	4.3 Resistors and Colour Codes	The student should be able to: a) Identify and explain various types and sizes of resistors. b) Explain functions of each resistor.	(i) The teacher to use questioning strategies (what, why and how questions) to guide students to: - Identify and explain various types and sizes of resistors. - Explain functions of each resistor. - Describe the colour coding system of resistors.	<ul style="list-style-type: none"> <li>• Several types of resistors</li> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Engineering science text books</li> <li>• Reference books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to identify and explain various types and sizes of resistors?</li> <li>2. Is the student able to explain functions of each resistor?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>c) Compare resistor read value and measured one.</p> <p>d) Identify the practical application of various types of resistors.</p> <p>e) Read resistor colour codes.</p>	<p>(ii) The teacher to organize students into groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Compare resistor read value and measured one.</li> <li>- Identify the practical application of various types of resistors.</li> </ul> <p>(iii) The teacher to create activities and guide students to read resistor colour codes.</p> <p>(iv) The teacher should monitor and facilitate students in reading resistor colour codes.</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and uses students' responses as feedback to support students to perform the tasks done on part (i-iii).</p>		<p>3. Is the student able to describe the colour coding system of resistors?</p> <p>4. Is the student able to compare resistor read value with the measured value?</p> <p>5. Is the student able to identify the practical applications of various types of resistors?</p> <p>6. Is the student able to read resistor colour codes?</p>	

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.4 Capacitor and colour codes	<p>The student should be able to:</p> <p>a) Explain various types, sizes and functions of capacitors.</p> <p>b) Identify functions of capacitors.</p> <p>c) Describe the practical application of various types of capacitors.</p> <p>d) Differentiate the colour coding system of capacitors.</p> <p>e) Read capacitor colour codes.</p>	<p>(i) The teacher to use questions to guide students to explain various types, sizes and functions of capacitors.</p> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to identify functions of capacitors.</p> <p>(iii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe practical application of various types of capacitors.</li> <li>- Differentiate the colour coding system of capacitors.</li> </ul> <p>(iv) The teacher to create activities for students to read capacitor colour codes.</p> <p>(v) The teacher should monitor and facilitate students in reading capacitor colour codes.</p> <p>(vi) Students to present their responses for sharing and discussion.</p> <p>(vii) The teacher to give students feedback and uses students' responses as feedback to support students to perform the tasks done on part (i-iv).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Several types of capacitors</li> <li>• Marker pens</li> <li>• Multmetre</li> <li>• Posters</li> <li>• Multimedia</li> <li>• Projector</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student identify different types of capacitors?</li> <li>2. Can the student identify functions of capacitors?</li> <li>3. Is the student able to describe the practical applications of various types of capacitors?</li> <li>4. Is the student able to differentiate the colour coding system of capacitors?</li> <li>5. Is the student able to read capacitor colour codes?</li> </ol>	6

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.5 Inductors	<p>The student should be able to:</p> <p>a) Describe various types, sizes of inductors.</p> <p>b) Identify functions of each inductor.</p> <p>c) Calculate the reactive inductance of inductors.</p>	<p>(i) The teacher to use questions to guide students to describe various types, sizes of inductors.</p> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to identify functions of each type of inductor.</p> <p>(iii) The teacher to create activities for students to calculate the reactive inductance of inductors.</p> <p>(iv) The teacher should monitor and facilitate students in calculating the reactive inductance of inductors.</p> <p>(v) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks done on part (i-iii).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Several types of inductors</li> <li>• Marker pens</li> <li>• Multimedia</li> <li>• Projector</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to describe various types, sizes of inductors?</li> <li>2. Is the student able to identify functions of each inductor?</li> <li>3. Is the student able to calculate the relative inductance of inductors?</li> </ol>	2



TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	4.6 Diodes	<p>The student should be able to:</p> <p>a) Describe the construction of P – N junction.</p> <p>b) Explain the mode of action of a P – N junction.</p> <p>c) Identify the types of diodes.</p> <p>d) Identify diode terminals (Anode and cathode) construct the rectifier circuit.</p> <p>e) Illustrate the construction of P – N junction</p> <p>f) Construct half and full wave rectifier circuit.</p> <p>g) Construct the rectifier circuit?</p>	<p>(i) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the construction of P – N junction.</li> <li>- Explain the mode of action of a P – N junction.</li> </ul> <p>(ii) The teacher to use questioning strategies (what, why and how questions) to guide students to:</p> <ul style="list-style-type: none"> <li>- Identify the types of diodes.</li> <li>- Identify diode terminals (Anode and cathode).</li> <li>- Describe the construction of a half and full wave rectifier.</li> </ul> <p>(iii) The teacher to create activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Illustrate the construction of P – N junction.</li> <li>- Construct the rectifier circuit</li> <li>- Construct half and full wave rectifier circuit.</li> </ul> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p>	<ul style="list-style-type: none"> <li>• Chart showing diodes</li> <li>• Marker pens</li> <li>• Flip chart</li> <li>• Multimedia projector</li> <li>• Diode samples</li> <li>• P –N junction diode</li> <li>• Light emitting diode (LED)</li> <li>• D.C. source</li> <li>• Capacitors</li> <li>• Resistors</li> <li>• Connecting wire</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student describe the construction of P-N junction?</li> <li>2. Is the student able to explain the mode of action of a P-N junction?</li> <li>3. Is the student able to identify diode?</li> <li>4. Is the student able to Identify diode terminals (Anode and cathode) construct the rectifier circuit?</li> <li>5. Is the student able to Illustrate the construction of P – N junction</li> <li>6. Is the student able to construct a half and full wave rectifier circuit?</li> <li>7. Is the student able to construct the rectifier circuit?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
			(v) Students to present their responses for sharing and discussion. (vi) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks done on part (i-iii).			
	4.7 Transistors	The student should be able to: a) Describe the construction of PNP and NPN transistor b) Explain the mode of action of PNP and NPN transistor c) Identify the types of transistors d) Identify transistor legs/terminals (Emitter, Base and collector)	(i) The teacher to organise students in groups and guide them to: - Describe the construction of PNP and NPN transistor. - Explain the mode of action of PNP and NPN transistor. (ii) The teacher to use questioning strategies (what, why and how questions) to guide students to: - Identify the types of transistors. - Identify transistor legs/terminals (Emitter, Base and collector) - Identify the applications of transistors in daily life	<ul style="list-style-type: none"> <li>• Chart showing a transistor</li> <li>• Transistors</li> <li>• NPN and PNP transistors</li> <li>• Radio</li> <li>• TV</li> <li>• Voltage amplifier</li> <li>• Switch</li> <li>• Engineering science text books</li> </ul>	1. Is the student able to explain the construction of PNP and NPN transistor? 2. Is the student able to explain the mode of action of PNP transistor? 3. Can the student identify various types of transistors? 4. Is the student able to identify transistor terminals? 5. Is the student able to identify the applications of transistor in daily life?	4

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>e) Outline the applications of transistors in daily life.</p> <p>f) Illustrate the construction of PNP and NPN transistor</p>	<p>(iii) The teacher to create activities and guide students in groups to illustrate the construction of PNP and NPN transistor.</p> <p>(iv) The teacher should monitor and facilitate students in performing the tasks given in part (iii).</p> <p>(v) Students to present their responses for sharing and discussion.</p> <p>(vi) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks given in part (i-iii).</p>		6. Is the student able to illustrate the construction of PNP and NPN transistor?	
	4.8 Analogue Signals	<p>The student should be able to:</p> <p>a) Explain the concept of analogue signals.</p> <p>b) Explain the concept of digital signals.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the concept of analogue signals.</li> <li>- Explain the concept of digital signals.</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Distinguish analogue and digital signals.</li> <li>- Describe the generation of digital signals.</li> </ul>	<ul style="list-style-type: none"> <li>• Chart showing analogue signals</li> <li>• Mobile phone (analogue)</li> <li>• Mobile phones (digital)</li> <li>• Chart showing digital signals</li> <li>• Watch</li> <li>• Multimeter</li> </ul>	<p>1. Can the student explain the meaning of analogue signals?</p> <p>2. Can the student explain the concept of digital signals?</p> <p>3. Is the student able to describe generation of digital signals?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		<p>d) Distinguish analogue and digital signals.</p> <p>e) Describe generation of digital signals.</p>	<p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks done on part (i) - ii).</p>		<p>4. Is the student able to distinguish analogue and digital signals?</p>	
	4.9 Single Stage Amplifier	<p>The student should be able to:</p> <p>a) Explain the concept of single stage amplifier.</p> <p>b) Design a single stage amplifier.</p> <p>c) Test a single stage amplifier.</p>	<p>(i) The teacher to use questions to guide students to explain the concept of single stage amplifier.</p> <p>(ii) The teacher to create activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Design a single stage amplifier</li> <li>- Test a single stage amplifier.</li> </ul> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks done on part (i)-(ii).</p>	<ul style="list-style-type: none"> <li>• Transistors</li> <li>• Capacitors</li> <li>• Tool kit</li> <li>• Resistors</li> <li>• Engineering science text books</li> </ul>	<p>1. Can the student explain the concept of single stage amplifier?</p> <p>2. Is the student able to design a single stage amplifier?</p> <p>3. Can the student test the single stage amplifier?</p>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
<b>5.0 SOLAR ENERGY</b>	5.1 Concept of solar energy	<p>The student should be able to:</p> <p>a) Explain the term solar energy.</p> <p>b) Describe the components of a solar energy system.</p> <p>c) Describe the uses of solar energy in daily life.</p> <p>d) Identify uses of solar energy in real world?</p> <p>e) Identify the areas where solar energy can be used.</p>	<p>(i) The teacher to use questions to guide students to:</p> <ul style="list-style-type: none"> <li>- Explain the term solar energy.</li> <li>- Describe the components of a solar energy system</li> </ul> <p>(ii) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the uses of solar energy in daily life.</li> <li>- Identify uses of solar energy in real world?</li> <li>- Identify the areas where solar energy can be used.</li> </ul> <p>(iii) Students to present their responses for sharing and discussion.</p> <p>(iv) The teacher should give students feedback and uses students' responses as feedback to support students in performing the tasks done on part (i)-(ii).</p>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Marker pens</li> <li>• Multimedia projector</li> <li>• Solar panel</li> <li>• Solar array</li> <li>• Mounting rack</li> <li>• Inverter</li> <li>• Batter pack</li> <li>• Power meter</li> <li>• Charge control</li> <li>• Engineering science text books</li> </ul>	<ol style="list-style-type: none"> <li>1. Is the student able to explain the meaning of solar energy?</li> <li>2. Can the student describe components of a solar energy system?</li> <li>3. Can the student identify uses of solar energy in real world?</li> <li>4. Is the student able to describe the uses of solar energy in daily life?</li> <li>5. Is the student able to identify areas where solar energy is used?</li> </ol>	2

TOPIC	SUB TOPIC	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	5.2 Solar Energy System Installation	<p>The student should be able to:</p> <p>a) Describe the procedures/process of installing a solar energy system.</p> <p>b) Install a solar energy system</p> <p>c) Describe the procedures/process of servicing solar energy systems.</p> <p>d) Service a solar energy system</p>	<p>(i) The teacher to organise students in groups and guide them to:</p> <ul style="list-style-type: none"> <li>- Describe the procedures/process of installing a solar energy system.</li> <li>- Describe the procedures/process of servicing solar energy systems.</li> </ul> <p>(ii) The teacher to create activities and guide students in groups to:</p> <ul style="list-style-type: none"> <li>- Perform installation of a solar energy system</li> <li>- Service a solar energy system.</li> </ul> <p>(iii) The teacher should monitor and facilitate students in performing the tasks given in part (ii).</p> <p>(iv) Students to present their responses for sharing and discussion.</p> <p>(v) The teacher to give students feedback and uses students' responses as feedback to support students to perform the tasks done on part (i &amp; ii).</p>	<ul style="list-style-type: none"> <li>• Solar panel</li> <li>• Solar battery</li> <li>• Solar cables</li> <li>• Engineering science text books</li> <li>• Reference books</li> </ul>	<ol style="list-style-type: none"> <li>1. Can the student describe the procedures/process of installing a solar energy system?</li> <li>2. Can the student install a solar energy system?</li> <li>3. Is the student able to describe the procedures/process of servicing solar energy systems?</li> <li>4. Is the student able to carry out service of a solar energy system?</li> </ol>	6