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SENIOR SCHOOL CURRICULUM DESIGN

GRADE 10

POWER MECHANICS



KENYA INSTITUTE OF CURRICULUM DEVELOPMENT
2024

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KENYA INSTITUTE OF CURRICULUM DEVELOPMENT
Nurturing Every Learner's Potential

SENIOR SCHOOL CURRICULUM DESIGN

GRADE 10

POWER MECHANICS

JUNE, 2024

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NATIONAL GOALS OF EDUCATION

Education in Kenya should:

i) Foster nationalism and patriotism and promote national unity.

Kenya's people belong to different communities, races and religions, but these differences need not divide them. They must be able to live and interact as Kenyans. It is a paramount duty of education to help young people acquire this sense of nationhood by removing conflicts and promoting positive attitudes of mutual respect which enable them to live together in harmony and foster patriotism in order to make a positive contribution to the life of the nation.

ii) Promote the social, economic, technological and industrial needs for national development.

Education should prepare the youth of the country to play an effective and productive role in the life of the nation.

a) Social Needs

Education in Kenya must prepare children for changes in attitudes and relationships which are necessary for the smooth progress of a rapidly developing modern economy. There is bound to be a silent social revolution following in the wake of rapid modernization. Education should assist our youth to adapt to this change.

b) Economic Needs

Education in Kenya should produce citizens with the skills, knowledge, expertise and personal qualities that are required to support a growing economy. Kenya is building up a modern and independent economy which is in need of an adequate and relevant domestic workforce.

c) Technological and Industrial Needs

Education in Kenya should provide learners with the necessary skills and attitudes for industrial development. Kenya recognizes the rapid industrial and technological changes taking place, especially in the developed world. We can only be part of this development if our education system is deliberately focused on the knowledge, skills and attitudes that will prepare our young people for these changing global trends.

iii) Promote individual development and self-fulfilment

Education should provide opportunities for the fullest development of individual talents and personality. It should help children to develop their potential interests and abilities. A vital aspect of individual development is the building of character.

- iv) Promote sound moral and religious values.**
Education should provide for the development of knowledge, skills and attitudes that will enhance the acquisition of sound moral values and help children to grow up into self-disciplined, self-reliant and integrated citizens.
- v) Promote social equality and responsibility.**
Education should promote social equality and foster a sense of social responsibility within an education system which provides equal educational opportunities for all. It should give all children varied and challenging opportunities for collective activities and corporate social service irrespective of gender, ability or geographical environment.
- vi) Promote respect for and development of Kenya's rich and varied cultures.**
Education should instil in the youth of Kenya an understanding of past and present cultures and their valid place in contemporary society. Children should be able to blend the best of traditional values with the changing requirements that must follow rapid development in order to build a stable and modern society.
- vii) Promote international consciousness and foster positive attitudes towards other nations.**
Kenya is part of the international community. It is part of the complicated and interdependent network of peoples and nations. Education should therefore lead the youth of the country to accept membership of this international community with all the obligations and responsibilities, rights and benefits that this membership entails.
- viii. Promote positive attitudes towards good health and environmental protection.**
Education should inculcate in young people the value of good health in order for them to avoid indulging in activities that will lead to physical or mental ill health. It should foster positive attitudes towards environmental development and conservation. It should lead the youth of Kenya to appreciate the need for a healthy environment.

LEARNING OUTCOMES FOR SENIOR SCHOOL

By the end of senior school, the learner should be able to:

1. Communicate effectively and utilise information and communication technology across varied contexts.
2. Apply mathematical, logical and critical thinking skills for problem solving.
3. Apply basic research and scientific skills to manipulate the environment and solve problems.
4. Exploit individual talents for leisure, self-fulfillment, career growth, further education and training.
5. Uphold national, moral and religious values and apply them in day to day life.
6. Apply and promote health care strategies in day to day life.
7. Protect, preserve and improve the environment for sustainability.
8. Demonstrate active local and global citizenship for harmonious co-existence.
9. Demonstrate appreciation of diversity in people and cultures.
10. Manage pertinent and contemporary issues responsibly.

THE SENIOR SCHOOL IN THE COMPETENCY BASED CURRICULUM (CBC)

Senior School is the fourth level of Basic Education in the Competency Based Curriculum (CBC) that learners shall come to after the Pre-Primary, Primary and Junior School (JS). The essence of Senior School is to offer learners a Pre- University/ Pre-career experience where the learners have an opportunity to choose pathways where they have demonstrated interest and/or potential at the earlier levels. Senior school comprises three years of education for learners in the age bracket of **15 to 18 years** and lays the foundation for further education and training at the tertiary level and the world of work. In the CBC vision, learners exiting this level are expected to be *engaged, empowered and ethical citizens* ready to participate in the socio-economic development of the nation.

At this level, learners shall take **SEVEN (07) learning areas (LAs)** as recommended by the *Presidential Working Party on Educational Reforms (PWPER)*. These shall comprise **Four Compulsory** learning areas, and Three learning areas opted for by the learner according to their chosen Pathway. While English and Kiswahili are indicated as Compulsory, the learners who opt for these learning areas as their subjects of specialization shall go through a *differentiated curriculum* in terms of scope, experiences and assessment. Such learners shall; therefore, take *Advanced English* or *Kiswahili Kipevu* with additional two lessons. It is recommended that **AT LEAST TWO** learning areas should be from chosen Pathway. In exceptional cases, some learners may opt for **ONE** learning area from the chosen Pathway and a maximum of **TWO** learning areas from any of the three pathways; depending on the learner's career projections and with guidance by the principals at Senior School.

PROPOSED LIST OF SUBJECTS AT SENIOR SCHOOL

Compulsory Subjects	Science, Technology, Engineering & Mathematics (STEM)	Social Sciences	Arts & Sports Science
1. English 2. Kiswahili/KSL 3. Community Service Learning 4. Physical Education <i>NB: ICT skills will be offered to all students to facilitate learning and enjoyment</i>	5. Mathematics/Advanced Mathematics 6. Biology 7. Chemistry 8. Physics 9. General Science 10. Agriculture 11. Computer Studies 12. Home Science 13. Drawing and Design 14. Aviation Technology 15. Building and Construction 16. Electrical Technology 17. Metal Technology 18. Power Mechanics 19. Wood Technology 20. Media Technology* 21. Marine and Fisheries Technology*	22. Advanced English 23. Literature in English 24. Indigenous Language 25. Kiswahili Kipevu/Kenya Sign Language 26. Fasihi ya Kiswahili 27. Sign Language 28. Arabic 29. French 30. German 31. Mandarin Chinese 32. History and Citizenship 33. Geography 34. Christian Religious Education/ Islamic Religious Education/Hindu Religious Education 35. Business Studies	36. Sports and Recreation 37. <i>Physical Education (C)</i> 38. Music and Dance 39. Theatre and Film 40. Fine Arts

LESSON DISTRIBUTION AT SENIOR SCHOOL

The number of lessons in each of the compulsory learning areas shall be 4; while the optional areas shall be 6 lessons each. A lesson shall be 40 minutes. The "free" lessons shall be used for development of ICT skills, Pastoral Instruction Programme (PPI), projects, collaborative study and further reading.

ESSENCE STATEMENT

Power mechanics involves the study of mechanical systems, forces, and movement. Pre-Technical studies at Junior School lays foundation for Power Mechanics at Senior School. It equips the learner with information on career progression in power mechanics related areas of study while preparing them to pursue further education. Power mechanics is key in the preparation of much needed technical workforce for the country. It also enables the learner to develop the core competencies prescribe in Competency Based Curriculum (CBC) which includes: Critical thinking and problem solving, Communication and collaboration, Citizenship, Learning to learn, Self-efficacy and Digital literacy. It also enables the learner to have values such as: Peace, Love, Unity, Responsibility, Patriotism and Integrity. The learning are also exposes the learner to Pertinent and contemporary issues in the society. The learning area covers the following strands: fundamentals of power mechanics technology, related drawing, vehicle systems, and engines.

SUBJECT GENERAL LEARNING OUTCOMES

By the end of Senior School, the learner should be able to:

1. Attain a firm foundation for career growth, further training and education in power mechanics related areas of study
2. Utilise acquired power mechanics competencies to service and repair vehicle systems
3. Apply acquired drawing skills to interpret and communicate engineering designs using information and communication technology where applicable.
4. Relate positively with members of the society during visits to work environment
5. Use acquired knowledge to identify business opportunities related to power mechanics
6. Appreciate the place of power mechanics in day-to-day life

SUMMARY OF STRANDS AND SUB STRANDS

Strand	Sub Strand	Suggested Number of Lessons
1.0. Fundamentals of Power Mechanics Technology	1.1. Overview of Power Mechanics as a learning area 1.2. Evolution of automobile 1.3. Power mechanics workshop layout 1.4. General workshop rules and regulations	42
2.0 Related Technical Drawing	2 1. Diagonal scale 2 2. Loci 2 3. Tangency 2 4. Blending of lines and curve	58
3.0 Vehicle Systems	3.1 Road wheels 3.2 Vehicle body 3.3 Vehicle chassis 3.4 Vehicle body Joining processes	50
4.0 Engines	4.1 Introduction to engines 4.2 Types of Engines 4.3 Classifications of Engine	30
Total Number of Lessons		180

Note: The suggested number of lessons per sub strand may be more or less depending on the context

STRAND 1.0: FUNDAMENTALS OF POWER MECHANICS TECHNOLOGY

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Suggested Key Inquiry Questions
<p>1.0 Fundamentals of Power Mechanics</p>	<p>1.1 Overview of Power Mechanics as a learning area (10 lessons)</p>	<p>by the end of the sub-strand the learner should be able to:</p> <ul style="list-style-type: none"> a) describe power mechanics as a learning area, b) identify career opportunities in power mechanics field, c) evaluate activities related to power mechanics in the locality, d) acknowledge the importance of power mechanics as a learning area. 	<p>The learner is guided to:</p> <ul style="list-style-type: none"> • use online or print resources to search for information on definition and scope of power mechanics as a learning area, • brainstorm on career opportunities within power mechanics field, • explore the local community environment to identify activities related to power mechanics, • brainstorm on the importance of power mechanics as a learning area, • engage a resource person on the importance of power mechanics as a learning area. 	<p>How is power mechanics important in day to day life?</p>

<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Learning to learn: as the learner uses print resources to search for information on definition and scope of power mechanics as a learning area. • Communication and collaboration: while the learner brainstorms with peers on career opportunities within power mechanics field. • Self-efficacy: as the learner successfully identifies career opportunities related to power mechanics. • Digital literacy: as the learner uses online resources to search for information on definition and scope of power mechanics as a learning area. • Citizenship: as learner explores the local community environment and identify activities related to power mechanics. 				
<p>Pertinent and Contemporary Issues (PCIs):</p> <ul style="list-style-type: none"> • Decision making: as the learner explores the local community environment and identify activities related to power mechanics. • Career guidance: as learners brainstorms and list career opportunities related to power mechanics. 				
<p>Values:</p> <ul style="list-style-type: none"> • Unity: as the learner works with peers in groups. • Respect: as the learner accommodates other members' opinion while discussing. 				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Suggested Key Inquiry Questions
1.0 Fundamentals of Power Mechanics	1.2. Evolution of an automobile (10 lessons)	By the end of the sub strand, the learner should be able to: a) explain the evolution of the automobile in the globally, b) describe trends in the historical developments of the automobile, c) explore the importance of innovation in automobile development, d) appreciate the importance of the evolution of the automobile.	The learner is guided to: <ul style="list-style-type: none"> • Brainstorm on evolution of the automobile globally, • Use digital or print resources to search for information on the history of the automobile, • Use online resources and print media to search on key trends in the historical developments of the automobile, • Discuss with peers the importance of innovation in automobile development, 	How has technology advancement affected power mechanic?

			<ul style="list-style-type: none"> • Reflect on the importance of the evolution of the automobile. 	
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Critical thinking: as the learner brainstorm on evolution of the automobile in society. • Communication and collaboration: as the learner discuss with peers the importance of innovation in automobile development. • Self-efficacy: as the learner articulates their views during the discussion. • Digital literacy: as the learner uses online resources to search for information on trends in automobile development. 				
<p>Pertinent and Contemporary Issues (PCIs):</p> <ul style="list-style-type: none"> • Assertiveness: as the learner engages in discussion with peers on the importance of innovation in automobile development. 				

- **Cyber security:** as learners use online resources to search for information on the evolution of the automobile in society.

Values:

- **Unity:** as the learner works with peers as a group while discussing.
- **Respect:** as the learner accommodates other members' opinion in the discussion on the importance of innovation in automobile development.

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Suggested Key Inquiry Questions
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<p>1.0 Fundamentals of Power Mechanics</p>	<p>1.3. Power Mechanics workshop layout</p> <p>(12 lessons)</p>	<p>By the end of the sub strand, the learner should be able to:</p> <ol style="list-style-type: none"> identify main areas in power mechanics workshop, sketch a layout of main areas in power mechanics workshop, explore the importance of the workshop areas in power mechanics, appreciate the importance of the workshop layout in power mechanics. 	<p>The learner is guided to:</p> <ul style="list-style-type: none"> use online resources and print media to search for information on the main areas of power mechanics workshop (<i>storage, working, work benches, office, passage ways among others</i>), brainstorm on the main areas of a power mechanic workshop, locate the main areas of power mechanics and their purposes, make illustrations of standard power mechanics workshop, use online resources and print media to search on the importance of the workshop areas in power mechanics, discuss with peers the importance of the workshop areas in power mechanics, reflect on the importance of the evolution of the automobile. 	<p>Why is a power mechanics workshop layout important?</p>
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Core competencies to be developed:

- Critical thinking and problem solving: as the learner locates the main areas of a power mechanic workshop.
- Communication and collaboration: as the learner discusses the importance of the workshop areas in power mechanics.
- Self-efficacy: as the learner eloquently airs their views while discussing.
- Digital literacy: as the learner uses online resources to search for information on the main areas of a power mechanic workshop.

Pertinent and Contemporary Issues (PCIs):

- Assertiveness: as the learner engages in discussions.
- Decision making: as the learner locates the main areas of power mechanics and their purposes.
- Cyber security: as learners uses online resources to search for information on the main areas of a power mechanic workshop.

Values:

- Unity: as the learner works harmoniously with peers in groups.
- Respect: as the learner accommodates other members' opinion.

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Suggested Key Inquiry Questions
1.0 Fundamentals of Power Mechanics	1.4. General workshop rules and regulations	By the end of the sub strand the learner should be able to: a) describe general safety rules and regulations in	The learner is guided to: <ul style="list-style-type: none"> • brainstorm with peers the general safety rules and 	Why is safety important in power mechanic

	(10 lessons)	<p>power mechanics workshop,</p> <p>b) interpret workshop safety signs used in power mechanics environment,</p> <p>c) practice safe use of personal protective equipment (PPE) in power mechanics workshop,</p> <p>d) appreciate the need for safety while working in power mechanics work environment.</p>	<p>regulations in power mechanics work environment,</p> <ul style="list-style-type: none"> • use digital and print resources to search for information on safety rules and regulations in power mechanics workshop, • watch a video to expound on workshop safety signs (<i>prohibitive signs, warning signs</i>) • use online resources and print media to search on use personal protective equipment (PPE) according to work environment rules and regulations, • use personal protective equipment (PPE) according to work environment rules and regulations. 	work environment?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Critical thinking and problem solving: as the learner brainstorms with peers the general work environment rules and regulations. • Self-efficacy: as the learner confidently presents their views in the discussion with peers on general safety rules and regulations in power mechanics work environment. 				

- Digital literacy: as the learner uses online resources to search for information on personal protective equipment (PPE) in power mechanics work environment.

Pertinent and Contemporary Issues (PCIs):

- Assertiveness: as the learner engages in demonstration and discussions on general safety rules and regulations in power mechanics work environment.
- Decision making: as the learner selects appropriate PPEs..
- Safety and security: as learner brainstorms with peers the general work environment rules and regulations
- Safety: As learner interprets workshop safety signs.

Values:

- Unity: as the learner works with peers in groups.
- Responsibility: As the learner uses personal protective equipment (PPE) according to work environment rules and regulations.
- Respect: as the learner accommodates other members' opinion.

Suggested Assessment Rubric				
Level Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Ability to describe power mechanics as a learning area	Comprehensively describes power mechanics as a learning area mentioning citing examples	Describes power mechanics as a learning area	Describes power mechanics as a learning area leaving out few key words	Describes power mechanics as a learning area leaving out many key words
Ability to describe trends in the historical developments of the automobile	Comprehensively describes describe trends in the historical developments of the automobile	Describes trends in the historical developments of the automobile	Describes trends in the historical developments of the automobile leaving out few key words	Describes trends in the historical developments of the automobile leaving out many key words
Ability to sketch a layout of main areas in power mechanics workshop,	Skillfully sketches a layout of the main areas in power mechanics workshop	Sketches a layout of the main areas in power mechanics workshop	Sketches a layout of the main areas in power mechanics workshop skipping few areas	Sketches a layout of the main areas in power mechanics workshop skipping many areas
Ability to practice safe use of personal protective equipment (PPE) in power mechanic workshop,	Skillfully practices safe use of personal protective equipment (PPE) in power mechanic workshop,	Practices safe use of personal protective equipment (PPE) in power mechanic workshop,	Practices safe use of most of the personal protective equipment (PPE) in power mechanic workshop skipping few steps	Practices use of only a few of the personal protective equipment (PPE) in power mechanic workshop skipping many steps

STRAND 2.0: RELATED DRAWING

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Related Drawing	2 1.Scales (12 lessons)	By the end of the sub strand the learner should be able to: a) describe diagonal scale used in drawing, b) construct diagonal scale used in drawing, c) interpret diagonal scale used in drawing, d) appreciate the application of diagonal scale in real life.	The learner is guided to: <ul style="list-style-type: none"> • use online resources and print media to search for information on diagonal scale, • discuss the procedure of drawing diagonal scale, • practise drawing diagonal scale, • brainstorm on the interpretation of diagonal scale used in drawing, • discuss how scales are used in real life. 	Why are scales important in real life?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Critical thinking and problem solving: as the learner draws diagonal scale. • Self-efficacy: as the learner successfully draws diagonal scale. • Digital literacy: as the learner uses online resources to search for information on diagonal scales. 				
<p>Pertinent and Contemporary Issues (PCIs):</p> <ul style="list-style-type: none"> • Decision making: as the learner draws diagonal and plain scale. • Career guidance: when learners brainstorm on how diagonal scale is applied in real life. 				
<p>Values:</p> <ul style="list-style-type: none"> • Unity: as the learner works with peers in groups. • Respect: as the learner accommodates other members' opinion while discussing. 				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Related Drawing	2 2.Loci (16 lessons)	By the end of the sub strand, the learner should be able to: a) define a locus as used in drawing b) describe types of locus used in drawing c) construct different types of locus used in technical drawing d) construct the locus of link mechanisms relevant to power mechanics. e) appreciate the application of loci in power mechanics	The learner is guided to: <ul style="list-style-type: none"> • use online resources and print media to search for the definition of locus of a point, • use online resources and print media to search for the description of types of loci, • practice drawing types of locus (<i>ellipse, cycloid, involute, parabola, hyperbola</i>), • discuss the procedure of drawing the locus of a mechanism, • practise drawing the locus of a point on a mechanism (<i>3-link and 2-link</i>), • discuss on the application of loci in power mechanics. 	<ol style="list-style-type: none"> 1. How is loci used in real life situation? 2. How are skills on loci applied in power mechanics?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Critical thinking and problem solving: when the learner draws the locus of a point on a given mechanism. • Communication and collaboration: as the learner discusses the procedure of drawing the locus of a mechanism • Self-efficacy: as the learner successfully constructs different loci. • Digital literacy: as the learner uses online resources to search for information on types of loci. 				

Pertinent and Contemporary Issues (PCIs):

Decision making: as the learner discusses the applications of loci in power mechanics.

Values:

- as the learner Unity: as the learner works with peers in groups while discussing the applications of loci in power mechanics.
- Respect: accommodates other members' opinion during discussion.

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Related Drawing	2 3.Tangency (14 lessons)	By the end of the sub strand, the learner should be able to: <ol style="list-style-type: none"> describe the methods of constructing tangents in drawing, construct a tangent to a circle from a point, construct external tangent to two circles, construct interior tangent to two circles, appreciate the importance of tangency in drawing. 	The learner is guided to: <ul style="list-style-type: none"> use online resources and print media to search for information on tangency as used in drawing, discuss with peers on the methods of constructing tangents, practise drawing a tangent to a circle from a point outside the circle, practise drawing external tangent to two circles (<i>equal circles, unequal circles</i>), practise drawing an internal tangent to two circles (<i>equal circles, unequal circles</i>), discuss on the importance of tangency in drawing. 	Where is tangency applied in real life situation?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> Critical thinking and problem solving: as the learner draws interior and external tangents. Communication and collaboration: as the learner discusses on the importance of tangency in drawing. Self-efficacy: as the learner successfully draws tangents. Digital literacy: as the learner interacts with online resources to search for information on tangents. 				

Pertinent and Contemporary Issues (PCIs):

Decision making: as the learner compares the different methods of drawing tangents.

Values:

- Unity: as the learner works with peers in groups
- Respect: as the learner accommodates other members' opinion while discussing

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Related Drawing	2.4 Blending of lines and curves (16 lessons)	By the end of the sub strand the learner should be able to: a) describe blending of lines and arcs as used in drawing, b) construct arcs that blend lines, c) construct arcs that blend two circles, d) use blending to construct given shapes, e) appreciate the application of blending in power mechanics.	The learner is guided to: <ul style="list-style-type: none"> • use online or print resources to search for information on blending of lines and arcs, • blend a curve and a line (<i>two straight lines, straight line and circle</i>), • blend two equal circles (<i>internal and external</i>), • construct different shapes using blending, • brainstorm on the applications of blending of lines and curves in power mechanics. 	<ol style="list-style-type: none"> 1. Why is blending of lines and curves important in drawing? 2. How is blending of lines and curves applied in real life?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Critical thinking and problem solving: as the learner brainstorms on the applications of blending of lines and curves in power mechanics. • Self-efficacy: as the learner successfully applies the skills to draw different diagrams. • Digital literacy: as the learner uses online resources to search for information on blending of lines and curves. 				
<p>Pertinent and Contemporary Issues (PCIs):</p> <ul style="list-style-type: none"> • Decision making: as the learner selects the correct method of blending arcs and lines. • Career guidance: when learners brainstorms on how blending of lines and curves is applied in real life. 				

Values:

- **Unity:** as the learner brainstorm in groups.
- **Respect:** as the learner accommodates other members' opinion while brainstorming.

Suggested Assessment rubric

Level Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Ability to describe diagonal scale used in drawing	Comprehensively describes diagonal scale used in drawing	Describes diagonal scale used in drawing	Describes diagonal scale used in drawing leaving key words	Describes diagonal scale used in drawing with assistance
Ability to construct different types of locus used in technical drawing	Accurately Constructs different types of locus used in technical drawing	Constructs different types of locus used in technical drawing	Partially Constructs different types of locus used in technical drawing	Constructs different types of locus used in technical drawing with prompts
Ability to construct interior tangent to two circles,	Accurately constructs interior tangent to two circles,	Constructs interior tangent to two circles,	Partially constructs interior tangent to two circles,	Constructs interior tangent to two circles with assistance
Ability to construct arc (s) that blend two circles.	Neatly constructs arc (s) that blend two circles.	Constructs arc (s) that blend two circles.	Partially constructs arc (s) that blend two circles.	Constructs arc (s) that blend two circles with assistance.

STRAND 3.0: VEHICLE SYSTEMS

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
3.0 Vehicle Systems	3.1 Road wheels (10 lessons)	By the end of the sub strand the learner should be able to: <ol style="list-style-type: none"> explain the functions of wheels in a vehicle, identify types of tires used in vehicles, illustrate types of ply orientation used on vehicle tires, interpret specifications on tire side walls, appreciate the role of tires in vehicle operations. 	The learner is guided to: <ul style="list-style-type: none"> use digital and print materials to search for information on functions of wheels in vehicle brainstorm on the types of tires (<i>tube and tubeless</i>) sketch types of tire ply orientations (<i>radial, cross ply</i>) use digital or print resources to search for information on tires specification and their interpretation 1 (<i>size, width, tire type, aspect ratio, load capacity, speed</i>) 	Why is it important to study about road wheels?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> Learning to learn: as the learner makes reference to digital and print materials while searching for information on vehicle road wheels. Communication and collaboration: as the learner discusses. Digital literacy: as the learner interacts with digital devices while searching for information functions of tires. 				
<p>Pertinent and Contemporary Issues (PCIs):</p> <ul style="list-style-type: none"> Social cohesion: as the learner discuss in groups when searching for information on tire type. 				

- Decision making: as the learner interprets tire specification.

Values:

- Unity: as the learner brainstorms with peers to search for types of tire.
- Respect: as the learner accommodates peers' opinions as they discuss tire types.

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
3.0 Vehicle Systems	3.2 Vehicle body (14 lessons)	<p>By the end of the sub strand the learner should be able to:</p> <ol style="list-style-type: none"> describe functions of a body in a vehicle, explain types of body used in vehicles, identify interior body parts of a vehicle, illustrate exterior body parts of a vehicle, appreciate the importance of bodies in vehicle. 	<p>The learner is guided to:</p> <ul style="list-style-type: none"> brainstorm on the functions of vehicle body, use digital and print materials to search for information on vehicle body types (<i>salon, station wagon, convertible, van, pickup and bus</i>), visit the locality to explore on different interior parts of a vehicle (<i>seats, floor, roof, doors, handles, seats, dashboard</i>), use visual aids to search for information on exterior vehicle body parts (<i>bumpers, fenders, roofs, bonnet, sills, door, boot, side wings</i>). 	<p>Why is it important to learn about vehicle bodies?</p>
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> Learning to learn: as the learner makes reference to print and digital resources while searching for information on vehicle body. Communication and collaboration: as the learner discusses about exterior body parts. Digital literacy: as the learner uses online resources to search for vehicle body types. 				

Pertinent and Contemporary Issues (PCIs):

- Social cohesion: as the learner visit locality and interacts with the society as they explore on different interior parts of a vehicle.
- Respect: as the learner acknowledges other’s contributions while they brainstorm on vehicle body parts.

Values:

- Unity: as the learner brainstorms with peers on exterior body parts.
- Respect: as the learner accommodates peers’ ideas and opinions as they discuss in groups.
- Responsibility: as the learner contributes in group discussions while identifying exterior body parts.

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
3.0 Vehicle Systems	3.3 Chassis (10 lessons)	By the end of the sub strand the learner should be able to: a) describe types of chassis used on vehicles, b) explain the functions of chassis in a vehicle, c) illustrate types of frame used in construction of vehicle chassis, d) appreciate the role of vehicle chassis.	The learner is guided to: <ul style="list-style-type: none"> • use print resources to search for types of chassis used in vehicles (<i>separate, integral,</i> • visit the locality to identify types of chassis, • discuss with peers the functions of chassis in a vehicle, • sketch different types of frames used in construction of vehicle chassis (<i>tube, channel, box, flat</i>). 	Why is it important to have a chassis in a vehicle body?
<p>Core competencies to be developed:</p> <ul style="list-style-type: none"> • Learning to learn: as the learner visits the locality to identify types of chassis. • Self-efficacy: as the learner correctly sketches different types of frames used in construction of vehicle chassis. 				
<p>Pertinent and Contemporary Issues (PCIs): Analytical thinking: as the learner visits the locality to identifying different chassis.</p>				
<p>Values:</p> <ul style="list-style-type: none"> • Unity: as the learner brainstorms with peers about the function of chassis. • Respect: as the learner accommodates peers' ideas and opinions as they discuss in groups the functions of chassis. 				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
3.0 Vehicle Systems	3.4 Vehicle body joining processes (16 Lessons)	By the end of the sub strand the learner should be able to: a) describe threaded fasteners used in vehicle body joining, b) illustrate locking devices uses in vehicle body, c) illustrate riveting as applied in vehicle body, d) perform joining process on vehicle body parts using adhesive, e) acknowledge the role of joining processes in vehicle body.	The learner is guided to: <ul style="list-style-type: none"> • use online resources and print media to search for information on threaded fasteners used in vehicle body joining (<i>bolts and nuts, screws</i>), • visit the locality to identify joining processes used in vehicles, • the use online and print media to search for the information locking devices (<i>cotter pin, circlip and split pin</i>), • the use online and print media to search information on riveting process, riveting tools, application of riveting as applied in vehicle body, • carryout joining process on vehicle body parts using adhesive, • use online resources to search for information on definition of the terms used in adhesives (<i>adhesive, bond, cohesion</i>). 	How is joining processes applied in vehicle body?

Core competencies to be developed:

- Digital literacy: as the learner uses online resources to search for information on the definition of terms used in adhesives.
- Self-efficacy: as the Lerner successfully carries out joining process on vehicle body parts using adhesive.
- Learning to learn: as the learner uses online resources to search for information on definition of the terms used in adhesives.

Pertinent and Contemporary Issues (PCIs):

- Analytical thinking: as the learner carries out joining process on vehicle body parts using adhesive.
- social cohesion: as the learner interacts with members of the community while visiting to identify joining processes used in vehicles.

Values:

- responsibility: as the learner carries out joining process on vehicle body parts using adhesive.
- Respect: as the learner behaves positively while they visit the locality to identify joining processes used in vehicles.

Suggested Assessment rubric				
Level Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Ability to interpret specification on the tire side walls.	Comprehensively interprets the tire specification	Interprets specification on the tire side walls.	Interprets specification leaving out few key specification	Interprets leaving out most of the key specification
Ability to sketch different types of vehicle body	Neatly Sketches all types of vehicle body	Sketches all types of vehicle body	Sketches types of vehicle body but leaving a few body types	Sketches few vehicle body types
Ability to illustrate different types of frame sections for vehicle chassis	Illustrates types of frame sections for vehicle chassis in details	Illustrates types of frame sections for vehicle chassis	Illustrates types of frame sections for vehicle chassis leaving few details	Illustrates types of frame sections for vehicle chassis leaving many details
Ability to use appropriate tools to perform various riveting processes while joining	Proficiently uses appropriate tool to perform various riveting processes while joining	Uses appropriate tool to perform various riveting processes while joining	Uses appropriate tool to perform various riveting processes while joining leaving out few steps.	Uses appropriate tool to perform various riveting processes while joining leaving out many steps.

STRAND 4.O: ENGINES

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
<p>4.0 Engines</p>	<p>4.1 Introduction to Engines (10 lessons)</p>	<p>By the end of the sub strand the learner should be able to:</p> <ol style="list-style-type: none"> define an engine as used in power mechanics, identify uses of engines in day-to-day life, explain terminologies used in engines, calculate the capacity of a given engine, appreciate the importance of engines in day to-day-life. 	<p>The learner is guided to:</p> <ul style="list-style-type: none"> use online or print resources to search for definitions of an engine as used in power mechanics, discuss with peers the definitions of an engine as used in power mechanics, use digital or print media to explore the uses of engines in day-to-day life, brainstorm on the terminologies used in engines, use online or print resources to search for information on engine terminologies (<i>bore, stroke, capacity, horse power, TDC, BDC</i>), carry out measurement and calculation to determine capacity of an engine using bore and stroke. 	<p>How are engines used in our day-to-day life?</p>
<p>Core Competencies to be Developed:</p> <ul style="list-style-type: none"> Critical Thinking: as the learner brainstorms the meaning of the terminologies used in an engine. 				

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| <ul style="list-style-type: none">• Communication and Collaboration: while the learner discusses with peers the definitions of engine terminologies.• Self-Efficacy: as the learner successfully carries out measurements and calculates the capacity of an engine.• Digital Literacy: as the learner uses online resources to search for definition of engine terminologies. |
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Pertinent and Contemporary Issues (PCIs):
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| <ul style="list-style-type: none">• Online Safety: as the learner accesses secure sites while using online resources to search for definitions of engine terminologies.• Decision Making: as the learner Carries out measurements on an engine. |
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Values:

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| <ul style="list-style-type: none">• Unity: as the learner works with peers in groups as a team.• Respect: as the learner accommodates other members' opinion while discussing on definitions of engine terminologies. |
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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
4.0 Engines	4.2 Types of Engines (12 lessons)	By the end of the sub strand the learner should be able to; a) explain the types of engines according to the combustion process, b) illustrate the layout of external combustion engines, c) differentiate internal and external combustion engines, d) appreciate the types of engines basing on the process of combustion.	The learner is guided to: <ul style="list-style-type: none"> • discuss with peers the types of engines according to the process of combustion (<i>external combustion and internal combustion</i>), • use digital or print media to search for information on the types of engines in relation to the process of combustion, • draw the layout of an external combustion engine, • distinguish between internal and external combustion engines (<i>in relation to source of power, size, components and efficiency</i>). 	Why is the study of types of engines important?
<p>Core competencies to be Developed:</p> <ul style="list-style-type: none"> • Learning to Learn: when the learner uses digital or print media to search for information on the types of engines in relation to the process of combustion. • Communication and Collaboration: as the learner discusses with peers the types of engines in relation to the process of combustion. • Self-Efficacy: while the learner successfully draws the layout of an external combustion engine. 				

Pertinent and Contemporary Issues (PCIs):

- Assertiveness: as the learner acquires skills of defending their position during discussion.
- Discipline: as the learner respectfully works with peers during discussions.

Values:

- Unity: as the learner works with peers in harmony.
- Respect: as the learner accommodates other members' opinion during discussions.

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
4.0 Engines	4.3 Classifications of Engines (8 Lessons)	By the end of the sub strand the learner should be able to; <ol style="list-style-type: none"> explain methods of classifying engines in power mechanics, categorize given engines into different classes, value the different classes of engines. 	The learner is guided to: <ul style="list-style-type: none"> use digital or print media to search for information on the methods of classifying engines, discuss with peers the methods of classifying engines (<i>type of combustion, type of fuel used, number of cylinders, layout/orientation of cylinders, cycle of operation, reciprocating and motion of engine-reciprocating and rotary</i>), sketch the various classes of engines practise classifying engines according to given classes. 	Why is classification of engines important?
<p>Core competencies to be Developed:</p> <ul style="list-style-type: none"> Learning to Learn: when the learner uses digital or print media to search for information on the methods of classifying engines Communication and Collaboration: as the learner discusses with peers the methods of classifying engines. Self-Efficacy: while the learner successfully classifies engines according to given classes. 				

Pertinent and Contemporary Issues (PCIs):

- Assertiveness: as the learner acquires skills of defending their position during discussion.
- Discipline: as the learner respectfully works with peers during discussions.

Values:

- Unity: as the learner works with peers in harmony.
- Respect: as the learner accommodates other members' opinion during discussions.

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Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
4.0 Engines	4.4 Engine components (16 Lessons)	By the end of the sub strand, the learner should be able to: a) identify components of an engine, b) sketch components of an engine, c) describe functions of components of an engine, d) perform measurements on engine components, e) appreciate the need for engine components.	The learner is guided to: <ul style="list-style-type: none"> • use online and print resources search for information on components of an engine, • use regalia, visual aids or print resources to identify engine components <i>crankshaft, camshaft, piston, connecting rod, valves, cylinder block, sump, rocker arms, cylinder head, rocker cover</i>), • illustrate components of an engine (<i>crankshaft, camshaft, piston, connecting rod, valves, cylinder block</i>), • brainstorm on the functions of engine components, • discuss with peers the function of engine components, • use appropriate instruments to carry out measurements on engine components (<i>journal, cylinder bore and clearances, piston ring gap</i>). 	<ol style="list-style-type: none"> 1. What are the main components of an internal combustion engine? 2. What are the key functions of internal combustion engine parts?

Core competencies to be Developed:

- Learning to Learn: when the learner uses online resources to search for information on components of an engine.
- Communication and Collaboration: as the learner discusses with peers the function of engine components.
- Self-Efficacy: while the learner successfully uses appropriate instruments to carry out measurements on engine components.

Pertinent and Contemporary Issues (PCIs):

- Assertiveness: as the learner acquires skills of defending their position during brainstorming.
- Discipline: as the learner respectfully works with peers during discussions.

Values:

- Unity: as the learner works with peers in harmony.
- Respect: as the learner accommodates other members' opinion during discussions.

Assessment rubric				
Level Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Ability to calculate the capacity of an engine	Calculates the capacity of an engine and interprets the readings	Calculates the capacity of an engine	Calculates the capacity of an engine with few errors	Calculates the capacity of an engine with prompts
Ability to illustrate the layout external combustion engines	Illustrates the layout external combustion engines and labels the components	Illustrates the layout external combustion engines	Illustrates the layout external combustion engines leaving out few components	Illustrates the layout external combustion engines with assistance
Ability to categorize engines according to given classes	Categorizes engines according to given classes and gives examples	Categorizes engines according to given classes	Partially categorizes engines according to given classes	Categorizes engines according to given classes with prompts
Ability to perform measurements on engine components	Perform measurements on engine components and interprets the findings	Performs measurements on engine components	Perform measurements on engine components leaving some measurements	Perform measurements on engine components with assistance

APPENDIX: LIST OF ASSESSMENT METHODS, LEARNING RESOURCES AND NON-FORMAL ACTIVITIES

Strand	Sub strand	Suggested assessment methods	Suggested Learning Resources	Non formal Activities
1.0 Fundamentals of power mechanics technology	1.1 Overview of Power Mechanics as a learning area	<ul style="list-style-type: none"> • Written tests • Question and answer • Checklist 	Manilla paper and marker pens to write definition of power mechanics, video clips on activities related to power mechanics.	Learners to visit workplace in the locality to observe activities related to power mechanics
	1.2 Evolution of automobile	<ul style="list-style-type: none"> • Question and answer • Written tests • Checklist 	Pictures on the evolution of automobile, Visual aids and Print media on key trends in the historical developments of the automobile,	Explore the locality to observe trends in automobile development
	1.3 Power mechanics workshop layout	<ul style="list-style-type: none"> • Written test • Question and answer • Checklist 	Pictures and plans on power mechanics workshop layout,	Visit the local workplace/workshops to conduct sensitization on

			drawing papers, pencils and rulers to draw simple workshop layouts	the need for good workshop layout
	1.4 General workshop rules and regulations	<ul style="list-style-type: none"> • Question and answer • Written tests • Observe learners as they write down general safety regulations • Checklist 	Manilla paper and marker pens to write the general workshop rules and regulations	Visit garage within the locality to develop flash cards on general workshop safety regulations
2.0 Related Drawing	2 1.Diagonal scale	<ul style="list-style-type: none"> • Written test • Observe learners as they develop diagonal scales • Question and answer 	Visual aids on diagonal scales, drawing paper and drawing set to draw diagonal scales	Learners to explore the community and identify applications of diagonal scales in real life
	2 2.loci	<ul style="list-style-type: none"> • Question and answer • Written tests • Rubric 	Drawing paper and drawing equipment to draw ellipse, cycloid, involute,	Learners to engage workers in various workplaces within the community on uses of loci

		<ul style="list-style-type: none"> Observe learners as they develop various types of loci 	parabola and hyperbola locus	
	2 3.Tangency	<ul style="list-style-type: none"> Question and answer Checklist Observe learners as they construct various types of tangents 	Drawing paper and drawing set for drawing tangents. Charts with illustrations on types of tangents	Learners to engage a resource person on the application of tangency in power mechanics
	2 4.Blending of lines and curves	<ul style="list-style-type: none"> Written test Question and answer Observe learners as they blend lines and circles 	Drawing paper and drawing set to draw blended lines and curves, charts with illustrations on blended lines and curves	Learners to identify and list items at home or in the community that were designed using knowledge of blending of lines and curves
3.0 Vehicle Systems	3.1 Road wheels	<ul style="list-style-type: none"> Question and answer Written tests Rubric Checklist 	Pictures on road wheels, Used vehicle tires with specifications on the tire walls	Visit parking areas in the locality and identify the various types of tires used in vehicles
	3.2 Vehicle body	<ul style="list-style-type: none"> Written test Question and answer 	Vehicles in garages and parking areas	Visit parking areas or garages in the locality and identify the various

		<ul style="list-style-type: none"> • Checklist 		types of vehicle body designs
	3.3 Vehicle chassis	<ul style="list-style-type: none"> • Question and answer • Written test • Checklist 	Pictures of various types of vehicle chassis,	Visit vehicle garages in the locality to identify vehicle chassis types
	3.4 Vehicle body Joining processes	<ul style="list-style-type: none"> • Question and answer • Written tests • Practical work • Checklist • Rubric 	<p>Vehicle garages where minor vehicle joining processes are performed</p> <p>Resource person the use of body hand tools in performing joining processes on vehicle body</p>	Participate in performing basic vehicle body joining processes in workplaces within the locality
4.0 Engines	4.1 Introduction to engines	<ul style="list-style-type: none"> • Question and answer • Written test • Checklist 	Pictures or video clips on general engine terminologies, basic measuring tools for measuring engine parameters	Develop charts on engine definition and engine terminologies,
	4.2 Types of engines	<ul style="list-style-type: none"> • Question and answer 	Pictures, sketched illustration on	Visit workplaces in the community to identify

		<ul style="list-style-type: none"> • Written tests • Rubric • Checklist 	<p>engine construction and orientation</p> <p>Used sectioned engines</p>	types of engines used in day-to-day life
	4.3 Classification of engines	<ul style="list-style-type: none"> • Written test • Rubric • Question and answer • Observation schedules 	<p>Pictures or videos on different classification of engines, engine technology text books</p> <p>Used engines sectioned and with most of the components</p>	Visit workplaces in the community to observe types of engines classified using various parameters



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