

National School Curriculum

INSTRUCTIONAL GUIDE FOR TVET (AUTOMOBILE)

CLASSES IX & X



Department of Curriculum and Professional Development
Ministry of Education, Royal Government of Bhutan



“Your parents, relatives, and friends would be very proud of what you have achieved. At your age, to have completed your studies is your personal accomplishment. Your knowledge and capabilities are a great asset for the nation. I congratulate you for your achievements. Finally, your capabilities and predisposition towards hard work will invariably shape the future of Bhutan. You must work with integrity, you must keep learning, keep working hard, and you must have the audacity to dream big.”

- His Majesty Jigme Khesar Namgyel Wangchuck

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Published by

Department of Curriculum and Professional Development
Ministry of Education
Royal Government of Bhutan
Thimphu, Bhutan.

Provisional Edition 2021**First Edition 2022**

www.education.gov.bt

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ISBN 978-99936-0-658-1

Acknowledgements

The Department of Curriculum and Professional Development (DCPD) would like to acknowledge the assistance provided by the Department of School Education, MoE, Royal Government of Bhutan in the development of Technical and Vocational Education and Training National School Curriculum Instructional Guide for classes IX - XII. The DCPD also extends its sincere gratitude to all the schools and individuals for their invaluable contributions towards the development of this instructional guide. The DCPD also wishes to extend heartfelt gratitude to the World Bank for rendering financial services during the course of the development of this instructional guide.

The DCPD also genuinely acknowledges the retrieval and use of contents and resources, either in part or whole, from relevant websites and other forms of sources with assurance that these resources will be used exclusively for educational purposes.

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Foreword

COVID-19 has suddenly caused unforgiving disruptions in public education all over the world and brought about threats of fragmentation due to disparities in accessibility and connectivity in many systems. In Bhutan too, continuity of education and learning has been severely affected as a result of nationwide school closures and due to restrictions and health protocols. The disruptions have led to challenges in many existing patterns and trends in education resulting in a massive shift away from teaching and learning in traditional settings.

In the new normal education, human interaction and well-being are a priority. Digital technology that enables communication, collaboration and learning across distance, is a source of innovation and expanded potentials. As we embrace this exceptional opportunity to transform the world, and as we reimagine the organization of our educational institutions and learning environments, we need to think about where we want to go.

In the post COVID 19 era, we must prioritize the development of the whole person not just academic knowledge. Inspiration for the change can be drawn from the 1996 Delors report, *Learning the treasure within*, in its specification of four pillars of learning as “learning to know”, “to do”, “to be”, and “to live together”. Therefore, curricula must be increasingly perceived as an integrated and based on themes and problems that allows learners to learn to live in peace with our common humanity and our common planet. This has the potential in the development of a strong base of knowledge about one’s self and about the world and find purpose and be better able to participate in social and political milieu.

The National School Curriculum is, not just a mere response to the pandemic, but also a culmination of the curriculum reform work for the last four years by the then Royal Education Council. It is an attempt to transform education from the teaching of “what” to learning of “how” and “why” towards empowering learners with the transversal competencies and the 21st century skills, and preparing them to be lifelong learners. We are optimistic that this move orients our education process towards nurturing nationally rooted and globally competent citizens.

Wish all our learners and teachers a life enriching experiential teaching and learning.

Tashi Delek.

A handwritten signature in black ink, appearing to read 'Tashi Namgyal', with a horizontal line underneath.

Tashi Namgyal

Director

Introduction

Technical and Vocational Education and Training (TVET) is aimed at providing knowledge and skills for employment. It comprises education, training and skills development related to a wide range of occupational fields, production, services and livelihood. The Department of Curriculum and Professional Development, Ministry of Education envisages that the TVET curriculum has a place in the mainstream education system, as it is the case in most of the education systems of the developed world. The formal Technical and Vocational Education and Training (TVET) began in 1965 at Don Bosco Technical School (DBTS), in Kharbandi (presently known as Rinchenling) in Phuntsholing. Even after that, major curriculum reform was planned by the then Department of Curriculum Research and Development (DCRD) in an attempt to make education relevant to the Bhutanese society through diversification of Secondary Education Curriculum in the schools, which included the introduction of TVET.

As per 'National Education Framework' developed collaboratively by the Royal Education Council (REC) and the Ministry of Education (MoE), it provides a pathway on integrating technical/vocational education in the mainstream school education curriculum and as elective subjects in higher classes (NEF, 2009; page 64).

With the collaborative efforts of the Ministry of Labour and Human Resources and the erstwhile Department of Curriculum Research and Development, Vocational Curriculum has been introduced in the schools with assistance from TTIs since 2011. After the first MoU that was signed between MoE and MoLHR in 2011, the second MoU was signed again in 2014, to improve technical/vocational courses. The technical/vocational courses offered by the TTIs/IZCs are adapted and redesigned and are offered in schools aligning to the 'Bhutan Education Blue Print' 2014-2024, which recommends upscaling and diversification of TVET in schools through the provision of alternative pathways in schools and the tertiary education systems, owing to the limited access to such courses, despite the growing demand for technical skills in the country.

The resolutions of the National School Curriculum Conference 2016, also strongly emphasised the need to upscale and deepen TVET. Accordingly, the TVET framework is developed from classes PP to XII, schools equipped with necessary resources and instructors trained. Tripartite MoU among the then REC, MoE and MoLHR was also signed in 2018 to implement the programmes collaboratively.

Although the TVET curriculum is competency based with more emphasis on hands-on experience, further improvements have been made taking care of cognitive and affective domains besides psychomotor. Teaching and learning approaches have also been enriched with the recommendation to use ICT and online resources. Since the pandemic (COVID-19) has resulted in the closure of schools, it has taught us lessons to be prepared for such an untoward situation in the future. Thus, the National School Curriculum Instructional Guide is prepared not only to encourage blended learning but also to facilitate remote learning. The guide would help the schools to implement the curriculum effectively without limiting to contact teaching/learning besides using a variety of pedagogies.

Purpose of the Instructional Guide

Among the many definitions of ‘curriculum’ this Instructional Guide underscores the meaning of curriculum as a standard and competency-based sequence of planned learning experiences where learners practise and achieve the proficiency in applying the learning experiences in real life scenarios. These proficiencies, in the curriculum framework, have been stated as “competencies” and ‘objectives’ for each class. In keeping with the principle, ‘less is more’ as stated the National School Curriculum, the contents of the curriculum have been reworked, so that learners can be engaged more in activities that can lead to the acquisition of required skills rather than having them ‘cover the syllabus’.

This Instructional Guide believes that the classroom teachers, as professional individuals, can make the most authentic and reliable judgment about each learner’s learning needs and the learning experiences to be provided to propel the learners in the learning continuum. With these beliefs and principles as the background, the following are the purposes of this document.

- Facilitate learners acquire required skills and competencies.
- Strengthen blended learning, including flipped classroom with multimedia, digital pedagogies and ICT devices and websites as tools to share the responsibility of learning amongst the learners, teachers, the parents and other stakeholders.
- Facilitate the use of Continuous Formative Assessment for learning using diverse appropriate assessment techniques and tools commensurate with individual differences in learning, and gather evidence to guide planning of educational programmes and activities for learners.
- Promote inclusive learning through the blended learning which facilitates learning anywhere, any time with the learner being responsible for the learning.
- Provide suggestive means of acquiring required skills by building interrelationship among, and through, the integration of the four strands of the curriculum.
- Help teachers assume the roles of facilitator, guide, motivator and evaluator.
- Guide teachers, parents and other stakeholders in helping learners achieve their potential.
- Empower teachers to design their own ‘course of study’ or ‘class curriculum’ for their students in line with the National School Curriculum Framework.
- Enhance sharing the burden of responsibility and accountability for learning amongst the stakeholders, including the learners themselves.

In this age of advanced communication and information technology, contents are widely available from a number of sources. Therefore, the teachers can select, structure and sequence the contents as required to best suit the learners’ need while maintaining coherence and consistency. In other words, while the contents of the curriculum are negotiable, the competencies and objectives are not. While, teachers may have access to number of materials, it should be kept in mind that the teaching and learning should be focused on achieving the competencies rather than ‘covering of the syllabus’. The teaching learning materials should be used as means to create a learning environment that is competency-based where the learners need to master the skills presented to them. While designing lesson plans and teaching learning activities, teachers need to ensure that the materials are relevant and appropriate for the given task.

The assessment should be competency-based wherein the teachers should assess the learners’ mastery of the skills stated as competencies and objectives for each class. Teachers should use appropriate assessment tools and techniques depending on the nature of the learning activities. The learners should be clearly informed about the success criteria, the areas of assessment and the tools to be used so that they know exactly what tasks are to be performed or expected of them. In the process of the performance, the teacher should continuously provide feedback and, if necessary, modify instructions. Efforts have to be made to ensure that every learner has mastered the skills.

Table of Contents

Acknowledgements.....	i
Foreword.....	ii
Introduction	iii
Purpose of the Instructional Guide	iv
Table of Contents.....	v
Class IX	1
MODULE I: SERVICING SUSPENSION SYSTEM	1
Chapter 1: Practising Occupational Health and Safety (OHS)	1
1.1 Applying principles of 5S.....	1
1.2 Using PPE.....	2
1.3 Maintaining workplace and personal safety.....	3
1.4 Maintaining tools and equipment safety.....	4
1.5 Using fire extinguisher	5
1.6 Using hacksaw	6
1.7 Using filing.....	7
1.8 Using drilling.....	8
1.9 Performing grinding	9
1.10 Performing greasing.....	10
1.11 Performing arc welding.....	11
1.12 Using multi-meter	12
1.13 Using vernier calliper	13
1.14 Using micrometer	14
Chapter 2: Replacing faulty rigid suspension components.....	16
2.1 Replacing a shock absorber	16
2.2 Replacing leaf spring assembly	17
2.3 Disassembling leaf spring assembly.....	19
2.4 Assembling leaf spring assembly	20
2.5 Changing leaf spring bush	21
Chapter 3: Replacing faulty independent suspension component	22
3.1 Replacing strut assembly	22
3.2 Disassembling strut and coil spring.....	23
3.3 Assembling strut and coil spring	24
3.4 Replacing coil spring.....	25

3.5 Replacing strut bar	26
3.6 Replacing suspension arm.....	27
3.7 Replacing torsion bar	28
3.8 Replacing lateral control rod.....	30
3.9 Replacing stabilizer bar	31
Chapter 4: Diagnosing suspension system failures	33
4.1 Performing visual inspection of suspension failure	33
4.3 Performing test drive	35
MODULE I: INTERPRETING ENGINEERING DRAWING	36
Chapter: 1 Draw basic signs, symbols and dimension.....	36
1.1 Using drawing instruments	36
1.2 Laying out drawing sheet	37
1.3 Interpreting engineering signs, symbols and abbreviations	38
1.4 Drawing different types of lines.....	39
1.5 Drawing letters and numbers	40
1.6 Providing dimensions.....	41
Class X	42
MODULE: II: SERVICING BRAKE SYSTEM.....	42
Chapter 1: Overhauling brake system	42
1.1 Checking the operation of the brake booster.....	42
1.2 Changing brake booster	43
1.3 Replacing master cylinder kits	44
1.4 Changing brake shoes	45
1.5 Replacing wheel cylinder kits.....	46
1.6 Changing brake caliper assembly.....	47
1.7 Replacing brake pipeline	48
Changing	49
1.8	49
1.9 Changing brake fluid	50
1.10 Changing load sensing device	51
1.11 Changing anti-lock brake system speed sensor	52
1.12 Changing parking brake cable	53
Chapter 2: Adjusting brake system.....	55
2.1 Adjusting brake pedal free play	55

2.2	Adjusting drum brake.....	56
2.3	Performing test drive	57
MODULE: III: SERVICING STEERING SYSTEM		58
Chapter 1: Servicing steering components.....		58
1.1	Replacing steering wheel	58
1.2	Replacing steering shaft.....	59
1.3	Replacing tie rod end	60
1.4	Replacing rack & pinion assembly.....	61
1.5	Replacing pitman arm	62
1.6	Replacing re-circulating ball type steering gearbox.....	63
1.7	Overhauling re-circulating type steering gearbox	64
1.8	Adjusting steering gear backlash	64
1.9	Replace integral power steering gearbox	65
MODULE: INTERPRETING ENGINEERING DRAWING		67
Chapter: 1 Draw isometric and mechanical parts.....		67
2.1	Converting drawing scale	67
2.2	Drawing Isometric blocks	68
2.3	Drawing orthographic projection.....	68
2.3	68
Resources		70

Class IX

MODULE I: SERVICING SUSPENSION SYSTEM

Chapter 1: Practising Occupational Health and Safety (OHS)

A. Competency/Competencies:

- i. Apply the principles of 5S in any place.

B. Learning objectives/Topic:

Learning objectives	Topic
<ul style="list-style-type: none">1.1.1 Define 5S.1.1.2 State the purposes of 5S.1.1.3 Explain the principle of 5S.1.1.4 Define OHS.1.1.5 State the importance of OHS.1.1.6 Explain the rights of the employee.1.1.7 State the main causes of accidents.1.1.8 State the safety rules.1.1.9 Apply principles of 5S. <p><i>Note:</i></p> <ul style="list-style-type: none">✓ <i>Ensure appropriate use of PPE.</i>✓ <i>Ensure to refer OHS manual.</i>	<p>1.1 Applying principles of 5S</p> <p>Overview: The topic is about the ways of organizing and managing the workplace that enable the learners to perform their tasks effectively and efficiently.</p>

C. Learning Experiences:

- ✓ Let the learners read INFORMATION SHEET 1.1.
- ✓ Let them perform OPERATION SHEET 1.1.
- ✓ Let the learners solve the SAMPLE SELF CHECK 1.1.
- ✓ Use PPT, posters, and handouts (principles of 5S).
- ✓ Share the web link <https://youtu.be/n9sxxq34D9HQ> with the learners which explains the principles of 5S.
- ✓ Provide handouts to learners through Google Classroom or any other social media platforms.

D. Assessment:

- ✓ Make learners perform OPERATION SHEET 1.1
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.1 that fulfills the objectives and competency.
- ✓ Conduct class tests.
- ✓ Make learners perform OPERATION SHEET 1.1 and send the short video as evidence through Google Classroom or any other social media platforms.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.1 and send answers through Google Classroom or any other social media platforms.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube and let learners submit answers through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts and posters (Principles of 5S).
- ✓ <https://youtu.be/n9sxq34D9HQ> (Explanation on principles of 5S).

A. Competency/Competencies:

- i. Use appropriate PPE as per the requirement.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.2.1 Define PPE.</p> <p>1.2.2 State the importance of PPE.</p> <p>1.2.3 List the categories of PPE.</p> <p>1.2.4 Use PPE.</p> <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure good care of PPE.</i>✓ <i>Ensure to wear appropriate PPE.</i>✓ <i>Ensure not to defective and damage PPE.</i>	<p>1.2 Using PPE</p> <p>Overview: The topic is about the proper use of various PPE and it helps the learners to maintain safety at workplace.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.2
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.2
- ✓ Let the learners solve the SAMPLE SELF CHECK 1.2
- ✓ Use PPT, handouts, and posters (PPE).
- ✓ Let the learners explore through the given web link.
<https://www.youtube.com/watch?v=DMBRNV9Hrk> that explains the importance of PPE.
- ✓ [Provide handouts to learners.](#)

D. Assessment:

- ✓ The learners should use appropriate PPE before the practical works are started.
- ✓ Assess the learners' ability to identify the different types of PPE and their purposes.
- ✓ Frame questions from CBLM and other resources-Google/YouTube.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.2 and send answers through Google Classroom or any other social media platforms.
- ✓ Ask learners to perform OPERATION SHEET 1.1 and send the short video as evidence through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials
- ✓ Handouts and posters (PPE).
- ✓ <https://www.youtube.com/watch?v=DMBRNV9Hrk> (Importance of PPE).

A. Competency/Competencies:

- i. Practise OHS procedures in any task for safety.
- ii. Maintain workplace and personal safety.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.3.1 Define safety precaution.</p> <p>1.3.2 List the different types of safety</p> <p>1.3.3 Explain workshop and personal safety.</p> <p>1.3.4 State the importance of maintaining workplace and personal safety.</p> <p>1.3.5 Explain the importance of safety signs and symbols.</p> <p>1.3.6 Explain the Emergency exit.</p> <p>1.3.7 Describe the layout of the workshop.</p> <p>1.3.8 Maintain workplace and personal safety.</p> <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure to follow OHS procedures.</i>✓ <i>Ensure to keep the workshop clean.</i>✓ <i>Ensure to ring the alarm bell before the accident spreads over.</i>✓ <i>Ensure to display safety signs and symbols.</i>✓ <i>Ensure to use appropriate PPE in the workplace.</i>✓ <i>Ensure to avoid horseplay at the workplace.</i>✓ <i>Ensure to avoid smoking and eating inside the workshop.</i>	<p>1.3 Maintaining workplace and personal safety</p> <p>Overview: The learners can maintain a workplace and personal safety knowing about safety signs and symbols and ways of setting conducive workshop.</p>

C. Learning Experiences:

- ✓ Let the learners read and explain the INFORMATION SHEET 1.3
- ✓ Demonstrate and let the student perform the OPERATION SHEET 1.3
- ✓ USE handouts and PPT.
- ✓ Based on the information obtained from the web link or relevant materials, let the learners answer the SAMPLE SELF CHECK 1.3 that is uploaded in the Google Classroom.
- ✓ Let the learners follow the link and explore maintaining a workplace and personal safety
<https://www.youtube.com/watch?v=4bkr5lpKGUM>

D. Assessment:

- ✓ The teachers may develop a rubric to assess learners' application of appropriate workplace and personal safety while performing the practical-oriented task.

- ✓ Assessm the work submitted through telegram, WeChat, Messenger, and google classroom.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts.
- ✓ <https://www.youtube.com/watch?v=WW0U6o1XNec> (Explanation on_maintaining a workplace and personal safe).

A. Competency/Competencies:

- Maintain tools and equipment safety.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.3.1 Explain tool and equipment safety.</p> <p>1.3.2 State the importance of maintaining tool and equipment safety</p> <p>1.3.3 List the dos and don'ts for tools and equipment.</p> <p>1.3.4 Maintain tools and equipment safety.</p> <p>Note:</p> <ul style="list-style-type: none"> ✓ <i>Ensure all the tools are in workable condition.</i> ✓ <i>Ensure to keep tools clean and dry, and tore them</i> ✓ <i>properly after use.</i> ✓ <i>Ensure to operate the machine when instructed.</i> ✓ <i>Ensure to refer manual before operation of tools and equipment.</i> 	<p>1.4 Maintaining tools and equipment safety</p> <p>Overview: The topic covers information on the ways of maintaining tools and equipment safety thereby increasing the efficiency of tools and equipment.</p>

C. Learning Experiences:

- ✓ Let the learners read and explain the INFORMATION SHEET 1.4
- ✓ Explain and let them perform the OPERATION SHEET 1.4.
- ✓ Let the learners solve the SAMPLE SELF CHECK 1.4
- ✓ Provide a web link <https://www.bramptonguardian.com/shopping-story/6829220-the-importance-of-using-the-right-tool-for-the-job/> that explains the do's and donts while using tools and equipment.
- ✓ [Share the link http://www.ehsdb.com/dos-and-donts--hand-tools-equipments.php](http://www.ehsdb.com/dos-and-donts--hand-tools-equipments.php) to learn the importance of using the right tool for the right job.

- ✓ Provide other resources such as video clips, handouts, etc through Google Classroom or any other social media platforms.

D. Assessment:

- ✓ As soon as the learners are aware of maintaining tools and equipment safety, ask them to perform OPERATION SHEET 1.4 and keep on practicing while performing any task.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.4
- ✓ Conduct class tests by framing the questions from CBLM and other ICT resources.
- ✓ Assess the learners' ability to explain the importance of maintaining tools and equipment safety, do's and don'ts of handling tools and equipment, by conducting the class test, letting the learners perform the task and rate them using rubrics, etc. Provide necessary feedback and intervention based on an assessment of the model.
- ✓ Give questions using different sources and let the learners submit answers through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials
- ✓ Handouts, video clips, and PowerPoint presentations.
- ✓ <https://www.bramptonguardian.com/shopping-story/6829220-the-importance-of-using-the-right-tool-for-the-job/> (Importance of using the right tool for the right job).
- ✓ <http://www.ehsdb.com/dos-and-donts--hand-tools-equipments.php> (Dos and dont's while using tools and equipment).

A. Competency/Competencies:

- Practise OHS procedures in any task for safety.
- Operate and use different fire extinguishers to combat different classes of fires at any time.

B. Learning objectives/Topic:

Learning objectives	Topic
1.5.1 Define fire extinguisher. 1.5.2 Label the parts of the fire extinguisher. 1.5.3 Explain the types of fires. 1.5.4 Explain the types of fire extinguishers. 1.5.5 State the methods of combating/extinguishing fires. 1.5.6 Use a fire extinguisher. Note: <ul style="list-style-type: none"> ✓ <i>Ensure to read the instructions provided on the fire extinguisher.</i> ✓ <i>Ensure appropriate use of PPE.</i> 	<p style="text-align: center;">1.5 Using fire extinguisher</p> <p>Overview: The use of different fire extinguishers are covered and it enables the learners to operate them appropriately.</p>

C. Learning Experiences

- ✓ Read and explain the INFORMATION SHEET 1.5
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.5
- ✓ Let the learners practice in a group followed by individual practice.
- ✓ Let the learners solve SAMPLE SELF CHECK 1.5.
- ✓ Let the learners explore the methods on how to use a fire extinguisher to combat fire from the link <https://www.youtube.com/watch?v=PQV71INDaqY>
- ✓ Let the learner explain how they extinguish the fire in their respective places.

D. Assessment:

- ✓ Assess the learners' ability to perform OPERATION SHEET 1.5 as per the rubrics or practical checklist.
- ✓ Usage of proper PPE while handling a fire extinguisher.
- ✓ Assessing the given Q&A submitted through any possible social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts.
- ✓ <https://www.youtube.com/watch?v=PQV71INDaqY> (How to use fire extinguisher)

A. Competency/Competencies:

- i. Practise OHS procedures in any task for safety.
- ii. Use hacksaw safely for better performance.

B. Learning objectives/Topic:

Learning objectives	Topic
1.6.1 State function of a hacksaw. 1.6.2 List parts of hack saw. 1.6.3 State types of hack saw. 1.6.4 Use hacksaw <i>Note: Ensure appropriate use of PPE.</i>	1.6 Using hacksaw Overview: Besides knowing the function, parts, and types of hacksaw, the learners can use the hacksaw.

C. Learning Experiences:

- ✓ Read the INFORMATION SHEET 1.6
- ✓ Read and Perform the OPERATION SHEET 1.6
- ✓ Let the learners solve the SAMPLE SELF CHECK 1.6
- ✓ Use PPT, posters (parts of hacksaw), and handouts.
- ✓ Provide a link <https://www.hunker.com/13402985/types-of-hacksaw-blades> that explains the types of hacksaw blades.
- ✓ Provide a link <https://www.youtube.com/watch?v=G0NGoPF3Q6A> that explains how to change hacksaw blades.

D. Assessment:

- ✓ Provide all the tools and materials and let the learners perform the OPERATION SHEET 1.6.
- ✓ After completing the practical, assess the end product using rubrics.
- ✓ Conduct class tests.
- ✓ Let them perform OPERATION SHEET 1.6 and send video clips/ images as evidence in google classroom.
- ✓ Assess the given question and answers submitted through Google Classroom, WeChat, etc.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Use PPT, posters (parts of hacksaw), and handouts.
- ✓ <https://www.hunker.com/13402985/types-of-hacksaw-blades> (Types of hacksaw blades).
- ✓ <https://www.youtube.com/watch?v=G0NGoPF3Q6A> (How to change hacksaw blades and how to use a hacksaw).

A. Competency/Competencies:

- i. Use file properly for better performance.

B. Learning objectives/Topic:

Learning objectives	Topic
1.7.1 State the function of the file. 1.7.2 List the types of files. 1.7.3 List the parts of the file. 1.7.4 Use file <i>Note: Ensure appropriate use of PPE.</i>	<p style="text-align: center;">1.7 Using filing</p> <p>Overview: This topic covers the function and types of files that enables the learners to use them.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.7
- ✓ Read and perform OPERATION SHEET 1.7
- ✓ Let the learners solve SAMPLE SELF CHECK 1.7
- ✓ Use PPT, posters (parts of hacksaw), and handouts.
- ✓ Provide the web link [https://en.wikipedia.org/wiki/File_\(tool\)](https://en.wikipedia.org/wiki/File_(tool)) to learn more about the types of files with functions.
- ✓ Provide the link <https://www.youtube.com/watch?v=BM8gZuLrOCE> to watch a short video clip on the filing process, types, etc.
- ✓ Provide handouts and pictures (parts of hacksaw) through google classroom, WeChat, etc.

D. Assessment:

- ✓ Assess the learners' ability to identify different types of files and use them.
- ✓ Assess the learner's product after practical according to the rubrics developed.

- ✓ Conduct class tests.
- ✓ Let the learners go through the links provided and assess the notes submitted through Google Classroom or any other social media platforms.
- ✓ Upload a question through possible social media platforms from the provided videos, handouts, CBLM, and assess their answers.
- ✓ Let the learners answer the SAMPLE SELF CHECK 1.7 and submit it through Google Classroom, etc.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, posters (parts of hacksaw), and handouts.
- ✓ [https://en.wikipedia.org/wiki/File_\(tool\)](https://en.wikipedia.org/wiki/File_(tool)) (Types of files with function).
- ✓ <https://www.youtube.com/watch?v=BM8gZuLrOCE> (Short video clip on the filing process, types, etc).

A. Competency/Competencies:

- i. Practice OHS procedures in any task for safety.
- ii. Identify and operate any type of drilling machine to perform the task.
- iii. Maintain equipment for effective and efficient performance.

B. Learning objectives/Topic:

Learning objectives	Topic
1.8.1 Define drilling machine. 1.8.2 State the function of the drilling machine. 1.8.3 List the types of drilling machines. 1.8.4 Use drilling Note: <ul style="list-style-type: none"> ✓ <i>Operate drilling machine.</i> ✓ <i>Use center punch.</i> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure to use coolant.</i> 	1.8 Using drilling Overview: This topic comprises of the function and the parts of the drilling machine. The learners can identify and operate any type of drilling machine.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.8 using posters, PPT and CBLM.
- ✓ Read, demonstrate and let them perform SKILL SHEET 1.8 (a)
- ✓ Read and let them perform SKILL SHEET 1.8 (b)
- ✓ Read, demonstrate and let them perform OPERATION SHEET 1.8
- ✓ Provide handouts and short video clips.
- ✓ Provide the link <https://www.youtube.com/watch?v=-HT-OWuP5qgabout%3Ablank> and <https://www.youtube.com/watch?v=V3u8wTjAedU> to learn on the parts and operation of radial drilling machines.

D. Assessment:

- ✓ Assess their ability to identify the parts and types of drilling machines.
- ✓ Assess their performance based on the end product according to the rubrics developed.
- ✓ Assess their notes or the task assigned to them based on the links, videos, handouts, etc provided through possible social media platforms.
- ✓ Let them do the SAMPLE SELF CHECK 1.8 and submit through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, and posters.
- ✓ <https://www.youtube.com/watch?v=-HT-OWuP5ggabout%3Ablank> & <https://www.youtube.com/watch?v=V3u8wTjAedU> (Parts and operation of radial drilling machine).

A. Competency/Competencies:

- i. Maintain equipment for effective and efficient performance.
- ii. Identify different types of grinding machine and operate for better performance.

B. Learning objectives/Topic:

Learning objectives	Topic
1.3.1 State the function of the grinding machine. 1.3.2 Label the parts of the grinding machine. 1.3.3 List the types of grinding machine 1.3.4 Perform grinding Note: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure to keep a safe distance between the hand and grinding machine.</i> ✓ <i>Ensure to use gradual force while grinding.</i> 	1.9 Performing grinding Overview: The function of a grinding machine and its working principles are covered and the learners can operate it safely.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.9 with the help of posters and PPT.
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.9 using the DEMO++ performance guide.
- ✓ Let them solve the SAMPLE SELF CHECK 1.9.
- ✓ Provide handouts and short video clips (How to perform grinding).
- ✓ Provide the link https://www.youtube.com/watch?v=gqwu6kua_g to learn more about bench grinders.

D. Assessment:

- ✓ Assess the learners' ability to identify and operate different types of grinder.
- ✓ Discuss the SAMPLE SELF CHECK 1.9 in the classroom.
- ✓ Conduct the class test for theoretical as well as practical.
- ✓ Assess the end product of learners after performing the OPERATION SHEET 1.9.
- ✓ Assess the answers of SAMPLE SELF CHECK 1.9, notes, and the assignments such as short answer questions, given to the learners through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Posters, PPT, and short video clips (How to perform grinding).
- ✓ https://www.youtube.com/watch?v=gqwu6kua_g (Bench grinder).

A. Competency/Competencies:

- i. Identify appropriate grease and use in the automotive components with the help of grease gun for better performance.

B. Learning objectives/Topic:

Learning objectives	Topic
1.10.1 State the types of grease. 1.10.2 Explain the purpose of grease. 1.10.3 Use hand grease gun Note: <ul style="list-style-type: none">✓ Ensure appropriate use of PPE.✓ Proper handling of tools and equipments.	1.10 Performing greasing Overview: The learners will be able to identify the types of grease and can also use hand grease gun.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.10
- ✓ Use PPT and handouts.
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.10
- ✓ Let them solve the SAMPLE SELF CHECK 1.10.
- ✓ Provide the web link <https://rb.gy/ksmzaa> on the functions and properties of grease.
- ✓ This link can be given <https://www.youtube.com/watch?v=MSvQck2GXuk> to learn on how to load the grease gun and use it.

D. Assessment:

- ✓ Assess the learners' ability to identify the types of grease and perform OPERATION SHEET 1.10 as per the rubrics.
- ✓ Conduct the class test.
- ✓ Assess the answers of SAMPLE SELF CHECK 1.10 submitted online.

- ✓ Upload handouts through Google Classroom or any other social media platforms and assess their understanding.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT and handouts.
- ✓ <https://rb.gy/ksmzaa> (functions and properties of grease).
- ✓ <https://www.youtube.com/watch?v=MSvQck2GXuk> (How to load the grease gun and use it)

A. Competency/Competencies:

- Practice OHS procedures in any task for safety.
- Perform arc welding as per the job requirement.

B. Learning objectives/Topic:

Learning objectives	Topic
1.11.1 Define arc welding 1.11.2 Define arc welding machine. 1.11.3 List the types of welding machines. 1.11.4 List the accessories and their functions. 1.11.5 Define arc length. 1.11.6 Perform Arc welding Note: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure to set welding current as per the job requirement.</i> 	<p style="text-align: center;">1.11 Performing arc welding</p> <p>Overview: The types of joints, welding, accessories, and their functions are covered. The learners can set up the arc welding machine and perform arc welding as per the requirement.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.11
- ✓ Use PPT, handouts, posters (arc welding set up), and short video clips (How to perform arc welding).
- ✓ Read and demonstrate the JOB SHEET 1.11: On operating of arc welding machine.
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.11
- ✓ Let them solve the SAMPLE SELF CHECK 1.11.
- ✓ Provide the web link <https://www.youtube.com/watch?v=Si4ivw9PwtU> on how to set up the arc welding machine.
- ✓ Provide the link <https://youtu.be/CoHVA7nr82A> to learn about the procedure of arc welding.

D. Assessment:

- ✓ Assess the learners' ability to set up the welding machine as per the required standards.

- ✓ Assess the learner's end product after performing the OPERATION SHEET 1.11 as per the rubrics.
- ✓ Conduct the class test.
- ✓ Assess the answers of SAMPLE SELF CHECK 1.11 submitted online.
- ✓ Upload the case study through Google Classroom or any other social media platforms and assess their understanding.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, posters (arc welding set up), and short video clips (How to perform arc welding), and case study.
- ✓ <https://www.youtube.com/watch?v=Si4ivw9PwtU> (Arc welding machine set up).
- ✓ <https://youtu.be/CoHVA7nr82A> (procedures of arc welding)

A. Competency/Competencies:

- i. Identify and use any types of multi-meter as per the requirements.

B. Learning objectives/Topic:

Learning objectives	Topic
1.12.1 State the functions of multi-meter. 1.12.2 List the types of multi-meter. 1.12.3 Set the multi-meter. Note: ✓ <i>Ensure appropriate use of PPE.</i>	1.12 Using multi-meter Overview: The learners can know about multi-meter and use it as well.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.12
- ✓ Use PPT, handouts, and short video clips (How to use multi-meter).
- ✓ Demonstrate and let the learners perform SKILL SHEET 1.12
- ✓ Let them solve the SAMPLE SELF CHECK 1.12
- ✓ Provide the web link <https://www.youtube.com/watch?v=TdUK6RPdIrA> on how to use micrometer.
- ✓ provide the web link <https://www.pribortorg.by/en/articles/what-is-a-multimeter> that explains the functions and types of multi-meter.

D. Assessment:

- ✓ Assess the learner's ability to perform SKILL SHEET 1.12 as per the rubrics.
- ✓ Conduct the class test.
- ✓ Assess the answers of SAMPLE SELF CHECK 1.11 submitted online.
- ✓ Upload the handouts and questions through Google Classroom or any other social media platforms and assess their understanding.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT and handouts.
- ✓ <https://www.youtube.com/watch?v=TdUK6RPdlrA> (How to use multi-meter)
- ✓ <https://www.pribortorg.by/en/articles/what-is-a-multimeter> (functions and types of multi-meter)

A. Competency/Competencies:

- i. Use Vernier calliper safely whenever applicable.

B. Learning objectives/Topic:

Learning objectives	Topic
1.13.1 Define Vernier calliper. 1.13.2 State the functions of Vernier calliper. 1.13.3 List the types of Vernier calliper. 1.13.4 Label the parts of Vernier caliper. 1.13.5 Define and state the use of: <ul style="list-style-type: none"> • Vernier scale • Main scale • Least count 1.13.6 State the difference between inch and metric readings. Note: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate handling of Vernier calliper.</i> 	<p style="text-align: center;">1.13 Using vernier calliper</p> <p>Overview: This topic comprises of the functions, types and parts of the Vernier calliper and the learners can use it with accurate readings as per the requirement.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.13
- ✓ Use PPT, handouts, posters (parts of Vernier caliper), and short video clips (How to take vernier caliper reading).
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.13
- ✓ Let them solve the SAMPLE SELF CHECK 1.13
- ✓ Provide the web link <https://www.youtube.com/watch?v=fnp4HvDltUI> to learn how to read vernier calliper.
- ✓ provide the link <https://www.youtube.com/watch?v=4hINi0jdoeQ> to watch the video on how to use Vernier caliper.

D. Assessment:

- ✓ Assess the learner's ability perform the OPERATION SHEET 1.13 as per the rubrics.
- ✓ Conduct the class test.
- ✓ Assess the answers of SAMPLE SELF CHECK 1.11 submitted online.

- ✓ Upload the questions through any social media platforms and assess their understanding.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, posters (parts of Vernier caliper), and short video clips (How to take vernier caliper reading).
- ✓ <https://www.youtube.com/watch?v=fnp4HvDltUI> (How to read Vernier calliper)
- ✓ <https://www.youtube.com/watch?v=4hINiOjdoeQ> (How to use Vernier calliper)

A. Competency/Competencies:

- Use micrometer accurately whenever applicable.

B. Learning objectives/Topic:

Learning objectives	Topic
1.14.1 Define Micrometer. 1.14.2 State the function of micrometer. 1.14.3 Label the parts of micrometer. 1.14.4 Explain the reading of micrometer. 1.14.5 Define and state the uses of: <ul style="list-style-type: none"> • Main scale (sleeve scale) • Thimble scale 1.14.6 Write the difference between Micrometer, Dial gauge and Vernier calliper. 1.14.7 Explain the unit conversion. <i>Note: Ensure appropriate handling of the Micrometer.</i>	1.14 Using micrometer Overview: All the related information on micrometer are covered and the learners can use it for the accurate measurements of any object when applicable.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.14
- ✓ Use PPT, handouts, and posters (parts of micrometer).
- ✓ Demonstrate and let the learners perform OPERATION SHEET 1.14
- ✓ Let them solve the SAMPLE SELF CHECK 1.14
- ✓ Provide the link <https://www.mscdirect.com/basicsof/outside-micrometers> that shows explanation on how to take a reading of micrometer.
- ✓ provide the web link <https://www.youtube.com/watch?v=vl-51zYDg10> to watch the video on how to read metric micrometer.

D. Assessment:

- ✓ Assess the learner's ability to perform OPERATION SHEET 1.14 as per the rubrics.
- ✓ Conduct the class test.
- ✓ Assess the answers of SAMPLE SELF CHECK 1.14 submitted online.

- ✓ Upload videos and handouts through Google Classroom and assess their understanding.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, posters (arc welding set up), and short video clips (How to perform arc welding), and case study.
- ✓ <https://www.youtube.com/watch?v=vl-51zYDg10> and <https://www.mscdirect.com/basicsof/outside-micrometers> (How to take readings of micrometer)

Chapter 2: Replacing faulty rigid suspension components

A. Competency/Competencies:

- i. Determine the defects and replace the shock absorber with bushes for any type of vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
2.1.1 Define suspension system. 2.1.2 State the function of the suspension system. 2.1.3 Explain the operation of the suspension system. 2.1.4 State the types of the suspension system. 2.1.5 List the components of the suspension system. 2.1.6 State the functions of shock absorber. 2.1.7 Classify the types of shock absorbers. 2.1.8 Illustrate the construction of the shock absorber. 2.1.9 Explain the operation of the shock absorber. 2.1.10 Replace shock absorber Note: <ul style="list-style-type: none"> ✓ <i>Ensure the vehicle is parked safely.</i> ✓ <i>Ensure to place the safety stands on the designated area.</i> ✓ <i>Ensure to secure nuts and bolts of the shock absorber.</i> ✓ <i>Ensure to handle tools and equipment properly.</i> 	2.1 Replacing a shock absorber Overview: The learners can identify the defects and change the shock absorber with bushes after learning about the types, functions, operations, and components of the suspension system.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 2.1
- ✓ Read, demonstrate and let the learners perform OPERATION SHEET 2.1
- ✓ Let them solve the SAMPLE SELF CHECK 2.1
- ✓ Use/provide PPT, handouts, posters, short video clips, Demo++ performance guide, and demonstration.
- ✓ Provide the link <https://connect2local.com/l/272277/c/329162/the-difference-between-independent---rigid-axle-suspension-systems> which shows the difference between independent and rigid axle suspension systems.
- ✓ Provide the link <https://clubtechnical.com/shock-absorber> that explains the function, working principle, and the types of the shock absorber.

D. Assessment:

- ✓ Conduct the class test to assess their understanding.

- ✓ Assess the learners' report on particular practical OPERATION SHEET 2.1 according to the rubrics developed.
- ✓ Assess the learners' ability to identify the type of suspension systems, components, and shock absorbers.
- ✓ Assess the learners' ability to change the shock absorber and its bushes.
- ✓ Assess the answers of SAMPLE SELF CHECK 2.1 through Google Classroom and any other possible social media platforms.
- ✓ Let the learners write notes based on the learning resources provided to them and assess the notes according to the rubrics developed.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, short video clips, and DEMO++ performance guide.
- ✓ <https://connect2local.com/l/272277/c/329162/the-difference-between-independent-rigid-axle-suspension-systems> (difference between independent and rigid axle suspension system).
- ✓ <https://clubtechnical.com/shock-absorber> (Explanation on function, working principle, and types of shock absorber).

A. Competency/Competencies:

- i. Determine the defects and replace the leaf spring in any type of vehicle and improve the vehicle's performance as per the standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
2.2.1 Explain the types of leaf spring. 2.2.2 State the functions of leaf spring. 2.2.3 Explain the operation of leaf spring. 2.2.4 Define and state the function of torque wrench. 2.2.5 Explain the types of torque wrench. 2.2.6 Explain the torque conversion factor. 2.2.7 Replace leaf spring assembly Note: <ul style="list-style-type: none"> ✓ <i>Ensure vehicle is parked safely.</i> ✓ <i>Ensure all tools and equipment are handled properly.</i> ✓ <i>Ensure that chassis and axle is supported by safety stand.</i> 	2.2 Replacing leaf spring assembly Overview: Besides the types, functions, and operation of the leaf spring assembly, the learners can use the torque wrench and replace the leaf spring assembly.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 2.2 using PPT and posters.
- ✓ Read, demonstrate and let them perform SKILL SHEET 2.2
- ✓ Demonstrate and let them perform SKILL SHEET 2.2
- ✓ Demonstrate and let the learners perform OPERATION SHEET 2.2 using the DEMO++ performance guide.
- ✓ Provide handouts and a DEMO++ performance guide.
- ✓ Provide the link <https://www.youtube.com/watch?v=5TjN0FigCzo> that explains the operation of leaf spring.
- ✓ Provide the web link <https://www.youtube.com/watch?v=AuzF1bGsYkc> that shows the types of torque wrench.
- ✓ Provide the link https://www.youtube.com/watch?v=Nk_KSRCSokc that shows how to use a click adjustable torque wrench.

D. Assessment:

- ✓ Conduct the class test.
- ✓ Asses the notes and assignments maintained by the learners as per the rubrics.
- ✓ Let the learners answer the SAMPLE SELF CHECK 2.2
- ✓ Let them write and submit the notes based on the learning resources.
- ✓ Assess the answers of SAMPLE SELF CHECK 2.2 and the questions given to them through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, and PPT.
- ✓ <https://www.youtube.com/watch?v=5TjN0FigCzo> (Operation of leaf spring).
- ✓ <https://www.youtube.com/watch?v=AuzF1bGsYkc> (Types of torque wrench).
- ✓ https://www.youtube.com/watch?v=Nk_KSRCSokc (How to use click adjustable torque wrench).

A. Competency/Competencies:

- i. Determine the defects of leaf spring in any vehicle and disassemble the leaf spring as per the standard procedure.

B. Learning objectives/Topic:

Learning objectives	Topic
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2.3.1. List the spring defects. 2.3.2. Describe the materials of spring. 2.3.3. Identify the components of leaf spring and its functions. 2.3.4. Disassemble leaf spring assembly Note: ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure proper usage of the right tools to pry up the clamp.</i>	2.3 Disassembling leaf spring assembly Overview: The components of leaf spring assembly with its function can be learned and the learners can disassemble and eliminate the defects of the leaf spring assembly.
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C. Learning Experiences:

- ✓ Explain the INFORMATION SHEET 2.3
- ✓ Demonstrate and let the learners perform OPERATION SHEET 2.3
- ✓ Let them solve SAMPLE SELF CHECK 2.3
- ✓ Give handouts, short video clips, and the DEMO++ performance guide.
- ✓ Give a link <https://www.truckspring.com/what-causes-leaf-spring-failure.aspx> that explains the causes of leaf spring defects.
- ✓ Provide a weblink <https://www.youtube.com/watch?v=iXLxWYOjgdg> that shows the procedure to dismantle leaf spring assembly.

D. Assessment:

- ✓ Let the learners do the presentation and asses as per the rubrics developed.
- ✓ Assess the learners' notes, assignments, etc frequently.
- ✓ Assess the ability of learners to determine the defects of leaf spring and disassemble it as per the required standard procedures.
- ✓ Let them solve and submit answers of SAMPLE SELF CHECK 2.3 through Google Classroom or any other social media platforms.
- ✓ Let the learners write and submit succinct notes through Google Classroom or any other possible social media platforms, based on their understanding after watching the videos, going through the handouts, and CBLM.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, PPT, and short video clips.
- ✓ <https://www.truckspring.com/what-causes-leaf-spring-failure.aspx> (causes of leaf spring failure).
- ✓ <https://www.youtube.com/watch?v=iXLxWYOjgdg> (procedure to dismantle leaf spring assembly).

A. Competency/Competencies:

- i. Disassemble and assemble any type of leaf spring as per the standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
2.4.1 Explain the importance of spring alignment. 2.4.2 Define pneumatic impact gun. 2.4.3 State the function of pneumatic impact gun. 2.4.4 List the external components of pneumatic gun. 2.4.5 Assemble leaf spring assembly Note: <ul style="list-style-type: none">✓ <i>Ensure appropriate use of PPE.</i>✓ <i>Ensure leaf spring assembly is clamped on the vice securely.</i>	2.4 Assembling leaf spring assembly Overview: Besides the definition and function of a pneumatic impact gun, the learners can assemble the leaf spring assembly using a pneumatic impact gun.

C. Learning Experiences:

- ✓ Explain INFORMATION SHEET 2.4
- ✓ Demonstrate SKILL SHEET 2.4
- ✓ Demonstrate and let the learners perform OPERATION SHEET 2.4
- ✓ Use handouts, PPT, DEMO ++ performance guide, and demonstration.
- ✓ Provide short video clips, handouts, pictures, PPT, DEMO++ performance guide, and case study.
- ✓ Provide a link https://www.youtube.com/watch?v=kQu2ipjom_Q that explains how and when to use a pneumatic impact wrench.

D. Assessment:

- ✓ Let the learners solve the SAMPLE SELF CHECK 2.4
- ✓ Give questions or let them write a short note as homework after every session.
- ✓ Check the learner note that has been jot down while teaching frequently.
- ✓ Assess their ability to perform OPERATION SHEET 2.4 as per the rubrics developed.
- ✓ Asses the report on OPERATION SHEET 2.4 written in their practical book.
- ✓ Share the web link https://www.youtube.com/watch?v=kQu2ipjom_Q to learn how to use a pneumatic impact wrench.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts PPT.
- ✓ https://www.youtube.com/watch?v=kQu2ipjom_Q (use of pneumatic impact wrench).

A. Competency/Competencies:

- i. Identify and replace any type of leaf spring bushes in any type of vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
2.5.1 Explain the function of spring bush. 2.5.1 State the types of bushes. 2.5.1 Change leaf spring bush Note: <ul style="list-style-type: none">✓ <i>Ensure appropriate use of PPE.</i>✓ <i>Ensure proper disposal of used bushes.</i>✓ <i>Ensure to follow the cross pattern for loosening and tightening U-bolt.</i>	2.5 Changing leaf spring bush Overview: The learners can change the leaf spring bush after learning about the functions and types of bushes.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 2.5
- ✓ Read, demonstrate and let them perform JOB SHEET 2.5
- ✓ Demonstrate and let the learners perform OPERATION SHEET 2.5
- ✓ Let them solve SAMPLE SELF CHECK 2.5
- ✓ Use handouts, CBLM, pictures, PPT, DEMO++ performance guide, and demonstration.
- ✓ Provide short video clips, DEMO++ performance guide, and handouts.

D. Assessment:

- ✓ Assess their understanding of the lesson through the notes, class test, and question/answer session.
- ✓ Assess the learners' ability to perform OPERATION SHEET 2.5 using observation checklist and rubrics as per the standard procedures.
- ✓ Asses the report written in their practical notebook after performing OPERATION SHEET 2.5
- ✓ Give additional questions to SAMPLE SELF CHECK 2.5, assignments, and assess the answers submitted through Google Classroom using rubrics.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, and short video clips.

Chapter 3: Replacing faulty independent suspension component

A. Competency/Competencies:

- i. Identify the defects and replace any type of independent suspension system and defective strut in any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
3.1.1 Define independent suspension system 3.1.2 State function of the strut assembly. 3.1.3 List the types of the independent suspension system. 3.1.4 Explain the construction of strut assembly. 3.1.5 Explain the operation of strut assembly. 3.1.6 Replace strut assembly Note: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure brake lines are secured.</i> ✓ <i>Ensure to tightened the wheel nut with the specified torque.</i> 	3.1 Replacing strut assembly Overview: The types and functions of the independent suspension systems as well as the construction and operation of the strut assembly are covered under this topic that enable the learners to identify and replace the strut assembly.

C. Learning Experiences:

- ✓ Read the INFORMATION SHEET 3.1
- ✓ Demonstrate and let the learners perform OPERATION SHEET 3.1
- ✓ Let them solve SAMPLE SELF CHECK 3.1
- ✓ Use handouts, CBLM, DEMO++ performance guide, demonstration, and PPT.
- ✓ Provide handouts, DEMO++ performance guide, and short video clips.
- ✓ Provide the web link <https://connect2local.com/l/272277/c/329162/the-difference-between-independent---rigid-axle-suspension-systems> that shows the difference between rigid and independent suspension systems.
- ✓ The link <https://cartreatments.com/pros-and-cons-of-macpherson-vs-double-wishbone-suspension/> shows the pros and cons of MacPherson strut assembly and double wishbone type.
- ✓ This link <https://www.youtube.com/watch?v=F9m5okh8NVU> shows how the struts and shocks work.

D. Assessment:

- ✓ Conduct class tests, presentations, group works, and question/ answer sessions.
- ✓ Give additional questions on SAMPLE SELF CHECK 3.1 and assess their answers.
- ✓ Develop rubrics and assess the learners' practical reports and notes frequently.
- ✓ Assess the learners' ability to identify the type of independent suspension system used and to perform the OPERATION SHEET 3.1.

- ✓ Conduct an online quiz.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, short video clips, and DEMO++ performance guide.
- ✓ <https://connect2local.com/l/272277/c/329162/the-difference-between-independent---rigid-axle-suspension-systems> (Difference between rigid and independent suspension system).
- ✓ <https://cartreatments.com/pros-and-cons-of-macpherson-vs-double-wishbone-suspension/> (Pros and cons of MacPherson strut assembly and double wishbone type).
- ✓ <https://www.youtube.com/watch?v=F9m5okh8NVU> (How struts and shocks work).

A. Competency/Competencies:

- Identify the jacking position in any vehicle.
- Identify the defects and disassemble the strut assembly at any time in a sequential array as per the requirement.

B. Learning objectives/Topic:

Learning objectives	Topic
3.2.1 Explain the components of an independent suspension system. 3.2.2 State the function of jack. 3.2.3 List types of Jacks. 3.2.4 Locate jacking position. 3.2.5 Use a screw jack. 3.2.6 Disassemble strut and coil spring Note: <ul style="list-style-type: none"> ✓ Ensure proper gripping of strut assembly in the bench vice. ✓ Ensure the hooks of the spring compressors are place properly. 	3.2 Disassembling strut and coil spring Overview: The learners can identify and disassemble the strut and coil spring after going through the components of independent suspension system.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 3.2
- ✓ Read, demonstrate and let the learners perform SKILL SHEET 3.2
- ✓ Demonstrate and let them perform OPERATION SHEET 3.2
- ✓ Use PPT, handouts, DEMO ++ performance guide, group discussion, posters (components of strut assembly), and demonstration.

D. Assessment:

- ✓ Conduct class tests and develop rubrics to rate every learner's presentation, notes written in their book, practical reports, etc.
- ✓ Assess the learners' ability to determine the defects of strut assembly and perform the OPERATION SHEET 3.2.
- ✓ Let them solve the SAMPLE SELF CHECK 3.2 and assess their answers accordingly.
- ✓ Share different learning materials and let the learners make a brief note and submit it through Google Classroom or any other possible social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, DEMO ++ performance guide, group discussion, posters (components of strut assembly), and demonstration.

A. Competency/Competencies:

- i. Disassemble/assemble the strut components and are installed in sequential order in any vehicle as per standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
3.3.1 State the importance of coil spring positioning. 3.3.2 Assemble strut and coil spring Note: <ul style="list-style-type: none"> ✓ Use coil spring compressor. ✓ Ensure to hold the piston rod safety while tightening the lock nut. ✓ Ensure to install the spring in a correct position. ✓ Endure to hock coil spring compressor correctly. ✓ Ensure to tighten each coil spring compressor hook evenly. 	3.3 Assembling strut and coil spring Overview: The importance of coil spring positioning is covered in this topic along with the techniques to assemble the strut assembly.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 3.3
- ✓ Demonstrate the SKILL SHEET 3.3
- ✓ Demonstrate and let the learners perform OPERATION SHEET 3.3
- ✓ Share PPT, pictures, DEMO++ performance guide, short video clips which demonstrate the OPERATION SHEET 3.3 as well as SKILL SHEET 3.3.
- ✓ Provide the link <https://www.youtube.com/watch?v=znhC17YH4YY> that shows how to use a coil spring compressor.

D. Assessment:

- ✓ Conduct class tests, question & answer sessions, and review every session to assess the learners' understanding.
- ✓ Develop rubrics to assess the assignment and questions given to the learners.
- ✓ Assess the learners' ability to perform OPERATION SHEET 3.3 as per practical checklist and rubrics.
- ✓ Let the learners write a note and solve the SAMPLE SELF CHECK 3.3 with additional questions given from the learning materials provided to them and assess their answers using rubrics.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, and DEMO++ performance guide.
- ✓ <https://www.youtube.com/watch?v=znhC17YH4YY> (How to use coil spring compressor).

A. Competency/Competencies:

- i. Install the coil spring as per the standard procedures in any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>3.4.1 State function of coil spring.</p> <p>3.4.2 List the characteristics of coil spring.</p> <p>3.4.3 Explain the operation of coil spring.</p> <p>3.4.4 Replace coil spring</p> <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure appropriate use of PPE.</i>✓ <i>Ensure to place the jack and safety stand in correct position.</i>	<p>3.4 Replacing coil spring</p> <p>Overview: The functions, characteristics, and operation of coil spring is covered under this topic which can assist the learners to replace the coil spring.</p>

C. Learning Experiences:

- ✓ Explain the INFORMATION SHEET 3.4 with the help of handouts, CBLM, pictures (coil spring), PPT, and group discussion.
- ✓ Read, demonstrate and let the learners perform OPERATION SHEET 3.4 by using the DEMO++ performance guide.
- ✓ Let them solve SAMPLE SELF CHECK 3.4
- ✓ Provide the link https://www.testingautos.com/car_care/when-replace-coil-springs.html to learn about when to replace coil spring.

D. Assessment:

- ✓ Check the notes and practical reports frequently after winding up the INFORMATION SHEET 3.4 and OPERATION SHEET 3.4.

- ✓ Develop and assess the learners' understanding by conducting the class test, group presentation, and quiz among themselves.
- ✓ Give and let the learners solve the questions as well as SAMPLE SELF CHECK 3.4 from CBLM and submit through google classroom.
- ✓ Give the web link <https://www.tirereview.com/the-role-of-springs-in-suspension-systems/> to understand more about the role of springs in the suspension system.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, PPT slides, and DEMO++ performance guide.
- ✓ https://www.testingautos.com/car_care/when-replace-coil-springs.html (When to replace coil spring).
- ✓ <https://www.tirereview.com/the-role-of-springs-in-suspension-systems/> (Role of springs in suspension system).

A. Competency/Competencies:

- Replace the strut bar with strut rod bushing of any vehicle without damaging other components as per the standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
3.5.1 Describe strut bar. 3.5.2 State the function of strut bar. 3.5.3 Replace strut bar Note: <ul style="list-style-type: none"> ✓ <i>Ensure to wedge wheels.</i> ✓ <i>Ensure to give specified torque to strut bar nut.</i> 	3.5 Replacing strut bar Overview: The learners can identify and replace the strut bar after going through the descriptions on the strut bar along with its function.

C. Learning Experiences:

- ✓ Read and explain INFORMATION SHEET 3.5
- ✓ Demonstrate and let the learners perform OPERATION SHEET 3.5
- ✓ Let the learners solve the SAMPLE SELF CHECK 3.5
- ✓ Use handouts, pictures (strut bar), PPT, quiz, and DEMO++ performance guide.
- ✓ Provide handouts, pictures, PPT slides, case study, and DEMO++ performance guide.
- ✓ Provide the link <https://www.youtube.com/watch?v=Y5hBVmDRpRQ> that shows how to inspect strut rod bushing & <https://www.youtube.com/watch?v=DbzloWkXR5s> the consequences of worn-out strut rod bushing.

D. Assessment:

- ✓ Assess the learners' ability through class tests, notes, assignments, and responses in the classroom.
- ✓ Let the learners solve the SAMPLE SELF CHECK 3.5
- ✓ Assess the learners' ability to determine the faults and perform the OPERATION SHEET 3.5
- ✓ Conduct an online quiz.
- ✓ Let them solve the questions on the case study and submit them through Google Classroom.

E. Resources:

- ✓ Competency-Based Learning Materials
- ✓ Handouts, case study, DEMO++ performance guide, and short video clips.
- ✓ <https://www.youtube.com/watch?v=Y5hBVmDRpRQ> (Inspection of strut rod bushing).
- ✓ <https://www.youtube.com/watch?v=DbzloWkXR5s> (Consequences of worn-out strut rod bushing).

A. Competency/Competencies:

- i. Replace the suspension arms without damaging other parts as per the standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
3.6.1 State the functions of the suspension arm. 3.6.2 Explain the types of the suspension arm. 3.6.3 Explain the operation of the suspension arm. 3.6.4 Replace suspension arm Note: <ul style="list-style-type: none"> ✓ Ensure appropriate use of PPE. ✓ Ensure to wedge the wheels. 	3.6 Replacing suspension arm Overview: This topic is about the types, functions, and operation of the suspension arms and the learners can identify the types of arms and replace them.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 3.6 using PPT, handouts, pictures (types of suspension arm), and short video clips (How the suspension arm works).
- ✓ Demonstrate using DEMO ++ performance guide and let the learners perform OPERATION SHEET 3.6
- ✓ Let them solve SAMPLE SELF CHECK 3.6
- ✓ Visit nearby TTIS and invite guest lecturers frequently.
- ✓ Let the learners do group presentations, quizzes, brainstorming, and demonstration.

- ✓ Provide a link <https://www.youtube.com/watch?v=sXkMu6PdiCM> that explains the difference between the control arm and the trailing arm.

D. Assessment:

- ✓ Develop rubrics to assess the learners' understanding by conducting class tests, giving assignments, questions and letting them do the presentations.
- ✓ Assess the learners' ability to perform OPERATION SHEET 3.6 using a practical checklist and rubrics.
- ✓ And also check their practical reports frequently.
- ✓ Conduct online quizzes, give assignments such as questions, SAMPLE SELF CHECK 3.6, case study, and let the learners submit through the google classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, pictures (types of suspension arm) and short video clips (How suspension arm works), and DEMO ++ performance guide through google classroom.
- ✓ <https://www.youtube.com/watch?v=sXkMu6PdiCM> (difference between the control arm and the trailing arm).

A. Competency/Competencies:

- Align the torsion bar and is adjust to the match mark as per the standard practices in any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
3.7.1 Define torsion bar. 3.7.2 State the function of the torsion bar. 3.7.3 Explain the characteristics of the torsion bar. 3.7.4 Explain the operation of the torsion bar. 3.7.4 Replace torsion bar Note: <ul style="list-style-type: none"> ✓ Ensure appropriate use of PPE. ✓ Ensure to wedge the wheels. ✓ Ensure to place the jack and safety standing correct position. 	3.7 Replacing torsion bar Overview: Besides the function, characteristics, and operation of the torsion bar, the learners can replace the torsion bar according to the procedures.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 3.7 using PPT, pictures, short video clips, providing handouts, and giving group work.
- ✓ Demonstrate and let the learners perform OPERATION SHEET 3.7 with the help of the DEMO++ performance guide and let them practice in a group and individually several times.
- ✓ Let the learners solve the SAMPLE SELF CHECK 3.7
- ✓ Take learners to nearby TTI (samthang) and let them perform their practical in TTI with the help of TTI instructors.
- ✓ Let the learners explore the link <https://www.youtube.com/watch?v=huWNurDnGB8&t=52s> which explains the working of the torsion bar.
- ✓ Share the link to know the advantages and disadvantages of the torsion bar https://en.wikipedia.org/wiki/Torsion_bar_suspension.
- ✓ <https://www.roughtrax4x4.com/blog/coil-leaf-torsion-bar-suspension/> share these links with learners to learn the difference between torsion bar, coil spring, and leaf spring.

D. Assessment:

- ✓ Conduct class tests, group presentations, quizzes, etc
- ✓ Assess the learners' ability to perform OPERATION SHEET 3.7 based on practical checklist and rubrics.
- ✓ Conduct online quiz, give assignments such as questions, SAMPLE SELF CHECK 3.7, and case study and let the learners submit through Google Classroom.
- ✓ Let them develop notes after receiving every learning material and submit them through Google Classroom.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, short video clips, DEMO++ performance guide, and CBLM.
- ✓ <https://www.youtube.com/watch?v=huWNurDnGB8&t=52s> (Working of torsion bar).
- ✓ https://en.wikipedia.org/wiki/Torsion_bar_suspension (Advantages and disadvantages of torsion bar).
- ✓ <https://www.roughtrax4x4.com/blog/coil-leaf-torsion-bar-suspension/> (difference between torsion bar, coil spring, and leaf spring).

A. Competency/Competencies:

- i. Replace the lateral control rod with specific torque as per the standard procedures in any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
3.8.1 Define lateral control rod. 3.8.2 State the function of the lateral control rod. 3.8.3 Explain the operation of the lateral control rod. 3.8.3 Replace lateral control rod Note: <ul style="list-style-type: none"> ✓ <i>Ensure to wedge the wheels.</i> ✓ <i>Ensure the jack saddle is placed in the correct position.</i> ✓ <i>Ensure appropriate use of PPE.</i> 	3.8 Replacing lateral control rod Overview: The learners can identify and replace the lateral control rod after going through all the information given on this topic.

C. Learning Experiences:

- ✓ Explain the INFORMATION SHEET 3.8
- ✓ Demonstrate and let the learners perform OPERATION SHEET 3.8
- ✓ Let them solve the SAMPLE SELF CHECK 3.8
- ✓ Use PPT, handouts, DEMO ++ performance guide, group discussion, and demonstration.

D. Assessment:

- ✓ Let the learners solve the SAMPLE SELF CHECK 3.8, notes, etc to assess their understanding.
- ✓ Check the learner note that has been jot down while teaching frequently.
- ✓ Assess their ability to perform OPERATION SHEET 3.8 and the report written in their practical book as per the rubrics developed.
- ✓ Let the learners write and submit a succinct note through Google Classroom. or any other possible social media platforms, based on their understanding after watching the videos, going through the handouts, and CBLM.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ PPT, handouts, and DEMO ++ performance guide.

A. Competency/Competencies:

- i. Replace the stabilizer bar and bushes with specific torque applied as per the standard procedures in any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
3.9.1 Define stabilizer bar. 3.9.2 State the function of the stabilizer bar. 3.9.3 Explain the construction of the stabilizer bar. 3.9.3 Explain the construction of the stabilizer link bar. 3.9.4 Replace stabilizer bar Note: <ul style="list-style-type: none">✓ <i>Ensure to park the vehicle safely.</i>✓ <i>Ensure appropriate use of PPE.</i>	3.9 Replacing stabilizer bar Overview: This topic includes the functions and construction of the stabilizer bar and the learners can replace the stabilizer bar.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 3.9 by using PPT, handouts, short video clips.
- ✓ Demonstrate and let the learners perform OPERATION SHEET 3.9
- ✓ Let them solve SAMPLE SELF CHECK 3.9
- ✓ Let the learners do the presentation, group discussion, and brainstorming.
- ✓ Give handouts, short video clips, case studies, and a DEMO++ performance guide.
- ✓ <https://www.youtube.com/watch?v=nk8WVpRN1kg> share this link to learn more about the functions, location, or operations of the stabilizer bar.
- ✓ Provide a web link <https://www.youtube.com/watch?v=liGnV3PTiQ> to learn how the anti-roll bar works.
- ✓ https://www.youtube.com/watch?v=EwmDdMzzDjY&list=TLPQMDUwMzlwMjFeQmEvah_qdg&index=3 This link shows the difference between understeer and oversteer.

D. Assessment:

- ✓ Conduct the class test, presentation, group work, and assess using rubrics developed.
- ✓ Asses the notes and assignments maintained by the learners as per the rubrics developed.
- ✓ Let the learners answer the SAMPLE SELF CHECK 3.9.
- ✓ Conduct online quizzes, give assignments such as questions, SAMPLE SELF CHECK 3.9, case study and let the learners submit through the Google Classroom.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts, short video clips, and DEMO++ performance guide.

- ✓ <https://www.youtube.com/watch?v=nk8WVpRN1kg> and <https://www.youtube.com/watch?v= liGnV3PTiQ> (Functions, location or operations of stabilizer bar).
- ✓ <https://www.youtube.com/watch?v=EwmDdMzzDjY&list=TLPQMDUwMzlwMjFeQmEvahgdg&index=3> (Difference between understeer and oversteer).

Chapter 4: Diagnosing suspension system failures

A. Competency/Competencies:

- i. Determine the faulty components in any vehicle as per the standard procedure.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>4.1.1 List the methods of inspecting suspension system failure.</p> <p>4.1.2 Explain types of defects in the suspension system.</p> <p>4.1.3 Explain the inspection checklist.</p> <p>4.1.4 Perform a visual inspection of suspension failure</p> <p>Note:</p> <ul style="list-style-type: none">✓ Ensure to use appropriate PPE.✓ Ensure to park the vehicle safely.	<p>4.1 Performing visual inspection of suspension failure</p> <p>Overview: The learners can determine the defects in the suspension system through different methods of inspection according to the checklist.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 4.1 using PPT, CBLM, and pictures.
- ✓ Let the learners perform OPERATION SHEET 4.1 according to the inspection checklist after the demonstration.
- ✓ Let them solve SAMPLE SELF CHECK 4.1
- ✓ Provide handouts to the learners.
- ✓ Share the web link <https://www.youtube.com/watch?v=8MygUVxCnH0> guides how to perform a visual inspection.

D. Assessment:

- ✓ Assess the learner's conceptual understanding of methods of inspecting the suspension failure, let learners answer the SAMPLE SELF CHECK 4.1, and give additional questions using rubrics to provide necessary intervention.
- ✓ Assess the learners' ability to determine the faults of the suspension system and perform OPERATION SHEET 4.1 according to the inspection checklist using rubrics and checklist in any vehicle.
- ✓ Assess the learner's conceptual understanding by letting the learners answer the SAMPLE SELF CHECK 4.1 and let learners submit through Google Classroom. or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.

- ✓ Handouts and PPT slides.
- ✓ <https://www.youtube.com/watch?v=8MygUVxCnH0> (How to perform a visual inspection).

A. Competency/Competencies:

- i. Perform the bounce test as per the standard procedure in any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
4.2.1 Explain the methods of the bounce test. 4.2.2 Perform bounce test. Note: ✓ <i>Ensure the vehicle is parked on the level ground.</i>	4.2 Performing bounce test Overview: The methods of bounce test are explained in this topic and the learners can determine whether the shock absorber is damaged or not through the bounce test.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 4.2
- ✓ Demonstrate and let the learners perform OPERATION SHEET 4.2
- ✓ Let them solve SAMPLE SELF CHECK 4.2
- ✓ Group presentation, pictures (bounce test), PPT, and DEMO++ performance guide.
- ✓ Provide DEMO++ performance guide and handouts.
- ✓ <https://www.youtube.com/watch?v=m8i-zyDEMCE> share this link to let the learners know how to perform bounce tests.

D. Assessment:

- ✓ Conduct the class test to assess their understanding.
- ✓ Assess the learners' report on particular practical OPERATION SHEET 4.2 according to the rubrics developed.
- ✓ Assess the learners' ability to determine the faults of the shock absorber and change the shock absorber in any vehicle.
- ✓ Assess the given question and answers submitted through Google Classroom., WeChat, etc.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ DEMO++ performance guide, pictures (bounce test), and handouts.
- ✓ <https://www.youtube.com/watch?v=m8i-zyDEMCE> (How to perform bounce test).

A. Competency/Competencies:

- i. Suspension failure symptoms are identified through the test drive and recommendation is provided as per the job requirement.

B. Learning objectives/Topic:

Learning objectives	Topic
4.3.1 Explain the symptoms, causes, and remedies of suspension system failure. 4.3.2 Perform test drive. Note: <ul style="list-style-type: none">✓ <i>Ensure to fasten the seat belt while driving.</i>✓ <i>Ensure to follow traffic signs and road hazards.</i>	4.3 Performing test drive Overview: Symptoms, causes, and the remedies of suspension system failures are covered under this topic and the learners can to identify the symptoms through a test drive.

C. Learning Experiences:

- ✓ Explain the INFORMATION SHEET 4.3 using PPT, CBLM, handouts.
- ✓ Let the learners perform OPERATION SHEET 4.3 after the demonstration.
- ✓ Let them solve SAMPLE SELF CHECK 4.3
- ✓ Upload handout and inspection checklist.

D. Assessment:

- ✓ Let the learners solve and upload the SAMPLE SELF CHECK 4.3 with a few additional questions
- ✓ Assess the learners' ability to identify the Suspension failure symptoms and remedies.
- ✓ Conduct class tests and question & answer sessions.
- ✓ Give a case study and submit the answer through any possible social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handouts and inspection checklist.

MODULE I: INTERPRETING ENGINEERING DRAWING

Chapter: 1 Draw basic signs, symbols and dimension

A. Competency/Competencies:

- i. Carry out basic engineering drawings as per the requirement.
- ii. Ensure proper handling of drawing instruments.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.1.1 Define engineering drawing.</p> <p>1.1.2 State the purposes of engineering drawing.</p> <p>1.1.3 List the types of drawing instruments.</p> <p>1.1.4 State uses of drawing instruments.</p> <p>1.1.5 List types and sizes of drawing papers.</p> <p>1.1.6 Use drawing instruments</p> <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure clean and neatness of drawing.</i>✓ <i>Ensure proper handling of drawing instruments.</i>	<p>1.1 Using drawing instruments</p> <p>Overview: The learners can use appropriate drawing instruments to carry out engineering drawings.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.1.
- ✓ Read, explain and demonstrate the OPERATION SHEET 1.1
- ✓ Let them solve SAMPLE SELF CHECK 1.1.
- ✓ Exhibit the real instruments to the learners which are required for the drawing.
- ✓ The web link <https://youtu.be/0Q6QwvtjVm8> OR https://youtu.be/kLe_brmh774 can be shared with the learners.
- ✓ The weblink <https://youtu.be/0Q6QwvtjVm8> or https://youtu.be/kLe_brmh774 can be shared with the learners.

D. Assessment:

- ✓ Assess the learner's conceptual understanding of different types of drawing instruments and their function, let learners answer the SAMPLE SELF CHECK 1.1, and give additional questions. Based on the assessment, provide necessary intervention.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handout
- ✓ <https://youtu.be/0Q6QwvtjVm8> and https://youtu.be/kLe_brmh774 (Explain the types of drawing instrument and their uses)

A. Competency/Competencies:

- i. Layout the drawing sheet as per the requirement.

B. Learning objectives/Topic:

Learning Objectives	Core Concepts(Chapters/topic)
<p>1.2.1 Define layout.</p> <p>1.2.2 List terminology used for layouts.</p> <p>1.2.3 Define title block.</p> <p>1.2.4 Explain the purpose of the title block.</p> <p>1.2.5 Layout drawing sheet</p> <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure clean and neatness of drawing.</i>✓ <i>Ensure Proper handling of drawing instruments.</i>	<p>1.2 Laying out drawing sheet</p> <p>Overview: The learners can layout the drawing sheet after going through the dimensions.</p>

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.2
- ✓ Demonstrate how to layout the drawing sheet according to OPERATION SHEET 1.2 and let the learners practice.
- ✓ Let the learners solve SAMPLE SELF CHECK 1.2
- ✓ The weblink <https://youtu.be/FzMPAiW8O-s> can be shared with the learners.
- ✓ Provide handouts to learners through Google Classroom or any other social media platforms.
- ✓ The weblink <https://youtu.be/FzMPAiW8O-s> can be shared.
- ✓ An instructor makes a video of the layout of the drawing sheet and uploads it to google classroom or any other social media platform.

D. Assessment:

- ✓ Let learners design the layout of the drawing sheet referring to OPERATION SHEET 1.2.
- ✓ Assess the learner's conceptual understanding by letting the learners answer the SAMPLE SELF CHECK 1.2.
- ✓ Let learners perform OPERATION SHEET 1.2 and submit or upload the layout sheet through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ Handout
- ✓ <https://youtu.be/FzMPAiW8O-s> (Explains the layout of drawing sheet).

A. Competency/Competencies::

- i. Interpret the signs and symbols as per the requirement.

B. Learning objectives/Topic:

Learning objectives	Core concepts(Chapters/Topic)
<ul style="list-style-type: none">1.3.1 Define sign and symbol1.3.2 Define abbreviation1.3.3 List the abbreviation used in dimensioning1.3.4 List the abbreviation used in drawing1.3.5 List the abbreviation used for the units of length1.3.6 <i>Interpreting engineering signs, symbols, and abbreviations.</i> <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure clean and neatness of drawing</i>✓ <i>Ensure Proper handling of drawing instruments</i>	<p>1.3 Interpreting engineering signs, symbols and abbreviations</p> <p>Overview: The learners can interpret engineering signs, symbols, and abbreviations while drawing.</p>

C. Pedagogy/learning experience

An instructor may carry out the instructional practice on interpreting Engineering Signs, symbols, and abbreviations in the following order.

- ✓ Let the learners read the INFORMATION SHEET 1.3
- ✓ Let the learners go through the OPERATION SHEET 1.3 and draw the signs and symbols.
- ✓ Let the learners solve the SAMPLE SELF CHECK 1.3.
- ✓ The weblink <https://youtu.be/MfNoq0y1LLY> can be shared with the learners.

D. Assessment:

- ✓ Make learners perform OPERATION SHEET 1.3
- ✓ Make learners solve the SAMPLE SELF CHECK 1.3
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.3 from CBLM and send answers through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Material for Class IX
- ✓ <https://youtu.be/MfNoq0y1LLY> (Explains the engineering signs and symbols)

A. Competency/Competencies:

- i. Draw different types of lines as per the applications.

B. Learning objectives/Topic:

Learning objectives	Core concepts(Chapters/Topic)
1.4.1 Define line. 1.4.2 State types of line and their applications. 1.4.3 Draw different types of lines Note: <ul style="list-style-type: none">✓ <i>Ensure clean and neatness of drawing.</i>✓ <i>Ensure Proper handling of drawing instruments.</i>	1.4 Drawing different types of lines Overview: The learners can identify different types of lines and use them appropriately while drawing.

C. Learning Experiences:

- ✓ Read and explain the INFORMATION SHEET 1.4
- ✓ Explain and demonstrate the OPERATION SHEET 1.4
- ✓ Let them solve the SAMPLE SELF CHECK 1.4
- ✓ An instructor may ask learners to watch the following videos:
 - <https://youtu.be/SaOoKpLBfYo>
 - <https://youtu.be/E6OXZ9OHpVk>
- ✓ Using the information from the videos, the learner develops a drawing containing all the lines.
- ✓ The learner takes note of the different types of lines and their application. Based on the information, the learner draws the symbols of different types of lines using a drawing instrument.

D. Assessment:

- ✓ Assess the notes and drawing containing different types of lines using a rubric or a checklist. Provide necessary intervention based on the assessment
- ✓ Assess the work uploaded in the Google Classroom to assess learners' understanding of different types of lines. Provide necessary intervention following the assessment.

E. Resources:

- ✓ Competency-Based Learning Materials
- ✓ <https://youtu.be/SaOoKpLBfYo> (Explains different types of lines)
- ✓ <https://youtu.be/E6OXZ9OHpVk> (Explain the application of lines with drawing)

A. Competency/Competencies::

- i. Draw letters and numbers as per the given scale.

B. Learning objectives/Topic:

Learning objectives	Core concepts(Chapters/Topics)
<ul style="list-style-type: none">1.5.1 Define lettering and numbering.1.5.2 Classify letters style.1.5.3 List the types of letters.1.5.4 Define freehand lettering.1.5.5 List the size of letters.1.5.6 State the rules for lettering and numbering.1.5.7 Draw letters and numbers <p>Note:</p> <ul style="list-style-type: none">✓ <i>Ensure clean and neatness of drawing.</i>✓ <i>Ensure Proper handling of drawing instruments.</i>	<p>1.5 Drawing letters and numbers</p> <p>Overview: The learners will know about the different letter styles, types, sizes and can use them to give directions and dimensions while drawing.</p>

C. Learning Experiences:

An instructor may carry out the instructional practice on lettering and numbering through the following order.

- ✓ Let the learners read INFORMATION SHEET 1.5
- ✓ Let the learners go through OPERATION SHEET 1.5 and let them draw the numbers and letters on a drawing sheet.
- ✓ The weblink <http://ednotebook.hostgator.co.in/basics-of-engineering-drawing> can be shared with the learners.
- ✓ The following web link can be shared with the learners or other learning resources (articles, online content, etc.) <http://ednotebook.hostgator.co.in/basics-of-engineering-drawing>, <https://youtu.be/onJlaSAkiEs>
- ✓ Based on the information obtained from the learning resources, the learner develops notes.

D. Assessment:

- ✓ Assess the learners drawing sheet used for drawing numbers and letters using OPERATION SHEET 1.5
- ✓ Let the learners solve the SAMPLE SELF CHECK 1.5
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Provide additional questions from CBLM and other resources-Google/YouTube and let learners submit answers through Google Classroom or any other social media platforms

E. Resources:

- ✓ Competency-Based Learning Material for Class IX

- ✓ <http://ednotebook.hostgator.co.in/basics-of-engineering-drawing> (Explains the techniques of lettering and numbering)
- ✓ <https://youtu.be/onJlaSAkiEs> (Describes the ways to write letters and numbers)

A. Competency/Competencies::

- i. Maintain dimensions as per the standard.

B. Learning objectives/Topic:

Learning objectives	Topic
1.6.1 Define dimension. 1.6.2 State the types of dimensioning. 1.6.3 Explain the system of dimensioning. 1.6.4 State the terminologies of dimensions. 1.6.5 Provide dimensions Note: <ul style="list-style-type: none"> ✓ <i>Ensure clean and neatness of drawing.</i> ✓ <i>Ensure Proper handling of drawing instruments.</i> 	1.6 Providing dimensions Overview: This topic is about the types and systems of dimensioning and the learners can use it while providing dimensions on the engineering drawing.

C. Learning experiences:

An instructor may carry out the instructional practice on lettering and numbering through the following order.

- ✓ Make the learners read INFORMATION SHEET 1.6
- ✓ Make the learners go through OPERATION SHEET 1.6
- ✓ Let the learners solve SAMPLE SELF CHECK 1.6
- ✓ The weblink <https://youtu.be/XS0lJsmY-qg> can be shared with the learners.
- ✓ The learner watches the video, explores the information, and develops notes.

D. Assessment:

- ✓ Assess learner's ability to identify types of dimensions and the learner's conceptual understanding of systems of dimensioning. Provide necessary intervention if needed.
- ✓ Provide the drawing and let the learners give the dimensions.
- ✓ Assess the learner's conceptual understanding of dimensioning by assessing the answers to questions of SAMPLE SELF CHECK 1.6 uploaded in the Google Classroom. Provide necessary intervention following the assessment.

E. Resources:

- ✓ Competency-Based Learning Material for Class IX
- ✓ <https://youtu.be/XS0lJsmY-qg> (explains the types of dimensioning and systems of dimensioning).

Class X

MODULE: II: SERVICING BRAKE SYSTEM

Chapter 1: Overhauling brake system

A. Competency/Competencies:

- i. Determine the faulty brake booster and brake booster operation is checked as per the standard procedure for all types of vehicles.

B. Learning objectives/Topic:

Learning objectives	Topic
1.1.1 Define brake system. 1.1.2 Explain the function of the brake system. 1.1.3 State the types of brake systems. 1.1.4 Explain the principle of the brake system. 1.1.5 Explain the components of the brake system. 1.1.6 State the function of the brake booster. 1.1.7 Explain the types of brake boosters. 1.1.8 Check operation of the brake booster. 1.1.9 Check the operation of the brake booster.	<p>1.1 Checking the operation of the brake booster.</p> <p>Overview: The function, types, and principles of a brake system are covered under this topic and the learners can check the operations of the brake booster.</p>

C. Learning Experiences:

- ✓ Let them read the INFORMATION SHEET 1.1
- ✓ Read, demonstrate and give the guided practice on the OPERATION SHEET 1.1
- ✓ Provide a short video clip on the operation of the brake booster.
- ✓ Provide the <https://carfromjapan.com/article/car-maintenance/brake-booster-works-braking-system/> (downloaded digital content, articles, etc.) that shows parts and functions of the brake booster.
- ✓ Provide the link <https://www.youtube.com/watch?v=82qBBJ8iwcc> to learned how hydraulic brake systems work.
- ✓ Used zoom session to teach students.

D. Assessment:

- ✓ Let them write notes from the INFORMATION SHEET 1.1 and assess notes regularly.
- ✓ Let them perform OPERATION SHEET 1.1 and assess according to checklist/rubric.
- ✓ Assess learner's information, comprehensiveness of practical, and ability to explain parts and functions of the brake system and brake booster as they perform the task using rubrics and checklist. Provide necessary intervention.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.1 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Conduct class tests, unit tests, and viva after completing the topic.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books, and handouts
- ✓ https://www.youtube.com/watch?v=l4Ka4_ws1E (how to brake booster and master cylinder works)
- ✓ <https://www.youtube.com/watch?v=82qBBJ8iwcc> (how hydraulic brake system work).
- ✓ <https://carfromjapan.com/article/car-maintenance/brake-booster-works-braking-system/> (shows parts and functions of brake booster).

A. Competency/Competencies:

- i. Install the brake booster components securely to improve braking effectiveness after changing brake booster for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.2.1 Illustrate the construction of the vacuum brake booster.</p> <p>1.2.2 Illustrate the construction of a hydraulic brake booster.</p> <p>1.2.3 Explain the operation of the brake booster.</p> <p>1.2.4 Change brake booster</p> <p>Notes:</p> <ul style="list-style-type: none">✓ <i>Ensure appropriate use of PPE.</i>✓ <i>Ensure to handle brake fluid safely.</i>	<p style="text-align: center;">1.2 Changing brake booster</p> <p>Overview: This topic is about the constructions and operations of the brake booster and the learners can determine the faulty brake boosters and change them.</p>

C. Learning Experiences:

- ✓ Let the learner read the INFORMATION SHEET 1.2
- ✓ Use PPT, handouts, and posters.
- ✓ Read, demonstrate and give the guided practice on the OPERATION SHEET 1.2 followed by individual practice.
- ✓ Based on the information from a link on Signs of Brake Booster is Bad or Failing Vacuum Leak (<https://www.youtube.com/watch?v=ZgzeMOKRY6A>) the learner develops a model (illustration), which includes animations, vocal narratives, or pop-up texts, etc., to explain parts and functions of the brake booster.
- ✓ Upload handouts & Demo++ PG through google classroom.
- ✓ Share the link <https://www.youtube.com/watch?v=IIHgURXfLE> with a learner to learn about how to brake booster and master cylinder work.
- ✓ Provide link <http://www.iitre.com/images/scripts/2015030319.pdf> to learn about the construction of vacuum brake booster.
- ✓ Used zoom session to teach students.

D. Assessment:

- ✓ Assess learner's information, comprehensiveness of practical, and ability to explain parts and functions of the brake system and brake booster as they perform the task using rubrics and checklist. Provide necessary intervention.
- ✓ Make learner read and perform OPERATION SHEET1.2
- ✓ Let's a learner solve SAMPLE SELF CHECK 1.2 and assess regularly.
- ✓ Assess the learner's notes and assignments frequently.
- ✓ Use a rubric to assess the learner's conceptual understanding of the parts and functions of a brake system and brake booster based on the vocal narratives and comprehensiveness of the demo++. Provide necessary intervention to the learners based on the learner's achievement derived using the rubric and submit through the social media platform.
- ✓ Give online quiz on the topic, question & answer session through zoom meeting.
- ✓ Let the learner write and submit notes through google classroom based on their understanding.

E. Resources:

- ✓ CBLM, reference books, and other TLM such as posters, PPT, etc.
- ✓ <https://www.youtube.com/watch?v=IIHgURXfLE> (How to brake booster and master cylinder work).
- ✓ <http://www.ijtre.com/images/scripts/2015030319.pdf> (Construction of vacuum brake booster)
- ✓ <https://www.youtube.com/watch?v=ZgzeMOKRY6A> (Signs of Brake Booster is Bad or Failing Vacuum Leak)

A. Competency/Competencies:

- i. Replace defective master cylinder kits as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.3.1 State the function of the master cylinder.</p> <p>1.3.2 Explain the types of master cylinders.</p> <p>1.3.3 Illustrate the construction of the master cylinder.</p> <p>1.3.4 Explain the operation of the master cylinder.</p> <p>1.3.5 Replace master cylinder kits</p> <p>Notes:</p> <ul style="list-style-type: none">✓ <i>Ensure to dispose of drained brake fluid in a safe container.</i>✓ <i>Ensure safe handling of brake fluid.</i>✓ <i>Ensure to use hand gloves and goggles.</i>	<p>1.3 Replacing master cylinder kits</p> <p>Overview: The functions, types, constructions, and operations of the master cylinder are included in this topic and the learners can replace the defective master cylinder kits.</p>

C. Learning Experiences:

- ✓ Let them read the INFORMATION SHEET 1.3
- ✓ Read, demonstrate and give the guided practice on OPERATION SHEET 1.3
- ✓ Provide a short video clip on the operation of master cylinder kits.
- ✓ Use PPT, handouts, and posters.
- ✓ Provide web link to learn about master cylinder working process
https://www.youtube.com/watch?v=l4Ka4_ws1E.
- ✓ Share the link <https://www.youtube.com/watch?v=82qBBJ8iwcc> through Google Classroom to learn how hydraulic brake systems work.
- ✓ Used zoom session to teach students.

D. Assessment:

- ✓ Ask learners to perform OPERATION SHEET 1.3 and assess according to the rubric.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.3 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Let learner read and write notes on INFORMATION SHEET 1.3, assess according to the rubric.
- ✓ Let learners solve questions on the case study and assess answers submitted in google classroom.

E. Resources:

- ✓ CBLM, reference books, and other TLM
- ✓ <https://www.youtube.com/watch?v=l4Ka4ws1E> (brake booster & master cylinder working process)
- ✓ <https://www.youtube.com/watch?v=82qBBJ8iwcc> (How hydraulic brake system work.)

A. Competency/Competencies:

- i. Replace the defective brake shoes per the service manual for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.4.1 Explain the types of brake shoes. 1.4.2 Explain the construction of the drum brake. 1.4.3 Explain the operation of a drum brake. 1.4.4 Change brake shoes Notes: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure to use a safety stand and wedge the vehicle.</i> ✓ <i>Ensure to place removed tire under the vehicle.</i> 	1.4 Changing brake shoes Overview: Information on types, constructions, and the operations of the brake shoes are covered and the learners can change the defective brake shoes.

C. Learning Experiences:

- ✓ Let learners read on INFORMATION SHEET 1.4
- ✓ Let learner read and perform on OPERATION SHEET 1.4
- ✓ Provide PPT, handouts, and poster
- ✓ The weblink <https://www.youtube.com/watch?v=P6g7yplvAf8> can be shared with the learners which explain how to change brake shoes.
- ✓ Provide the web link https://www.youtube.com/watch?v=bMg_j5_AGMg that shows how to brake system work.

D. Assessment:

- ✓ Make learners perform OPERATION SHEET 1.4 assess according to rubric/checklist submitted through the social media platform.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.4 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Conduct unit test, class test, and viva completing after topic.
- ✓ Assess learner's notes and assignments regularly.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube and let learners submit answers through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials and X, REC
- ✓ Hand-outs
- ✓ <https://www.youtube.com/watch?v=P6g7yplvAf8> (How to change brake shoe).
- ✓ https://www.youtube.com/watch?v=bMg_j5_AGMg (How brake system works)

A. Competency/Competencies:

- i. Replace the damaged wheel cylinder kits and brake bleeding is performed as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.5.1 Define wheel cylinder. 1.5.2 State function of the wheel cylinder. 1.5.3 Explain the types of wheel cylinders. 1.5.4 Illustrate the construction of the wheel cylinder. 1.5.5 Explain the operation of the wheel cylinder. 1.5.6 Replaced wheel cylinder kits Notes: <ul style="list-style-type: none"> ✓ Ensure to wedge the wheels. ✓ Ensure not to spill brake fluid over the vehicle body. 	<p style="text-align: right;">1.5 Replacing wheel cylinder kits</p> <p>Overview: The learners can replace the wheel cylinder kits besides knowing about functions, types, constructions, and the operation of the wheel cylinder.</p>

C. Learning Experiences:

- ✓ Let learner read the INFORMATION SHEET 1.5
- ✓ Let learners read and perform on OPERATION SHEET 1.5.
- ✓ Provide a short video clip on the operation of the wheel cylinder.
- ✓ Provide the web link <https://www.youtube.com/watch?v=GIWYkCOPAQQ> (How to replace a wheel cylinder).
- ✓ Provide the link handouts, ppt, and poster through google classroom or any other social media platform.

D. Assessment:

- ✓ Assess the learner's ability to identify parts of the wheel cylinder and their function.
- ✓ Assess the learner's ability after practical on OPERATION SHEET 1.5 according to the rubrics developed.
- ✓ Let learners solve the SAMPLE SELF CHECK 1.5 and assess regularly.
- ✓ Conduct unit tests and class tests.
- ✓ Let learners do a presentation and assess according to the criteria developed.
- ✓ Upload a question through possible social media platforms from the provided videos, handouts, CBLM, and assess their answers.

E. Resources:

- ✓ CBLM, REC, handouts, PPT, and posters.
- ✓ <https://www.youtube.com/watch?v=GIWYkCOPAQQ> (How to replace a wheel cylinder)

A. Competency/Competencies:

- i. Change the defective brake caliper assembly as per the standard procedures and braking performance is effective for any automotive vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.6.1 Explain the types of brake caliper. 1.6.2 Illustrate the construction of the brake caliper. 1.6.3 Explain the operation of the brake caliper. 1.6.4 State functions of brake pad and its wear indicator. 1.6.5 Describe the materials of the brake pad. 1.6.6 Change brake caliper assembly Notes: <ul style="list-style-type: none"> ✓ <i>Ensure safe handling of brake pipe while disconnecting.</i> ✓ <i>Ensure safe handling of brake fluid.</i> 	<p style="text-align: center;">1.6 Changing brake caliper assembly</p> <p>Overview: Information on brake caliper assemblies such as types, constructions, and operations are covered and the learners can change the defective brake caliper assembly.</p>

✓ <i>Ensure appropriate use of PPE.</i>	
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C. Learning Experiences:

- ✓ Let the learner read the INFORMATION SHEET 1.6
- ✓ Let the learner read and perform OPERATION SHEET 1.6
- ✓ Provide link <https://www.youtube.com/watch?v=vxUTGxC15nU> to learn about how to diagnose a Seized Caliper Piston.
- ✓ Provide link <https://www.youtube.com/watch?v=vyc25Yxw7Ec> to learn how to replace brake caliper.
- ✓ Provide handouts and short video clips through the social media platform.

D. Assessment:

- ✓ Provide all the tools and materials, let learners perform OPERATION SHEET 1.6 and assess according to rubric/checklist.
- ✓ Let them solve SAMPLE SELF CHECK 1.6
- ✓ Conduct unit tests, class tests, and viva after completing the topic.
- ✓ Assess the given question and answers submitted through Google classroom and other social media platforms.
- ✓ Give case study and submit answers through the social media platform.

E. Resources:

- ✓ CBLM of classes X
- ✓ PPT and handouts
- ✓ <https://www.youtube.com/watch?v=vxUTGxC15nU> (How to diagnose a seized caliper Piston).
- ✓ <https://www.youtube.com/watch?v=vyc25Yxw7Ec> (How to replace brake caliper).

A. Competency/Competencies:

- i. Change the damaged brake pipe as per the standard procedures and the brake system is operating effectively (improved) for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.7.1 State the function of the brake pipeline. 1.7.2 Describe brake pipe layout. 1.7.3 Explain the types of brake pipes. 1.7.4 Use a flaring tool. 1.7.5 Replace brake pipeline Notes: <ul style="list-style-type: none"> • <i>Ensure to engage the parking brake.</i> 	<p style="text-align: right;">1.7 Replacing brake pipeline</p> <p>Overview: This topic is about the brake fluid pipelines that can be replaced by the learners.</p>

<ul style="list-style-type: none"> • <i>Ensure to handle brake safely.</i> • <i>Ensure appropriate use of PPE.</i> 	
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C. Learning Experiences:

- ✓ Let learners read the INFORMATION SHEET 1.7
- ✓ Let learners read and perform OPERATION SHEET 1.7
- ✓ Let learners read and perform SKILL SHEET 1.7
- ✓ Provide link <https://www.youtube.com/watch?v=yGNljntB0IM> to learn about how to replace brake pipeline/hose.
- ✓ Provide link https://www.youtube.com/watch?v=0E_w8_-Q_kU to learn about how to change brake line hose.
- ✓ Upload handouts and short video clips through social media.

D. Assessment:

- ✓ Provide all the tools and materials and let the learners perform the OPERATION SHEET 1.7.
- ✓ Let learners solve SAMPLE SELF CHECK 1.7
- ✓ After completing the practical, assess the end product using rubrics.
- ✓ Assess the learners' ability as per the required standard.
- ✓ Give assignment/ presentation topic and assess according to criteria developed.
- ✓ Assess the given question and answers submitted through Google classroom, Wechat, etc.
- ✓ Give additional questions and let the learner submit answers through the social media platform.

E. Resources:

- ✓ CBLM of classes IX-X
- ✓ <https://www.youtube.com/watch?v=yGNljntB0IM> (How to replace brake pipeline/hose).
- ✓ https://www.youtube.com/watch?v=0E_w8_-Q_kU (How to change brake line hose).

A. Competency/Competencies:

- Replace the rotor disc run out and thickness is inspected and change as per standard practices for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.8.1 State function of brake disc/rotor. 1.8.2 State the types of brake disc/rotor. 1.8.3 Explain the defects of the brake disc/rotor. 1.8.4 Use micrometer. 1.8.5 Change brake disc/ rotor Notes: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure to support the vehicle with a safety stand.</i> 	Changing brake disc/rotor Overview: The learners can identify the defects and change the defective brake disc based on the information learned such as functions, types, and the defects of the brake disc. 1.8

C. Learning Experiences:

- ✓ Let learners read the INFORMATION SHEET 1.8
- ✓ Let learner read and perform OPERATION SHEET 1.8
- ✓ Demonstrate using OPERATION SHEET 1.8.
- ✓ The weblink (<https://www.youtube.com/watch?v=bGKJOICWmFQ>) can be shared with the students as it is easy to understand how the brake disc/rotor works.
- ✓ Upload ppt, handouts, and poster in google classroom.
- ✓ Conduct pre-assessment on defects of brake disc/rotor & types of the brake disc (let student use <https://www.youtube.com/watch?v=MAuVDB-G-HQ>)

D. Assessment:

- ✓ Make learner read and perform OPERATION SHEET 1.8
- ✓ Let's a learner solve SAMPLE SELF CHECK 1.8
- ✓ Assess the learner's notes, assignments frequently.
- ✓ Assess the ability of the learner when the effectiveness of braking performance is diminished and the following components are damaged (Brake rotor) and change as per the standard procedures.
- ✓ Give additional questions using different sources through the social media platform.
- ✓ Give online quiz on the topic, question & answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books, and other TLM such as posters, PPT, etc.
- ✓ <https://www.youtube.com/watch?v=MAuVDB-G-HQ> (Defects of brake disc/rotor & types of brake disc).
- ✓ <https://www.youtube.com/watch?v=bGKJOICWmFQ> (How to brake disc/rotor work)

A. Competency/Competencies:

- i. Change the contaminated or aged brake fluid and perform brake bleeding as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.9.1 State the purpose of changing brake fluid. 1.9.2 State the function of brake fluid. 1.9.3 Explain the types of brake fluid. 1.9.4 List the properties of brake fluid. 1.9.5 State the purpose of brake bleeding. 1.9.6 Explain the changing intervals of brake fluid. 1.9.7 Change brake fluid Notes:	1.9 Changing brake fluid Overview: This topic comprises the purpose, types, functions, and properties of brake fluid as well as the purpose of brake bleeding. Consequently, the learners will be able to change the brake fluid and perform brake bleeding.

<ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure safe handling of brake fluid.</i> 	
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C. Learning Experiences:

- ✓ Let learners read INFORMATION SHEET 1.9
- ✓ Let learner read and perform OPERATION SHEET 1.9
- ✓ Provide web link <https://www.youtube.com/watch?v=T05HSYDL8-Q> can be shared with the learners which explain how to change brake fluid.
- ✓ Provide web link <https://www.youtube.com/watch?v=T05HSYDL8-Q> can be shared with the learners which explain how to change brake fluid.
- ✓ Provide handouts to learners through Google Classroom or any other social media platforms.
- ✓ Provides the web link https://www.penriteoil.com.au/assets/tech_pdfs_new/Nov2015/Brake_Fluids.pdf that explains about the brake fluid.

D. Assessment:

- ✓ Make learners perform OPERATION SHEET 1.9 and assess according to rubrics /checklist.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.9 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube and let learners submit answers through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials and X, REC
- ✓ Hand-outs
- ✓ https://www.penriteoil.com.au/assets/tech_pdfs_new/Nov2015/Brake_Fluids.pdf (Explains the brake fluid).
- ✓ <https://www.youtube.com/watch?v=T05HSYDL8-Q> (How to change brake fluid)

A. Competency/Competencies:

- Replace load sensing device as per the standard procedure.

B. Learning objectives/Topic:

Learning objectives	Topic
1.10.1 Explain the function of load sensing device. 1.10.2 Explain the construction and operation of load sensing device. Notes: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> 	1.10 Changing load sensing device Overview: The learners will be able to change the load sensing device as its informations such as the functions and constructions are covered.

C. Learning Experiences:

- ✓ Let learners read INFORMATION SHEET 1.10
- ✓ Let them read and perform OPERATION SHEET 1.10
- ✓ Use PPT, handouts, demonstration, and short video clips.

D. Assessment:

- ✓ assess the learners ability to perform OPERATION SHEET 1.10 as per the rubrics.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.10 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Assess learner's notes and assignments frequently.

E. Resources:

- ✓ Competency-Based Learning Materials and X, REC
- ✓ PPT, handouts and short video clips.

A. Competency/Competencies:

- ii. Replace the defective ABS wheel sensor and sensor wire connector is connected as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.11.1 Define ABS. 1.11.2 List the components of ABS. 1.11.3 State the function of the speed sensor. 1.11.4 Explain the operation of the ABS. 1.11.5 Change anti-lock brake system speed sensor Notes: <ul style="list-style-type: none"> ✓ <i>Ensure appropriate use of PPE.</i> ✓ <i>Ensure that sensor wire is routed as previously to avoid crimping or twisting the wire harness.</i> 	<div style="text-align: right;"> 1.11 Changing anti-lock brake system speed sensor </div> Overview: This topic is about the components of the ABS and the operations of ABS that can enable the learners to change the defective ABS wheel speed sensor.

C. Learning Experiences:

- ✓ Let learners read INFORMATION SHEET 1.11
- ✓ Let them read and perform OPERATION SHEET 1.11
- ✓ Use PPT, handouts, demonstration, and short video clips.
- ✓ The weblink <https://www.youtube.com/watch?v=LcuAsf3GZOA> can be shared with the learner how to replace a broken ABS wheel sensor inside a steering knuckle.
- ✓ Provide hand-outs to learners through Google Classroom or any other social media platforms.
- ✓ Provide the web link <https://www.youtube.com/watch?v=98DXe3uKwfc> that explains to understand ABS.

D. Assessment:

- ✓ Make learners perform OPERATION SHEET 1.11

- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.11 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Assess learner's notes and assignments frequently.
- ✓ Let learners do a presentation and assess accordingly.
- ✓ Let learners solve questions on the case study and assess answers submitted through google classroom.

E. Resources:

- ✓ Competency-Based Learning Materials and X, REC
- ✓ Hand-outs
- ✓ <https://www.youtube.com/watch?v=LcuAsf3GZOA> (How to replace a broken ABS wheel sensor inside a steering knuckle)
- ✓ <https://www.youtube.com/watch?v=98DXe3uKwfc> (Explains ABS)

A. Competency/Competencies:

- i. Replace the broken hand brake cable connections and adjusted them as per standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.11.1 State the function of the hand brake cable. 1.11.2 List the types of the hand brake. 1.11.3 Explain the operation of the hand brake. 1.11.4 Ensure proper disposal of old brake cable. 1.11.5 Change parking brake cable Notes: ✓ <i>Ensure to use appropriate PPE.</i>	<p style="text-align: center;">1.12 Changing parking brake cable</p> <p>Overview: This topic includes the functions, types, and operations of the parking brake cable that enables the learners to change the parking brake cables whenever required.</p>

C. Learning Experiences:

- ✓ Let learners read INFORMATION SHEET 1.11
- ✓ Demonstrate the technique to change the hand brake cable as per the standard procedures.
- ✓ Let them read and perform OPERATION SHEET 1.11
- ✓ Let the learner practice in a group and follow by individual practice according to rubrics provided.
- ✓ The weblink <https://www.youtube.com/watch?v=prwAtIDcsVE> can be shared with the learners How to Replace and Adjust Parking Brake Cables.
- ✓ Provide handouts to learners through Google Classroom or any other social media platforms.
- ✓ Provide the web link <https://www.youtube.com/watch?v=h6ej2BoAmvA> that explains the operation of the hand brake.

D. Assessment:

- ✓ Make learners perform OPERATION SHEET 1.11 and assess according to rubrics.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.11
- ✓ Give additional questions from CBLM and other resources-Google/YouTube and let learners submit answers through Google Classroom or any other social media platforms.
- ✓ Let learners solve the questions on the case study and assess answers submitted in google classroom

E. Resources:

- ✓ Competency-Based Learning Materials and X, REC
- ✓ Hand-outs
- ✓ <https://www.youtube.com/watch?v=prwAtIDcsVE> (How to replace and adjust parking brake cables).
- ✓ <https://www.youtube.com/watch?v=h6ej2BoAmvA> (Explains the operation of hand brake).

Chapter 2: Adjusting brake system

A. Competency/Competencies::

- i. Fit the disconnected brake pedal and adjust brake free play to the specification as per the service manual for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>2.1.1 Define pedal-free play.</p> <p>2.1.2 State the importance of brake pedal-free play.</p> <p>2.1.3 State the purpose of brake pedal-free play.</p> <p>2.1.4 Define pedal height.</p> <p>2.1.5 State the purpose of pedal height.</p> <p>2.1.6 Define reserve distance.</p> <p>2.1.7 State the purpose of reserve distance.</p> <p>2.1.8 Adjust brake pedal free play</p> <p>Notes:</p> <ul style="list-style-type: none">✓ Ensure to engage the parking brake✓ Ensure appropriate use of PPE	<p style="text-align: right;">2.1 Adjusting brake pedal free play</p> <p>Overview: Besides knowing the importance and purpose of brake pedal free play, pedal height, and reserve height, the learners can adjust the brake pedal free play to a required specification.</p>

C. Learning Experiences:

- ✓ Let learners read the INFORMATION SHEET 2.1.
- ✓ Read, demonstrate and give the guided practice on the OPERATION SHEET 2.1
- ✓ Provide a short video clip on brake pedal-free play.
- ✓ Provide link <https://www.youtube.com/watch?v=jF0MZJE0eSM> to learn about brake pedal height inspection.
- ✓ Provide link <https://www.youtube.com/watch?v=rqyNjkWYZUs> to learn how to adjust brake lever-free play.

D. Assessment:

- ✓ Let learners perform OPERATION SHEET 2.1 and assess according to rubric/checklist.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 2.1 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Assess by conducting the class tests, unit tests, and case studies.
- ✓ Give case study and research type questions and assess through the social media platform.

E. Resources:

- ✓ CBLM, NNC, and handouts.
- ✓ <https://www.youtube.com/watch?v=jF0MZJE0eSM> (How to inspect the brake pedal height).
- ✓ <https://www.youtube.com/watch?v=rqyNjkWYZUs> (How to adjust brake lever-free play).

A. Competency/Competencies:

- i. Rectify the ineffective drum brake and adjust to specification as per the service manual for any vehicle.

B. Learning objectives/Topic:

Learning Objectives	Topic
2.2.1 Explain the types of drum brake adjusters. 2.2.2 List the purpose of brake adjustment. 2.2.2 Adjust drum brake Notes: <ul style="list-style-type: none">✓ <i>Ensure to wedge the wheels.</i>✓ <i>Ensure appropriate use of PPE.</i>	2.2 Adjusting drum brake Overview: Not only does the learners get information on the types and purpose of brake adjustment, but can also adjust the drum brake.

C. Learning Experiences:

- ✓ Let learners read the INFORMATION SHEET 2.2.
- ✓ Read, demonstrate and give the guided practice on the OPERATION SHEET 2.2
- ✓ Make students do individual practice on OPERATION SHEET 2.2.
- ✓ Provide PPT, handouts, and poster
- ✓ Let <https://www.youtube.com/watch?v=bnc3VnQ8kUY> share with the learner (downloaded digital content, articles, etc.) that shows parts and functions of the drum brake.
- ✓ Provide link <https://www.youtube.com/watch?v=ApuBEn2zct8> and <https://www.youtube.com/watch?v=IUnLEGuW1HQ> to learn about how drum brakes work in cars and light vehicles.
- ✓ Used zoom session to teach students.

D. Assessment:

- ✓ Ask learners to solve the SAMPLE SELF CHECK 2.2 that fulfills objectives and competency.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Assess notes and assignments regularly.
- ✓ Give additional questions using different sources through social media platforms.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books, and other TLM, handouts)
- ✓ <https://www.youtube.com/watch?v=bnc3VnQ8kUY>(Parts and functions of drum brake).
- ✓ <https://www.youtube.com/watch?v=ApuBEn2zct8>(How drum brakes work in cars and light vehicles).
- ✓ <https://www.youtube.com/watch?v=IUnLEGuW1HQ>(How to drum brake system work).

A. Competency/Competencies:

- i. Identify the faulty brake system symptoms for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>2.3.1 List the symptoms, causes, and remedies of brake failure.</p> <p>2.3.1 Perform test drive</p> <p>Notes:</p> <ul style="list-style-type: none">✓ <i>Ensure to fasten the seat belt.</i>✓ <i>Ensure to maintain the speed limit.</i>	<p style="text-align: right;">2.3 Performing test drive</p> <p>Overview: This topic comprises the symptoms and causes of the brake failure that help the learners to identify the faulty brake system through a test drive.</p>

C. Learning Experiences:

- ✓ Let learners read the INFORMATION SHEET 2.3.
- ✓ Read, demonstrate and give the guided practice on OPERATION SHEET 2.3
- ✓ Provide a short video clip on symptoms, causes, and remedies of brake failure.
- ✓ Give handouts, PPT, and DEMO++PG through google classroom, Wechat, or any other social media.
- ✓ Provide link <https://www.youtube.com/watch?v=1XJm5-sOyhY> How to Diagnose Problems with Your Brakes.
- ✓ Provide link <https://motoroctane.com/advisor/206457-brake-problems> to learn about symptoms of brake system failures.

D. Assessment:

- ✓ Let learners perform OPERATION SHEET 2.3 and assess according to rubric/checklist.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 2.3 that fulfills objectives and competency
- ✓ Let the learners do a presentation and assess as per the criteria developed.
- ✓ Conduct class tests, unit tests and give homework/classwork to assess the learner.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.
- ✓ Let the learners write a note and submit it through any possible social media based on their understanding after watching videos.
- ✓ Give case study and submit answers through the possible social media platform.

E. Resources:

- ✓ CBLM, reference books, and other TLM, hand-outs)
- ✓ <https://www.youtube.com/watch?v=1XJm5-sOyhY> (How to diagnose problems with your brakes).
- ✓ <https://motoroctane.com/advisor/206457-brake-problems> (Symptom of brake system failures).

MODULE: III: SERVICING STEERING SYSTEM

Chapter 1: Servicing steering components

A. Competency/Competencies:

- i. Replace the steering wheel in the correct position as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning Objectives	Topic
<p>1.1.1 Define steering system.</p> <p>1.1.2 State the functions of the steering system.</p> <p>1.1.3 Explain the principles of the steering system.</p> <p>1.1.4 Explain the types of the steering system.</p> <p>1.1.5 Explain the components of the steering system.</p> <p>1.1.6 List the types of steering gearbox.</p> <p>1.1.7 Explain the basics of the SRS system.</p> <p>1.1.8 State the advantages of the SRS system.</p> <p>1.1.9 Replace steering wheel</p> <p>Notes:</p> <ul style="list-style-type: none">✓ <i>Ensure to disconnect the battery negative terminal before removing the steering wheel.</i>✓ <i>Ensure to tighten the wheel nut to the specified torque.</i>✓ <i>Ensure to use appropriate PPE.</i>	<p>1.1 Replacing steering wheel</p> <p>Overview: The topic covers the information on the functions, principles, types, and the components of the steering system and the types of steering gearbox as well. It enables the learners to change the steering whenever required.</p>

C. Learning Experiences:

- ✓ Let learners read the INFORMATION SHEET 1.1
- ✓ Use PPT, handouts, flip charts, and posters.
- ✓ Read, demonstrate and give the guided practice on OPERATION SHEET 1.1
- ✓ Make students do individual practice on OPERATION SHEET 1.1.
- ✓ Provide link <https://www.youtube.com/watch?v=em1O8mz7sF0> to learn about the steering system.
- ✓ Used zoom session to teach students.

D. Assessment:

- ✓ Let learners perform OPERATION SHEET 1.1 and assess according to rubric/checklist.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.1 that fulfills objectives and competency.
- ✓ Give assignments, classwork, homework, and presentation to assess learners according to criteria developed.
- ✓ Conduct unit tests, class tests, and case studies to assess learners' understanding of the lesson.

- ✓ Use a rubric to assess the learner's conceptual understanding of the parts and functions of a steering system and principles of a steering system based on the vocal narratives and comprehensiveness of the demo++. Provide necessary intervention to the learners based on the learner's achievement derived using the rubric and submit through the social media platform.
- ✓ Let the learners write & submit notes through google classroom.

E. Resources:

- ✓ CBLM, reference books, and other TLM, handouts)
- ✓ <https://www.youtube.com/watch?v=em1O8mz7sF0> (Explain steering system).

A. Competency/Competencies:

- Replace the steering column without damaging other components and all electrical connections are connected as per the standard procedures for any type of vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.2.1 State the function of the steering shaft. 1.2.2 State the function of the universal joint. 1.2.3 State the function of the steering column. 1.2.4 Illustrate the construction of the steering column. 1.2.5 Replace steering shaft Notes: <ul style="list-style-type: none"> ✓ <i>Ensure to take care of electrical components</i> ✓ <i>Ensure to use appropriate PPE.</i> 	<p style="text-align: right;">1.2 Replacing steering shaft</p> <p>Overview: The learners can change the steering shaft after going through the information such as functions of the steering shaft, column universal joint, and their constructions as well.</p>

C. Learning Experiences:

- ✓ Let Learners read the INFORMATION SHEET 1.2.
- ✓ Read, demonstrate and give the guided practice on OPERATION SHEET 1.2
- ✓ Make students do individual practice on operation sheet 1.2.
- ✓ Use PPT, handouts, and posters through the social media platform.
- ✓ Provide link <https://www.youtube.com/watch?v=EvoprDLubKw> to learn about how to change the steering shaft.
- ✓ Provide link https://www.youtube.com/watch?v=ypZ6Yv_N6h0 to learn how to remove steering wheel column shaft.

D. Assessment:

- ✓ Let learners perform OPERATION SHEET 1.2 and assess according to rubric/checklist.
- ✓ Assess learner's information, comprehensiveness of practical, and ability to explain parts and functions of universal joints, steering shaft, and steering column as they perform the task using rubrics and checklist. Provide necessary intervention.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.2 that fulfills objectives and competency.

- ✓ Conduct unit tests, class tests, and viva exams.
- ✓ Give case study and submit answers through any possible social media platform.

E. Resources:

- ✓ CBLM, reference books, and other TLM, handouts)
- ✓ <https://www.youtube.com/watch?v=EvoprDLubKw> (How to change steering shaft)
- ✓ https://www.youtube.com/watch?v=ypZ6Yv_N6h0 (How to remove steering wheel column shaft).

A. Competency/Competencies:

- Replace the tie rod end as per the number of threads counted following standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
1.3.1 State the function of the tie rod end. 1.3.2 Explain the construction of the tie rod end. 1.3.3 Use tie rod end remover. 1.3.4 Replace tie rod end Notes: <ul style="list-style-type: none"> ✓ Ensure appropriate use of PPE. ✓ Ensure proper disposal of waste. 	<p style="text-align: right;">1.3 Replacing tie rod end</p> <p>Overview: This topic is about the functions and the construction of the tie-rod end that enables the learners to identify and replace the tie-rod end.</p>

C. Learning Experiences:

- ✓ The learner should read the INFORMATION SHEET 1.3
- ✓ Read, demonstrate and give guided practice on the OPERATION SHEET 1.3
- ✓ Make students do individual practice on OPERATION SHEET 1.3.
- ✓ Let learners read and perform SKILL SHEET 1.3
- ✓ Give PPT, handouts, and posters through the social media platform.
- ✓ Provide link <https://www.youtube.com/watch?v=8IJvb3tFjfc> to learn how to change tie rod end.
- ✓ Provide link <https://www.youtube.com/watch?v=7PMOkoJJswk> to learnt what is tie rod does and why it's important

D. Assessment:

- ✓ Assess learners' information, comprehensiveness of practical, and ability to explain construction and functions of tie rod end as they perform the task using rubrics and checklist. Provide necessary intervention.
- ✓ Conduct unit tests, class tests to assess the learners' knowledge and skills.
- ✓ Let learner read and perform SKILL SHEET 1.3: on using tie rod end remover.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.3 that fulfills objectives and competency.
- ✓ Give additional questions using different sources through the social media platform.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books, and handouts)
- ✓ <https://www.youtube.com/watch?v=7PMOkJJswk> (What is tie rod do and why it's important)
- ✓ <https://www.youtube.com/watch?v=8Jv3tFjfc> (How to change tie rod end).

A. Competency/Competencies:

- i. Replace the rack and pinion gearbox without damaging other components following the service manual for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.4.1 State the function of rack and pinion. 1.4.2 Explain the steering gear mechanism. 1.4.3 Calculate gear ratio. 1.4.4 List the components of rack and pinion. 1.4.5 Explain the operation of the rack and pinion steering gearbox. 1.4.6 Replace rack and pinion assembly Notes: <ul style="list-style-type: none"> ✓ <i>Ensure to use appropriate PPE.</i> ✓ <i>Ensure to jack up the vehicle in the correct position.</i> 	1.4 Replacing rack & pinion assembly Overview: Information on the functions, components, and the operation of the rack and pinion assembly are covered. It enables the learners to replace the defective rack and pinion assembly.

C. Learning Experiences:

- ✓ Let Learner read the INFORMATION SHEET 1.4
- ✓ Read, demonstrate and give guided practice on the OPERATION SHEET 1.4
- ✓ Make students do individual practice on OPERATION SHEET 1.4.
- ✓ Provide link <https://www.youtube.com/watch?v=NtZo4cDH3hk> to learn rack and pinion how it works)
- ✓ Provide link <https://www.youtube.com/watch?v=VglkpPON5fk> to learn how rack and pinion steering gearbox mechanism works.
- ✓ Provide PPT, handouts, case study, and short video

D. Assessment:

- ✓ Let learner perform OPERATION SHEET 1.4 and assess based on rubrics/checklist.
- ✓ Conduct class tests, unit tests and viva theory test.
- ✓ Assess learners' notes, practical reports, and assignments regularly.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.4 that fulfills objectives and competency
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Give case study and submit through google classroom.
- ✓ Give additional questions using different sources through the social media platform.

E. Resources:

- ✓ CBLM, reference books, and other TLM, handouts)
- ✓ <https://www.youtube.com/watch?v=NtZo4cDH3hk> (How rack and pinion steering works)
- ✓ <https://www.youtube.com/watch?v=VgIkpPON5fk> (How rack and pinion steering gearbox mechanism works).

A. Competency/Competencies:

- i. Align the pitman arm and sector shaft as per the alignment mark for any vehicle.

B. Learning objectives/ topic

Learning objectives	Topic
1.2.1 State the functions of the pitman arm. 1.2.2 Replace pitman arm Notes: <ul style="list-style-type: none"> ✓ Ensure appropriate use of PPE. ✓ Ensure to wedge the wheel. 	1.5 Replacing pitman arm Overview: The learners can replace the pitman arm besides knowing its function.

C. Learning Experiences:

- ✓ Let learner read the INFORMATION SHEET 1.5
- ✓ Read, demonstrate and give guided practice on the OPERATION SHEET 1.5: on replacing pitman arm.
- ✓ Use PPT, handouts, and posters.
- ✓ Make students do individual practice on OPERATION SHEET 1.5.
- ✓ Provide link <https://www.youtube.com/watch?v=hENZiD7YSyg> to learn about how to Replace Pitman Arm.
- ✓ Provide link https://www.youtube.com/watch?v=u47F6ZMR0_g to learn Signs of a bad Pitman Arm failing symptoms noise movement

D. Assessment:

- ✓ Let learner perform OPERATION 1.5 and assess according to rubrics/checklist
- ✓ Conduct class tests, unit tests and viva sessions after completing every topic.
- ✓ Give additional questions using different sources through the social media platform.
- ✓ Let make the learner solve SAMPLE SELF CHECK 1.5 and submit through Google classroom, Wechat, and other social media platforms.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books, and other TLM, handouts
- ✓ <https://www.youtube.com/watch?v=hENZiD7YSyg> (How to replace pitman arm)
- ✓ https://www.youtube.com/watch?v=u47F6ZMR0_g (Signs of a bad pitman arm failing symptoms noise movement).

A. Competency/Competencies:

- i. Replace the re-circulating ball-type steering gearbox as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
<p>1.2.1 Illustrate the construction of a re-circulating type gearbox.</p> <p>1.2.2 Replace re-circulating ball type steering gearbox</p> <p>Notes:</p> <ul style="list-style-type: none">✓ <i>Ensure to wedge the wheel.</i>✓ <i>Ensure to use appropriate PPE.</i>	<p>1.6 Replacing re-circulating ball type steering gearbox</p> <p>Overview: The learners will be able to replace the re-circulating ball-type steering gearbox as the information on the constructions of the gearbox is covered.</p>

C. Learning Experiences:

- ✓ The learners should read INFORMATION SHEET 1.6
- ✓ Let learner read and perform OPERATION SHEET 1.6
- ✓ Use PPT, handouts, posters and flip charts.
- ✓ Provide hand-outs to learners through Google Classroom or any other social media platforms.
- ✓ Provide web link <https://www.youtube.com/watch?v=LcuAsf3GZOA> can be shared with the learner how to replace a replace re-circulating ball type steering gear box.

D. Assessment:

- ✓ Let the learners make notes on INFORMATION SHEET 1.6
- ✓ Make learners perform OPERATION SHEET 1.6
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.6 that fulfills objectives and competency.
- ✓ Conduct unit test, class test, and viva exam after completing a topic.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube and let learners submit answers through Google Classroom or any other social media platforms.

E. Resources:

- ✓ Competency-Based Learning Materials of X, REC
- ✓ Hand-outs
- ✓ <https://www.youtube.com/watch?v=LcuAsf3GZOA> (How to replace a replace re-circulating ball-type steering gearbox).

A. Competency/Competencies::

- i. Overhaul the recirculating ball steering system is carried out following service manual for all the vehicles.

B. Learning objectives/Topic:

Learning Objectives	Topic
1.2.1 Explain the operation of the recirculating gearbox. 1.2.2 Overhaul re-circulating type steering gearbox Notes: ✓ <i>Ensure to wedge the wheel.</i> ✓ <i>Ensure to use appropriate PPE.</i>	1.7 Overhauling re-circulating type steering gearbox Overview: Besides the operation of the recirculating gearbox, the learners can overhaul the gearbox as per the requirement.

C. Learning Experiences:

- ✓ The learner should read the INFORMATION SHEET 1.7.
- ✓ Read, demonstrate and give guided practice on the OPERATION SHEET 1.7
- ✓ Use PPT, handouts, and posters.
- ✓ Provide link <https://www.youtube.com/watch?v=qD00DIGVhtk> to learn about working of the recirculating type steering gearbox
- ✓ Used zoom session to teach students.

D. Assessment:

- ✓ Assess learner's information, comprehensiveness of practical, and ability to explain on overhauling recirculating –ball steering gearbox as they perform the task using a rubrics and checklist. Provide necessary intervention.
- ✓ Ask learners to solve the SAMPLE SELF CHECK 1.7 that fulfills objectives and competency.
- ✓ Conduct class test, unit test and viva session after completing every topic.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Give additional question using different sources through social media platform.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books and other TLM, handouts)
- ✓ <https://www.youtube.com/watch?v=qD00DIGVhtk> (Working of recirculating type steering gearbox)

A. Competency/Competencies:

- i. Adjust the steering gear backlash as per the manufacture specification depending upon the different vehicles.

B. Learning objectives/Topic:

Learning objectives	Topic
1.8.1 Define backlash. 1.8.2 State the purpose of backlash. 1.8.3 Use a dial gauge. 1.8.4 Adjust steering gear backlash Notes:	1.8 Adjusting steering gear backlash Overview: The learners can adjust the steering gear backlash as the information related to it is covered.

<ul style="list-style-type: none"> ✓ Ensure dial gauge is handled safely. ✓ Ensure to use appropriate PPE. 	
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C. Learning Experiences:

- ✓ The learner should read the INFORMATION SHEET 1.8
- ✓ Read, demonstrate and give guided practice on the OPERATION SHEET 1.8
- ✓ Use PPT, handouts, and posters.
- ✓ Let learners read and perform SKILL SHEET 1.8
- ✓ Provide a short video clip on Adjust steering gear backlash.
- ✓ Provide link <https://www.youtube.com/watch?v=gAD0ugRQNek> to learn how to adjust steering gearbox play.
- ✓ Provide link <https://www.ijert.org/research/removal-of-backlash-from-steering-systems-IJERTV2IS110470.pdf> to learn about steering gear backlash.

D. Assessment:

- ✓ Assess learners' information, comprehensiveness of practical, and ability to adjust steering gear backlash as they perform the task using rubrics and checklist. Provide necessary intervention.
- ✓ Conduct class tests, unit tests, and viva sessions after completing every topic.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Let make the learner solve SAMPLE SELF CHECK 1.8 and submit through Google classroom, Wechat, and other social media platforms.
- ✓ Give case study and submit answer through google classroom.

E. Resources:

- ✓ CBLM, reference books and other TLM, handouts)
- ✓ <https://www.youtube.com/watch?v=gAD0ugRQNek>(How to adjust steering gearbox play)
- ✓ <https://www.ijert.org/research/removal-of-backlash-from-steering-systems-IJERTV2IS110470.pdf> (steering gear backlash).

A. Competency/Competencies::

- Replace the integral power steering gearbox as per the standard procedures for any vehicle.

B. Learning objectives/Topic:

Learning objectives	Topic
1.2.1 Define power steering system. 1.2.2 State the types of power steering. 1.2.3 State the types of power steering gearbox. 1.2.4 Explain the construction of an integral power steering gearbox. 1.2.5 Explain the operation of the integral power steering gearbox.	<p>1.9 Replace integral power steering gearbox</p> <p>Overview: This topic is about the types, construction, and operation of the integral power steering gearbox that enables the learners to</p>

1.2.6 Replace integral power steering gearbox Notes: <ul style="list-style-type: none"> ✓ <i>Ensure proper disposal of used power steering fluid.</i> ✓ <i>Ensure to use appropriate PPE.</i> 	replace the integral power steering gearbox.
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C. Learning Experiences:

- ✓ Let the learner read the INFORMATION SHEET 1.9
- ✓ Read, demonstrate and give the guided practice on the OPERATION SHEET 1.9
- ✓ Use PPT, handouts, and posters.
- ✓ Make students do individual practice on OPERATION SHEET 1.9.
- ✓ Provide a short video clip on the operation of the integral power steering gearbox.
- ✓ Let learner go through OPERATION SHEET 1.9
- ✓ Provide link <https://www.youtube.com/watch?v=AeXj35aOK7k> to learn about how power steering pumps work.
- ✓ Provide link <https://www.youtube.com/watch?v=6bBYBP8uxYk> to learn how to change the power steering gearbox.

D. Assessment:

- ✓ Let learners read and perform OPERATION SHEET 1.9 and assess according to rubrics.
- ✓ Conduct class tests, unit tests, and viva sessions after completing every topic.
- ✓ Give additional questions from CBLM and other resources-Google/YouTube.
- ✓ Give additional questions using different sources through the social media platform.
- ✓ Let make the learner solve SAMPLE SELF CHECK 1.9 and submit through Google classroom, Wechat, and other social media platforms.
- ✓ Give online quiz on the topic, question and answer session through zoom meeting.

E. Resources:

- ✓ CBLM, reference books, and other TLM, handouts
- ✓ <https://www.youtube.com/watch?v=AeXj35aOK7k> (How power steering pump work).
- ✓ <https://www.youtube.com/watch?v=6bBYBP8uxYk> (How to change power steering

MODULE: INTERPRETING ENGINEERING DRAWING

Chapter: 1 Draw isometric and mechanical parts

A. Learning objectives/Topic:

Learning objectives	Topic
<p>2.1.1 Define the scale of the drawing.</p> <p>2.1.2 List types of scale.</p> <p>2.1.3 Convert drawing scale</p> <p>Notes:</p> <ul style="list-style-type: none">✓ <i>Ensure clean and neatness of drawing.</i>✓ <i>Ensure Proper handling of drawing instruments gearbox)</i>	<p>2.1 Converting drawing scale</p> <p>The learners can convert the drawing scales after knowing about its types.</p>

Overview: The learners can convert the engineering drawing scales as per the requirements.

B. Competency/Competencies::

- Convert the drawing scales as per the standard ratios.

C. Pedagogy/Learning experience

- ✓ Let the learners read INFORMATION SHEET 2.1.
- ✓ Let the learners perform OPERATION SHEET 2.1.
- ✓ Let the learners solve SAMPLE SELF CHECK 2.1.
- ✓ Let the learner searches for more information on engineering drawing scales from the link https://bis.gov.in/other/WC_SP_46_03122014.pdf (books, internets, handouts, etc.)
- ✓ Let the learners in a group discussion on the conversion of drawing scales required for standard ratios based on the information gathered.

D. Assessment:

- ✓ Assess the learner's ability to gather information discussed in the group.
- ✓ Assess learners' performance OPERATION SHEET 2.1.
- ✓ Assess the response on SAMPLE SELF CHECK 2.1.
- ✓ Provide necessary feedback and intervention based on the rating from the rubric

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ https://bis.gov.in/other/WC_SP_46_03122014.pdf (Explains the engineering drawing scales)

A. Competency/Competencies::

- i. Draw isometric blocks and interpret any mechanical parts into 3D drawings as per the given dimension in standard procedures.

B. Learning objectives/Topic:

Learning objectives	Topic
2.2.1 Define isometric drawing. 2.2.2 State isometric terminologies. 2.2.3 Draw isometric block 2.2.4 <i>Ensure clean and neatness of drawing.</i> 2.2.5 <i>Ensure Proper handling of drawing instruments.</i>	<p style="text-align: right;">2.2 Drawing Isometric blocks</p> <p>Overview: The learners can draw any mechanical parts into 3D drawings.</p>

C. Learning experiences:

- ✓ The learners read INFORMATION SHEET 2.2.
- ✓ Let the learners perform OPERATION SHEET 2.2.
- ✓ Let the learners solve SAMPLE SELF CHECK 2.2
- ✓ Share the web link <https://youtu.be/c6DygJMwos8> to understand the techniques of drawing isometric blocks.
- ✓ Let the learners watch the video and prepare a mind map and post it in the Google Classroom.
- ✓ Provide drawing and let the learners draw an isometric view.

D. Assessment:

- ✓ Assess the learners' performance on OPERATION SHEET 2.2
- ✓ Asses the isometric drawing assigned to the learners.
- ✓ Assess the response on SAMPLE SELF CHECK 2.2 uploaded in Google Classroom.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ <https://youtu.be/c6DygJMwos8> (Explains the tips of drawing isometric block)

A. Competency/Competencies:

- i. Draw isometric views and orthographic projections.

B. Learning objectives/Topic:

Learning Objectives	Topic
2.3.1 Define orthographic drawing. 2.3.2 List the four quadrants. 2.3.3 State types of orthographic projections. 2.3.4 Differentiate between first and third angle projection. 2.3.5 Draw orthographic projection	<p>2.3 Drawing orthographic projection</p> <p>Overview: The learners can draw six principle views of the orthographic projection.</p> <p style="text-align: right;">2.3</p>

Notes:

- ✓ *Ensure clean and neatness of drawing.*
- ✓ *Ensure Proper handling of drawing instruments*

C. Learning Experiences:

- ✓ Conduct pre-assessment on drawing of 3-D shapes.
- ✓ Let the learners draw 3-D shapes on paper.
- ✓ Let the learners draw orthographic views from 3-D figures.
- ✓ Let the learners read INFORMATION 2.3
- ✓ Share the web link <https://youtu.be/1sjaelzuGAK> to know basic orthographic projection.
- ✓ Provide structures (real objects) and make learners draw orthographic views.
- ✓ Let the learners solve OPERATION 2.3 and SAMPLE SELF CHECK 2.3
- ✓ Provide isometric drawing and let learners draw orthographic views.

D. Assessment:

- ✓ Monitor the pre-assessment carried out in the classroom.
- ✓ Assess the learners' response to OPERATION SHEET 2.3 and SAMPLE SELF CHECK 2.3
- ✓ Assess the drawing drawn by the learners.
- ✓ Assess the learners' response to an additional question on orthographic views.

E. Resources:

- ✓ Competency-Based Learning Materials.
- ✓ <https://youtu.be/1sjaelzuGAK> basic orthographic projection.

Resources

1. Technical and Vocational Education and Training (TVET) New Normal Curriculum Framework (Classes: PP-XII)
2. Competency-Based Learning Materials