LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: Auto Service Technician L4

(QUALIFICATION PACK: Ref. Id. ASC/Q1402)

SECTOR: Automotive

Classes 11 and 12

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
Shyamla Hills, Bhopal- 462 002, M.P., India
http://www.psscive.ac.in

Gandhiji's Talisman

I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test:

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to Swaraj for the hungry and spiritually starving millions?

Then you will find your doubts and your self melting away.

M K Gandhi

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LEARNING OUTCOME BASED CURRICULUM
Automotive- Auto Service Technician

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FOREWORD

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE) a constituent of the National Council of Educational Research and Training (NCERT) is spearheading the efforts of developing learning outcome based curricula and courseware aimed at integrating both vocational and general qualifications to open pathways of career progression for students. It is a part of Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education (CSSVSHSE) launched by the Ministry of Human Resource Development, Government of India in 2012. The PSS Central Institute of Vocational Education (PSSCIVE) is developing curricula under the project approved by the Project Approval Board (PAB) of *Rashtriya Madhyamik Shiksha Abhiyan* (RMSA). The main purpose of the learning outcome based curricula is to bring about the improvement in teaching-learning process and working competences through learning outcomes embedded in the vocational subject.

It is a matter of great pleasure to introduce this learning outcome based curriculum as part of the vocational training packages for the job role of **Auto Service Technician L4**. The curriculum has been developed for the secondary students of vocational education and is aligned to the National Occupation Standards (NOSs) of a job role identified and approved under the National Skill Qualification Framework (NSQF).

The curriculum aims to provide children with employability and vocational skills to support occupational mobility and lifelong learning. It will help them to acquire specific occupational skills that meet employers' immediate needs. The teaching process is to be performed through the interactive sessions in classrooms, practical activities in laboratories and workshops, projects, field visits, and professional experiences.

The curriculum has been developed and reviewed by a group of experts and their contributions are greatly acknowledged. The utility of the curriculum will be adjudged by the qualitative improvement that it brings about in teaching-learning. The feedback and suggestions on the content by the teachers and other stakeholders will be of immense value to us in bringing about further improvement in this document.

DR. H.K. SENAPATHY
Director
National Council of Education Research & Training

PREFACE

India today stands poised at a very exciting juncture in its saga. The potential for achieving inclusive growth are immense and the possibilities are equally exciting. The world is looking at us to deliver sustainable growth and progress. To meet the growing expectations, India will largely depend upon its young workforce. The much-discussed demographic dividend will bring sustaining benefits only if this young workforce is skilled and its potential is channelized in the right direction.

In order to fulfil the growing aspirations of our youth and the demand of skilled human resource, the Ministry of Human Resource Development (MHRD), Government of India introduced the revised Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education that aims to provide for the diversification of educational opportunities so as to enhance individual employability, reduce the mismatch between demand and supply of skilled manpower and provide an alternative for those pursuing higher education. For spearheading the scheme, the PSS Central Institute of Vocational Education (PSSCIVE) was entrusted the responsibility to develop learning outcome based curricula, student workbooks, teacher handbooks and e-learning materials for the job roles in various sectors, with growth potential for employment.

The PSSCIVE firmly believes that the vocationalisation of education in the nation need to be established on a strong footing of philosophical, cultural and sociological traditions and it should aptly address the needs and aspirations of the students besides meeting the skill demands of the industry. The curriculum, therefore, aims at developing the desired professional, managerial and communication skills to fulfil the needs of the society and the world of work. In order to honour its commitment to the nation, the PSSSCIVE has initiated the work on developing learning outcome based curricula with the involvement of faculty members and leading experts in respective fields. It is being done through the concerted efforts of leading academicians, professionals, policy makers, partner institutions, Vocational Education and Training experts, industry representatives, and teachers. The expert group through a series of consultations, working group meetings and use of reference materials develops a National Curriculum. Currently, the Institute is working on developing curricula and courseware for over 100 job roles in various sectors.

We extend our gratitude to all the contributors for selflessly sharing their precious knowledge, acclaimed expertise, and valuable time and positively responding to our request for development of curriculum. We are grateful to MHRD and NCERT for the financial support and cooperation in realising the objective of providing learning outcome based curricula and courseware to the States and other stakeholders under the PAB (Project Approval Board) approved project of *Rashtriya Madhyamik Shiskha Abhiyan* (RMSA) of MHRD.

Finally, for transforming the proposed curriculum design into a vibrant reality of implementation, all the institutions involved in the delivery system shall have to come together with a firm commitment and they should secure optimal community support. The success of this curriculum depends upon its effective implementation and it is expected that the managers of vocational education and training system, including subject teachers will make efforts to create better facilities, develop linkages with the world of work and foster a conducive environment as per the content of the curriculum document.

The PSSCIVE, Bhopal remains committed in bringing about reforms in the vocational education and training system through the learner-centric curricula and courseware. We hope that this document will prove useful in turning out more competent Indian workforce for the 21st Century.

DR.RAJESH P. KHAMBAYAT
Joint Director
PSS Central Institute of Vocational Education

ACKNOWLEDGEMENTS

On behalf of the team at the PSS Central Institute of Vocational Education (PSSCIVE) we are grateful to the members of the Project Approval Board (PAB) *of Rashtriya Madhyamik Shiksha Abhiyan* (RMSA) and the officials of the Ministry of Human Resource Development (MHRD), Government of India for the financial support to the project for development of curricula.

We are grateful to the Director, NCERT for his support and guidance. We also acknowledge the contributions of our colleagues at the Technical Support Group of RMSA, MHRD, RMSA Cell at the National Council of Educational Research and Training (NCERT), National Skill Development Agency (NSDA) and National Skill Development Corporation (NSDC) and Automotive Skill Development Council (ASDC) for their academic support and cooperation.

We are grateful to the expert contributors and reviewers for their earnest effort and contributions in the development of this learning outcome based curriculum. Their names are acknowledged in the list of contributors and reviewers.

The contributions made by Dr. Vinay Swarup Mehrotra, Professor and Head, Curriculum Development and Evaluation Centre (CDEC) and Vipin Kumar Jain, Associate Professor and Head, Programme Planning and Monitoring Cell (PPMC), PSSCIVE in development of the curriculum for the employability skills are duly acknowledged.

Mr. Nagendra Kore, RMSA, Goa and Mr. Sudhir Vishwakarma, CRISP, Bhopal for reviewing this document.

We are also grateful to the Course Coordinator **Prof. Saurabh Prakash,** Professor & Head, Department of Engineering & Technology for developing this curriculum.

PSSCIVE Team

CONTENTS

1. COURSE OVERVIEW

COURSE TITLE: Automotive- Automotive Service Technician

The present curriculum Automotive Service Technician job role is related to Level L-3. This course fulfills the needs of the students willing to learn activities relating to the Automotive Service Technician job role. Any student/ entrepreneur willing to start an Automobile Service Centre can acquire the desired competencies with the help of this curriculum. Automobile or Automotive Engineering has gained recognition and importance ever since motor vehicles capable for transporting passengers has been in vogue. Now due to the rapid growth of auto component manufacturers and automobile industries, there is a great demand for Automobile technicians. Automobile Engineering alias Automotive Engineering or Vehicle Engineering is one of the most challenging careers in the field of engineering with a wide scope.

COURSE OBJECTIVES: On completion of the course, students should be able to:

- ☐ Identify the principal components of a computer system
- ☐ Identify and control hazards in the workplace that pose a danger or threat to their safety or health, or that of others.
- ☐ Demonstrate self-management skills.
- ☐ Demonstrate the ability to provide a self-analysis in context of entrepreneurial skills and abilities.
- ☐ Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection.
- ☐ Communicate effectively with the customers
- ☐ Greet, escort, seat the customers and offer refreshments(tea/ coffee)
- ☐ Enquire and understand customer queries related to vehicle type, model, specifications
- ☐ Identify features of different elements of Engineering such as mechanical, electrical, electronic, software and safety engineering
- ☐ Repairing and servicing automobiles such as cars, trucks, motorcycles, scooters etc
- ☐ Understanding the mechanism of vehicle chassis, internal combustion engine, electrical systems, motor transport affairs, workshop technology

COURSE REQUIREMENTS: The learner should have the basic knowledge of science.

COURSE LEVEL: This is a course for class XI and XII. On completion of this course, a student can take up a higher level course in the area of Automotive Sector.

COURSE DURATION: **600 hrs**

Class 11	:	300 hrs
Class 12	:	300 hrs
Total	**:**	**600 hrs**

2. SCHEME OF UNITS

This course is a planned sequence of instructions consisting of Units meant for developing employability and vocational competencies of students of Class 9 and 10 opting for vocational subject along with general education subjects. The unit-wise distribution of hours and marks for Class 9 is as follows:

CLASS 11			
Units		**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1 : Communication Skills-III	25	**10**
	Unit 2 : Self-management Skills-III	25	
	Unit 3 : Information and Communication Technology Skills-III	20	
	Unit 4 : Entrepreneurial Skills-III	25	
	Unit 5 : Green Skills-III	15	
		110	**10**
Part B	**Vocational Skills**		
	Unit 1: Introduction to Engineering Geometrics and drawing	20	**40**
	Unit2:Fasteners	15	
	Unit3: Materials for construction of automotive components	20	
	Unit 4: Measuring instrument	20	
	Unit 5: Regular maintenance of an engine	15	
	Unit 6: Regular maintenance of Transmission system	20	
	Unit7:Regular maintenance of Gear box	20	
	Unit 8: Service of wheels	15	
	Unit 9 : Regular maintenance of Tubes and Tyres	10	
	Unit 10 : Regular Maintenance of Brakes	10	
		165	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
		10	**35**
Part D	**Project Work/Field Visit**		

	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
		15	**15**
	Grand Total	**300**	**100**

The unit-wise distribution of hours and marks for Class 12 is as follows:

CLASS 12			
Units		**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1 : Communication Skills-IV	20	10
	Unit 2 : Self-management Skills-IV	10	
	Unit 3 : Information and Communication Technology Skills-IV	20	
	Unit 4 : Entrepreneurial Skills-IV	15	
	Unit 5 : Green Skills-IV	10	
		110	**10**
Part B	**Vocational Skills**		
	Unit 1: Service Manual	30	**30**
	Unit 2 : Serviceability, Replacement or Repair of Engine Components	30	
	Unit 3: Transmission system	20	
	Unit 4: Suspension system	20	
	Unit5: Auto Electrical System	65	
		165	**40**
Part C	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
		10	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
		15	**15**
	Grand Total	**300**	**100**

3. TEACHING/TRAINING ACTIVITIES

The teaching and training activities have to be conducted in classroom, laboratory/ workshops and field visits. Students should be taken to field visits for interaction with experts and to expose them to the various tools, equipment, materials, procedures and operations in the workplace. Special emphasis should be laid on the occupational safety, health and hygiene during the training and field visits.

CLASSROOM ACTIVITIES

Classroom activities are an integral part of this course and interactive lecture sessions, followed by discussions should be conducted by trained vocational teachers. Vocational teachers should make effective use of a variety of instructional or teaching aids, such as audio-video materials, colour slides, charts, diagrams, models, exhibits, hand-outs, online teaching materials, etc. to transmit knowledge and impart training to the students.

PRACTICAL WORK IN LABORATORY/WORKSHOP

Practical work may include but not limited to hands-on-training, simulated training, role play, case based studies, exercises, etc. Equipment and supplies should be provided to enhance hands-on learning experience of students. Only trained personnel should teach specialized techniques. A training plan that reflects tools, equipment, materials, skills and activities to be performed by the students should be submitted by the vocational teacher to the Head of the Institution.

FIELD VISITS/ EDUCATIONAL TOUR

In field visits, children will go outside the classroom to obtain specific information from experts or to make observations of the activities. A checklist of observations to be made by the students during the field visits should be developed by the Vocational Teachers for systematic collection of information by the students on the various aspects. Principals and Teachers should identify the different opportunities for field visits within a short distance from the school and make necessary arrangements for the visits. At least three field visits should be conducted in a year.

4. ASSESSMENT AND CERTIFICATION

Upon successful completion of the course by the candidate, the Central/ State Examination Board for Secondary Education and the respective Sector Skill Council will certify the competencies.

The National Skills Qualifications Framework (NSQF) is based on outcomes referenced to the National Occupation Standards (NOSs), rather than inputs. The NSQF level descriptors, which are the learning outcomes for each level, include the process, professional knowledge, professional skills, core skills and responsibility. The assessment is to be undertaken to verify that individuals have the knowledge and skills needed to perform a particular job and that the learning programme undertaken has delivered education at a given standard. It should

be closely linked to certification so that the individual and the employer could come to know the competencies acquired through the vocational subject or course. The assessment should be reliable, valid, flexible, convenient, cost effective and above all it should be fair and transparent. Standardized assessment tools should be used for assessment of knowledge of students. Necessary arrangements should be made for using technology in assessment of students.

KNOWLEDGE ASSESSMENT (THEORY)

Knowledge Assessment should include two components: one comprising of internal assessment and second an external examination, including theory examination to be conducted by the Board. The assessment tools shall contain components for testing the knowledge and application of knowledge. The knowledge test can be objective paper based test or short structured questions based on the content of the curriculum.

WRITTEN TEST

It allows candidates to demonstrate that they have the knowledge and understanding of a given topic. Theory question paper for the vocational subject should be prepared by the subject experts comprising group of experts of academicians, experts from existing vocational subject experts/teachers, and subject experts from university/colleges or industry. The respective Sector Skill Council should be consulted by the Central/State Board for preparing the panel of experts for question paper setting and conducting the examinations.

The blue print for the question paper may be as follows:

Duration: 3 hrs **Max. Mark: 30**

		No. of Questions			
S.No.	**Typology of Question**	**Very Short Answer (1 mark)**	**Short Answer (2 Marks)**	**Long Answer (3 Marks)**	**Marks**
1.	Remembering – (Knowledge based simple recall questions, to know specific facts, terms, concepts, principles, or theories; identify, define or recite, information)	**3**	**2**	**2**	**13**
2.	Understanding – (Comprehension – to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	**2**	**3**	**2**	**14**
3.	Application – (Use abstract information in concrete situation, to apply knowledge to new situations: Use given content to interpret a situation, private an example, or solve a problem)	**0**	**2**	**1**	**07**
4.	High Order Thinking Skills –	**0**	**2**	**0**	**04**

	(Analysis & Synthesis – Classify, compare, contrast, or differentiate between different pieces of information; Organize and/ or integrate unique pieces of information from a variety of sources)				
5.	Evaluation – (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	**0**	**1**	**0**	**02**
	Total	**5x1=5**	**10x2=20**	**5x3=15**	**40 (20 questions)**

SKILL ASSESSMENT (PRACTICAL)

Assessment of skills by the students should be done by the assessors/examiners on the basis of practical demonstration of skills by the candidate, using a competency checklist. The competency checklist should be developed as per the National Occupation Standards (NOSs) given in the Qualification Pack for the Job Role to bring about necessary consistency in the quality of assessment across different sectors and Institutions. The student has to demonstrate competency against the performance criteria defined in the National Occupation Standards and the assessment will indicate that they are 'competent', or are 'not yet competent'. The assessors assessing the skills of the students should possess a current experience in the industry and should have undergone an effective training in assessment principles and practices. The Sector Skill Councils should ensure that the assessors are provided with the training on the assessment of competencies.

Practical examination allows candidates to demonstrate that they have the knowledge and understanding of performing a task. This will include hands-on practical exam and viva voce. For practical, there should be a team of two evaluators – the subject teacher and the expert from the relevant industry certified by the Board or concerned Sector Skill Council. The same team of examiners will conduct the viva voce.

Project Work (individual or group project) is a great way to assess the practical skills on a certain time period or timeline. Project work should be given on the basis of the capability of the individual to perform the tasks or activities involved in the project. Projects should be discussed in the class and the teacher should periodically monitor the progress of the project and provide feedback for improvement and innovation. Field visits should be organised as part of the project work. Field visits can be followed by a small-group work/project work. When the class returns from the field visit, each group might be asked to use the information that they have gathered to prepare presentations or reports of their observations. Project work should be assessed on the basis of practical file or student portfolio.

Student Portfolio is a compilation of documents that supports the candidate's claim of competence. Documents may include reports, articles, photos of products prepared by students in relation to the unit of competency.

Viva voce allows candidates to demonstrate communication skills and content knowledge. Audio or video recording can be done at the time of viva voce. The number of external examiners would be decided as per the existing norms of the Board and these norms should

be suitably adopted/adapted as per the specific requirements of the vocational subject. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits.

CONTINUOUS AND COMPREHENSIVE EVALUATION

Continuous and Comprehensive Evaluation (CCE) refers to a system of school-based evaluation of students that covers all aspects of student's development. In this scheme, the term `continuous' is meant to emphasize that evaluation of identified aspects of students `growth and development' is a continuous process rather than an event, built into the total teaching-learning process and spread over the entire span of academic session. The second term `comprehensive' means that the scheme attempts to cover both the scholastic and the co-scholastic aspects of students' growth and development. For details, the CCE manual of Central Board of Secondary Education (CBSE) or the guidelines issued by the State Boards on the procedure for CCE should be followed by the Institutions.

5. UNIT CONTENTS

CLASS 11

Part A: Employability Skills

S.No.	Units	Duration (Hrs)
1.	Communication Skills - III	25
2.	Self-management Skills - IIII	25
3.	Information and Communication Technology Skills- III	20
4.	Entrepreneurial Skills - III	25
5.	Green Skills - III	15
	Total	**110**

Sub-Unit 1: Communication Skill - III

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Total Duration (25 Hrs)
1. Demonstrate knowledge of various methods of communication	1. Methods of communication - Verbal - Non-verbal - Visual	1. Writing pros and cons of written, verbal and non-verbal communication 2. Listing do's and don'ts for avoiding common body language mistakes	**10**
2. Identify specific communication styles	1. Communication styles- assertive, aggressive, passive-aggressive, submissive, etc.	2. Observing and sharing communication styles of friends, teachers and family members and adapting the best	**10**

		practices 3. Role plays on communication styles.	
3. Demonstrate basic writing skills	1. Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	1. Demonstration and practice of writing sentences and paragraphs on topics related to the subject	**05**

Sub-Unit 2: Self-management - III

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Total Duration (25 Hrs)
1. Demonstrate impressive appearance and grooming	1. Describe the importance of dressing appropriately, looking decent and positive body language 2. Describe the term grooming 3. Prepare a personal grooming checklist 4. Describe the techniques of self-exploration	1. Demonstration of impressive appearance and groomed personality 2. Demonstration of the ability to self- explore	**07**
2. Demonstrate team work skills	1. Describe the important factors that influence in team building 2. Describe factors influencing team work	1. Group discussion on qualities of a good team 2. Group discussion on strategies that are adopted for team building and team work	**08**
3. Apply time management strategies and techniques	1. Meaning and importance of time management – setting and prioritizing goals, creating a schedule, making lists of tasks, balancing work and leisure, using different optimization tools to break large tasks into smaller tasks.	1. Game on time management 2. Checklist preparation 3. To-do-list preparation	**10**

Sub-Unit 3: Information & Communication Technology - III

Learning Outcome	Theory (08 hrs)	Practical (12 hrs)	Total Duration

			(20 Hrs)
1. Create a document on word processor	1. Introduction to word processing. 2. Software packages for word processing. 3. Opening and exiting the word processor. 4. Creating a document	1. Demonstration and practice of the following: • Listing the features of word processing • Listing the software packages for word processing • Opening and exit the word processor • Creating a document	**10**
2. Edit, save and print a document in word processor	1. Editing text 2. Wrapping and aligning the text 3. Font size, type and face. 4. Header and Footer 5. Auto correct 6. Numbering and bullet 7. Creating table 8. Find and replace 9. Page numbering. 10. Printing document. 11. Saving a document in various formats.	1. Demonstration and practising the following: • Editing the text • Word wrapping and alignment • Changing font type, size and face • Inserting header and footer • Removing header and footer 2. Using autocorrect option 3. Insert page numbers and bullet 4. Save and print a document	**10**

Sub-Unit 4: Entrepreneurship Development - III

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Total Duration (25 Hrs)
1. Describe the significance of entrepreneurial values and attitude	1. Values in general and entrepreneurial values 2. Entrepreneurial value orientation with respect to innovativeness, independence, outstanding performance and respect for work	1. Listing of entrepreneurial values by the students. 2. Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur 3. Exhibiting entrepreneurial values in Ice breaking, rapport building, group work and home	**10**

		assignments	
2. Demonstrate the knowledge of attitudinal changes required to become an entrepreneur	1. Attitudes in general and entrepreneurial attitudes 2. Using imagination/ intuition 3. Tendency to take moderate risk 4. Enjoying freedom of expression and action 5. Looking for economic opportunities 6. Believing that we can change the environment 7. Analyzing situation and planning action 8. Involving in activity	1. Preparing a list of factors that influence attitude in general and entrepreneurial attitude 2. Demonstrating and identifying own entrepreneurial attitudes during the following micro lab activities like thematic appreciation test 3. Preparing a short write-up on "who am I" 4. Take up a product and suggest how its features can be improved 5. Group activity for suggesting brand names, names of enterprises, etc.	**15**

Sub-Unit 5: Green Skills - III

Learning Outcome	Theory (07 hrs)	Practical (08 hrs)	Total Duration (15 Hrs)
1. Describe importance of main sector of green economy	1. Main sectors of green economy- E-waste management, green transportation, renewal energy, green construction, water management 2. Policy initiatives for greening economy in India	1. Preparing a poster on any one of the sectors of green economy 2. Writing a two-page essay on important initiatives taken in India for promoting green economy	**08**
2. Describe the major green Sectors/Areas and the role of various stakeholder in green economy	1. Stakeholders in green economy 2. Role of government and private agencies in greening cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries	1. Preparing posters on green Sectors/Areas: cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries	**07**
Total	**45**	**65**	**110**

Part B: Vocational Skills

S. No.	Units	Duration (Hrs.)
1	Introduction to Engineering Geometrics and drawing	20
2	Fastener	15
3	Materials for construction of automotive components	20
4	Measuring instruments	20
5	Regular maintenance of an engine	15
6	Regular maintenance of Transmission system	20
7	Regular maintenance of Gear box	20
8	Service of wheels	15
9	Regular maintenance of tubes and tyres	10
10	Regular Maintenance of brakes	10
	Total	**165**

Unit 1: Introduction to Engineering Geometrics and drawing			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Draw engineering geometric and drawings	Drawing tools Engineering drawing Different types of projections Dimensioning technique	Identify and describe drawing tools Draw geometric construction Identify and describe various simple engineering drawing Draw engineering drawing Draw various projections Measure and draw dimesioning	
Total			**20**

Unit 2: Fastener			
Learning Outcome	**Theory**	**Practical**	**Duration (15 Hrs)**
Identify different type of fasteners used in a vehicle	Fasteners and their type and uses Various procedure used for removal of fasteners in a vehicle Various special tools for handling of fasteners Importance of specified torque values for tightening the fastener	Identify various fasteners used in a vehicle. Handle rusty, broken, spoiled threaded fasteners Use of special tools for removal of defected/ affected fasteners Selection of appropriate fasteners and tightening at appropriate torque.	**15**

Total		**15**

Unit 3: Materials for construction of automotive components			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Selection and identification of material used in automobiles and their basic manufacturing process	Engineering materials and its type Manufacturing process used in manufacturing the component	Identification of engineering material used in automobiles Selection and describing engineering material Making of a list of basic manufacturing process used in fabrication of a part of automobile Writing of list of process used in manufacturing	**20**
Total			**20**

Unit 4: Measuring instrument			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Handle and use the various measuring equipments	Dial gauge, telescopic gauge and bore gauge and their least count, Vernier caliper and tyre depth gauge Micrometer Hydrometer and bevel gauge Torque wrench and filler gauge Dashboard and indicators in a vehicle	Handling and Use of Vernier caliper and tyre depth gauge Setting and uses of micrometer Handling and Use of hydrometer and bevel gauge Handling and Use of torque wrench and filler gauge Identification of various symbolic (gauges) information on dashboard in a vehicle	**20**
Total			**20**

Unit 5: Regular maintenance of an engine			
Learning Outcome	**Theory**	**Practical**	**Duration (15 Hrs)**
Describe regular maintenance procedures for an engine	Inspection of an engine Washing of the engine Tuning fuel system of an engine Tuning of an ignition system of an engine	Tracing different leakages like oil, coolant and combustion gases Washing of an engine externally Handling of the washing	**15**

	Tuning of engine lubrication system Tuning of engine cooling system Tightening of fastener (Nuts/Bolts/Screws) Engine Timing	equipment Listing the precautions during washing of engine Tracing the fuel system in a given vehicle engine Checking of the fuel line for leakage Conducting fuel pump test and compare its reading with the service manual Practice of setting of carburettor for ideal speed Testing of nozzle for pressure Do tracing of the primary and secondary circuit(s) Checking the terminals for loose connection Cleaning spark plug and distributor Checking the level and quality of lubricating oil Replacing the oil and Changing the oil filter check the oil pressure Reading temperature gauge Checking circulation of water in cooling system Tracing for coolant leakage Tightening the fasteners with specified torque and with sequence in the following components: cylinder head, induction manifold, exhaust manifold and engine foundation nuts and bolt. Checking and observing importance of engine timing Observing the sound change after tuning process	
Total			**15**

Unit 6: Regular maintenance of Transmission system			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Maintenance procedure on the transmission system of a vehicle	Transmission system Clutch maintenance Clutch adjustments	Explain the function of different units used to transmit engine power identify the different units	**20**

		of the transmission system clean motor cycle drive chain Lubricate the drive chain Adjust the drive chain Able to inspect the functioning of clutch linkage for free movement Lubricate the clutch linkage Tighten the fasteners as per need Doing of setting of free play adjustment of clutch Setting of pedal travel adjustment of clutch pedal Inspecting the power transmission from clutch assembly	
Total			**20**

Unit 7: Regular maintenance of Gear Box			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Maintenance of gears	Lubrication of gear box Setting of gears	Checking the level of lubricating oil and quality of oil in the gear box Changing of the lubricating oil from the gearbox Checking the various combination of gears Setting of gear lever and selecting mechanism Check the power transmission through respective gears	**20**
Total			**20**

Unit 8: Service of wheels			
Learning Outcome	**Theory**	**Practical**	**Duration (15 Hrs)**
Identify the components of service of wheels	Importance of wheels Importance of hub greasing and bearing play adjustments	Identify different types of wheels Make a list the functions of wheels Practice of removing the wheel from axle Practice of removing the hub Practice of removing and	**15**

		replacing wheel stud Cleaning the wheel bearing Greasing of hub and wheel bearing Do adjust wheel play (Bearing) adjustment	
Total			**15**

Unit 9: Regular maintenance of tubes and tyres			
Learning Outcome	**Theory**	**Practical**	**Duration (25 Hrs)**
1. **repairing puncture in tyres and their maintenance**	Tyres and their maintenance Tyre puncture	Measuring air pressure in tyres as per specifications Doing rotation of tyres for normal wear Do the repairing practice of punctured tubes with hot patch, and cold patch Do repairing practice of a puncture of tubeless tyres	**10**
Total			**10**

Unit 10: Regular Maintenance of Brakes			
Learning Outcome	**Theory**	**Practical**	**Duration (10 Hrs)**
Brakes and its maintenance	Brake and its maintenance Brake and its adjustment	Identify the different components of different types of brakes Inspect and lubricate the controls of the braking system Carry out Free pedal/lever adjustment Carry out Checking efficiency of brake Able to carry out adjustments of rear brake Do the adjustments of front brake	**10**
Total			**10**

CLASS 12

Part A: Employability Skills

S.No.	Units	Duration (Hrs)
1.	Communication Skills - IV	25
2.	Self-management Skills - IV	25
3.	Information and Communication Technology Skills- IV	20
4.	Entrepreneurial Skills - IV	25
5.	Green Skills - IV	15
	Total	**110**

Sub-Unit 1: Communication Skills - IV

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Total Duration (25 Hrs)
1. Describe the steps to active listening skills	1. Importance of active listening at workplace 2. Steps to active listening	1. Demonstration of the key aspects of becoming active listener 2. Preparing posters of steps for active listening	**10**
2. Demonstrate basic writing skills	2. Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph	1. Demonstration and practice of writing sentences and paragraphs on topics related to the subject	**15**

Sub-Unit 2: Self-management -IV

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Total Duration (25 Hrs)
1. Describe the various factors influencing self-motivation	1. Finding and listing motives (needs and desires); 2. Finding sources of motivation and inspiration (music, books, activities);expansive thoughts; living fully in the present moment; dreaming big	1. Group discussion on identifying needs and desire 2. Discussion on sources of motivation and inspiration	**10**

2. Describe the basic personality traits, types and disorders	1. Describe the meaning of personality 2. Describe how personality influence others 3. Describe basic personality traits 4. Describe common personality disorders- paranoid, antisocial, schizoid, borderline, narcissistic, avoidant, dependent and obsessive	1. Demonstrate the knowledge of different personality types	**15**

Sub-Unit 3: Information & Communication Technology - IV

Learning Outcome	Theory (08 hrs)	Practical (12 hrs)	Total Duration (20 Hrs)
1. Perform tabulation using spreadsheet application	1. Introduction to spreadsheet application 2. Spreadsheet applications 3. Creating a new worksheet 4. Opening workbook and entering text 5. Resizing fonts and styles 6. Copying and moving 7. Filter and sorting 8. Formulas and functions 9. Password protection. 10. Printing a spreadsheet. 11. Saving a spreadsheet in various formats.	1. Demonstration and practice on the following: • Introduction to the spreadsheet application • Listing the spreadsheet applications • Creating a new worksheet • Opening the workbook and enter text • Resizing fonts and styles • Copying and move the cell data • Sorting and Filter the data • Applying elementary formulas and functions • Protecting the spreadsheet with password • Printing a spreadsheet • Saving the spreadsheet in various formats.	**10**
2. Prepare presentation using presentation application	1. Introduction to presentation 2. Software packages for presentation	1. Demonstration and practice on the following: • Listing the software	**10**

	3. Creating a new presentation 4. Adding a slide 5. Deleting a slide 6. Entering and editing text 7. Formatting text 8. Inserting clipart and images 9. Slide layout 10. Saving a presentation 11. Printing a presentation document.	packages for presentation • Explaining the features of presentation • Creating a new presentation • Adding a slide to presentation. • Deleting a slide • Entering and edit text • Formatting text • Inserting clipart and images • Sliding layout • Saving a presentation • Printing a presentation document	

Sub-Unit 4:Entrepreneurship Development - IV

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Total Duration (25 Hrs)
1. Identify the general and entrepreneurial behavioural competencies	1. Barriers to becoming entrepreneur 2. Behavioural and entrepreneurial competencies – adaptability/decisive ness, initiative/ perseverance, interpersonal skills, organizational skills, stress management, valuing service and diversity	1. Administering self-rating questionnaire and score responses on each of the competencies 2. Collect small story/ anecdote of prominent successful entrepreneurs 3. Identify entrepreneurial competencies reflected in each story and connect it to the definition of behavioural competencies 4. Preparation of competencies profile of students	**10**
2. Demonstrate the knowledge of self-assessment of behavioural competencies	1. Entrepreneurial competencies in particular : self - confidence, initiative, seeing and acting on opportunities, concern for quality, goal setting and risk taking, problem solving and creativity, systematic planning	1. Games and exercises on changing entrepreneurial behaviour and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and	**15**

	and efficiency, information seeking, persistence, influencing and negotiating, team building	creativity	

Sub-Unit 5: Green Skills - IV

Learning Outcome	Theory (05 hrs)	Practical (10 hrs)	Total Duration (15 Hrs)
1. Identify the role and importance of green jobs in different sectors	1. Role of green jobs in toxin-free homes, 2. Green organic gardening, public transport and energy conservation, 3. Green jobs in water conservation 4. Green jobs in solar and wind power, waste reduction, reuse and recycling of wastes, 5. Green jobs in green tourism 6. Green jobs in building and construction 7. Green jobs in appropriate technology 8. Role of green jobs in Improving energy and raw materials use 9. Role of green jobs in limiting greenhouse gas emissions 10. Role of green jobs minimizing waste and pollution 11. Role of green jobs in protecting and restoring ecosystems 12. Role of green jobs in support adaptation to the effects of climate change	1. Listing of green jobs and preparation of posters on green job profiles 2. Prepare posters on green jobs.	**15**
Total	**43**	**67**	**110**

Part B: Vocational Skills

S.No.	Units	Duration (Hrs)
1.	Unit 1: Service Manual	30
2.	Unit 2 : Serviceability, Replacement or Repair of Engine Components	30
3.	Unit 3: Transmission system	20
4.	Unit 4: Suspension system	20
5.	Unit5: Auto Electrical System	65
	Total	**165**

Unit 1: Service Manual			
Learning Outcome	**Theory**	**Practical**	**Duration (30 Hrs)**
Use of service manual	Service manual and its use in workshop	Reading and understanding of service manual	**30**
Total			**30**

Unit 2: Serviceability, replacement or repair of engine components			
Learning Outcome	**Theory**	**Practical**	**Duration (30 Hrs)**
Do test and replace/repair of components in a auto engine	Valve mechanism, reasons for leakage Importance of reface valve, cutting of the valve seat, and valve lapping operations Use of valve spring, valve seat and valve guide Piston ring and gapes with piston clearance in cylinder bore Connecting rod Engine bearing Cooling System functions Importance, advantages and use of MPFI Loose connection and reasons Nozzel pressure	Test for leakage from the valve mechanism Do the reface valve, cut the valve seat, valve lapping operations Inspecting valve spring, valve seat and valve guide Inspecting and replace piston ring Inspecting the piston clearance in cylinder bore Inspect and do replacement of connecting rod Checking and doing replacement of engine bearings with appropriate clearance	**30**

	Throttle chamber Importance and use of CRDI Reasons for loose connection and rectification Faulty nozzle, sensors Turbo charger	Identify and locate faults in the cooling system Replace defective component in the cooling system Able to trace and inspect the components of MPFI systems with fuel and air intake Able to trace for the loose connection Replace faulty nozzle, sensors Servicing throttle body To do trace connection and inspect the components of CRDI systems with fuel and air intake Checking of loose connection Replacing faulty nozzle, sensors Do servicing of turbo charger	
Total			**30**

Unit 3: Transmission system			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Explain working of transmission system	Clutch adjustment and overhaul procedure Importance of propeller shaft, universal and slip joints Differential unit and its adjustment Introduction to automatic power transmission	Do adjustment in Clutch Overhauling practices clutch assembly used in vehicle and inspection of components Servicing/ overhauling of propeller shaft, universal and slip joints Servicing and adjustment of differential unit Identify and understand automatic transmission system used in power transmission	**20**
Total			**20**

Unit 4: Suspension system			
Learning Outcome	**Theory**	**Practical**	**Duration (20 Hrs)**
Test working of suspension system	Suspension system in a vehicle with introductory air suspension Cambering of leaf springs, shackle, shackle pin and centre bolt Strut/shock absorbers, steering linkages Manual steering systems Power steering systems Power steering system with EPS and Hydraulic Wheel balancing Wheel alignment 1. Steering adjustment	Inspect and identify the faulty suspension system, Carry out the maintenance Trace trouble in suspension system Replace the defective components of suspension system Tracing and test working of strut, shock, absorber and steering linkage Replace the defective components Check working of the manual steering system Check the working of power steering system Check and handle power steering system with EPS and Hydraulic Do wheel balancing Carryout the wheel alignment Do steering adjustment	**20**
Total			**20**
Unit 5: Auto Electrical			
Learning Outcome	**Theory**	**Practical**	**Duration (65 Hrs)**
Auto electrical application in a vehicle	Use of electrical symbol and circuit diagram Multi meter and Oscilloscope and its uses Battery and its maintenance Electrical connection, lights and their uses Fuse Amperage Horn assembly, electrical fuel gauge and fuel pump Battery charging system Self starter circuit diagram and its components Circuit diagram for ignition system and components Wiper and its servicing method Heater Ventilator Air Condition system in a Vehicle and its use	Practice of reading electrical symbol and circuit diagram, colour code and specification of cables and wiring hardness Checking multi meter, timing light (stroboscope) and oscilloscope for resistance, ampererage and voltage Regular maintenance of the battery Identify the components of earthling Practice of topping Up of battery electrolyte Do the replacement of positive / negative battery cable Checking electrical	**65**

		connection, test and replace of head Light / indicator/ brake Bulbs Practice of replacement of fuses and do continuity test Practice of replacement of Horn assembly, electrical fuel gauge and fuel pump their application and maintenance Draw and check the circuit for battery charging system with alternator Draw and check self starter circuit and its component Draw and check circuit diagram for ignition system Do the servicing of the wiper system Identify the components of HVAC system in	
Total			**65**

6. ORGANISATION OF FIELD VISITS

In a year, at least 3 field visits/educational tours should be organised for the students to expose them to the activities in the workplace like . Automobile show room, Automobile Fair, Different section of show room and service centre, Telecaller centre, Service centre

Visit a Automobile showroom and service centre and observe the following: During the visit, students should obtain the following information from the owner or the supervisor of the showroom:

1. Activity of Automobile show room
2. Different section of show room and service centre
3. Service centre activity
4. Automobile Fair
5. Different section of showroom
6. Number of Vehicle sold annually
7. Power transmission section of engine
8. Type of engine and technology
9. Automation system
10. Denting and painting section
11. Electrical section
12. Auto electrical system

7. LIST OF EQUIPMENT AND MATERIALS

The list given below is suggestive and an exhaustive list should be prepared by the vocational teacher. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

1. Two Post lift
2. Air compressor
3. Wheel balancer
4. Bench vice
5. Work tables
6. Bench grinder
7. Oil draining & filling equipment
8. Cooling system tester
9. Multi meter
10. Hydro meter
11. BC clamp meter
12. Coolant tester
13. Battery & charging system tester (Megatronics)
14. Diagnostic tool (genesis Evo)
15. Hand tools
16. Pneumatic tools
17. Torque wrenches

18. Car seat covers
19. Steering covers
20. Gear Knob covers
21. Fender covers/kits
22. Floor mats
23. Cotton gloves
24. Hard toed boots
25. Sun glasses (3 m)
26. Bump caps
27. Air tester filter machine
28. Hydraulic press
29. Hydraulic jacks
30. Vehicle safety stands
31. Parts washing station car
32. Pullers
33. Sliding hammer
34. Wheel aligner
35. Head Light Focusing
36. A/c Machine (124 Robin air)
37. General Hand Tools
38. A/c Leakage Tester
39. Old car

8. VOCATIONAL TEACHER'S/ TRAINER'S QUALIFICATION AND GUIDELINES

Qualification and other requirements for appointment of vocational teachers/trainers on contractual basis should be decided by the State/UT. The suggestive qualifications and minimum competencies for the vocational teacher should be as follows:

S.No.	Qualification	Minimum Competencies	Age Limit
1.	Degree in Automobile Engineering /Mechanical Engineering from a recognized Institute /University, with at least 1 year work / teaching experience Or Diploma in Automobile Engineering/Mechanical Engineering from a recognized Institute /University, with at least 1 year work / teaching experience	• Effective communication skills (oral and written) • Basic computing skills.	18-37 years (as on Jan. 01 (year)) Age relaxation to be provided as per Govt. rules.

Vocational Teachers/Trainers form the backbone of Vocational Education being imparted as an integral part of Rashtriya Madhyamik Shiksha *Abhiyan* (RMSA). They are directly involved in teaching of vocational subjects and also serve as a link between the industry and the schools for arranging industry visits, On-the-Job Training (OJT) and placement.

These guidelines have been prepared with an aim to help and guide the States in engaging quality Vocational Teachers/Trainers in the schools. Various parameters that need to be looked into while engaging the Vocational Teachers/Trainers are mode and procedure of selection of Vocational Teachers/Trainers, Educational Qualifications, Industry Experience, and Certification/Accreditation.

The State may engage Vocational Teachers/Trainers in schools approved under the component of Vocationalisation of Secondary and Higher Secondary Education under RMSA in the following ways:

(i) directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education(PSSCIVE), NCERT or the respective Sector Skill Council(SSC)

OR

(ii) Through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

* *The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteria which the different organisations involved in education and training must meet in order to be accredited by competent bodies to provide government-funded education and training/skills activities. This is applicable to all organizations offering NSQF-compliant qualifications.*

The educational qualifications required for being a Vocational Teacher/Trainer for a particular job role are clearly mentioned in the curriculum for the particular NSQF compliant job role. The State should ensure that teachers / trainers deployed in the schools have relevant technical competencies for the NSQF qualification being delivered. The Vocational Teachers/Trainers preferably should be certified by the concerned Sector Skill Council for the particular Qualification Pack/Job role which he will be teaching. Copies of relevant certificates and/or record of experience of the teacher/trainer in the industry should be kept as record.

To ensure the quality of the Vocational Teachers/Trainers, the State should ensure that a standardized procedure for selection of Vocational Teachers/Trainers is followed. The selection procedure should consist of the following:

(i) Written test for the technical/domain specific knowledge related to the sector;
(ii) Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
(iii) Practical test/mock test in classroom/workshop/laboratory.

In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP.

The State should ensure that the Vocational Teachers/ Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools.

The State should ensure that the existing trainers undergo in-service training of 5 days every year to make them aware of the relevant and new techniques/approaches in their sector and understand the latest trends and policy reforms in vocational education.

The Head Master/Principal of the school where the scheme is being implemented should facilitate and ensure that the Vocational Teachers/Trainers:

(i) Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
(ii) Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
(iii) Make effective use of learning aids and ICT tools during the classroom sessions;
(iv) Engage students in learning activities, which include a mix of different methodologies, such as project based work, team work, practical and simulation based learning experiences;
(v) Work with the institution's management to organise skill demonstrations, site visits, on-job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
(vi) Identify the weaknesses of students and assist them in up-gradation of competency;
(vii) Cater to different learning styles and level of ability of students;
(viii) Assess the learning needs and abilities, when working with students with different abilities
(ix) Identify any additional support the student may need and help to make special arrangements for that support;
(x) Provide placement assistance

Assessment and evaluation of Vocational Teachers/Trainers is very critical for making them aware of their performance and for suggesting corrective actions. The States/UTs should ensure that the performance of the Vocational Teachers/Trainers is appraised annually. Performance based appraisal in relation to certain pre-established criteria and objectives should be done periodically to ensure the quality of the Vocational Teachers/Trainers. Following parameters may be considered during the appraisal process:

1. Participation in guidance and counselling activities conducted at Institutional, District and State level;
2. Adoption of innovative teaching and training methods;
3. Improvement in result of vocational students of Class X or Class XII;
4. Continuous up-gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
5. Membership of professional society at District, State, Regional, National and International level;

6. Development of teaching-learning materials in the subject area;
7. Efforts made in developing linkages with the Industry/Establishments;
8. Efforts made towards involving the local community in Vocational Education
9. Publication of papers in National and International Journals;
10. Organisation of activities for promotion of vocational subjects;
11. Involvement in placement of students/student support services.

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