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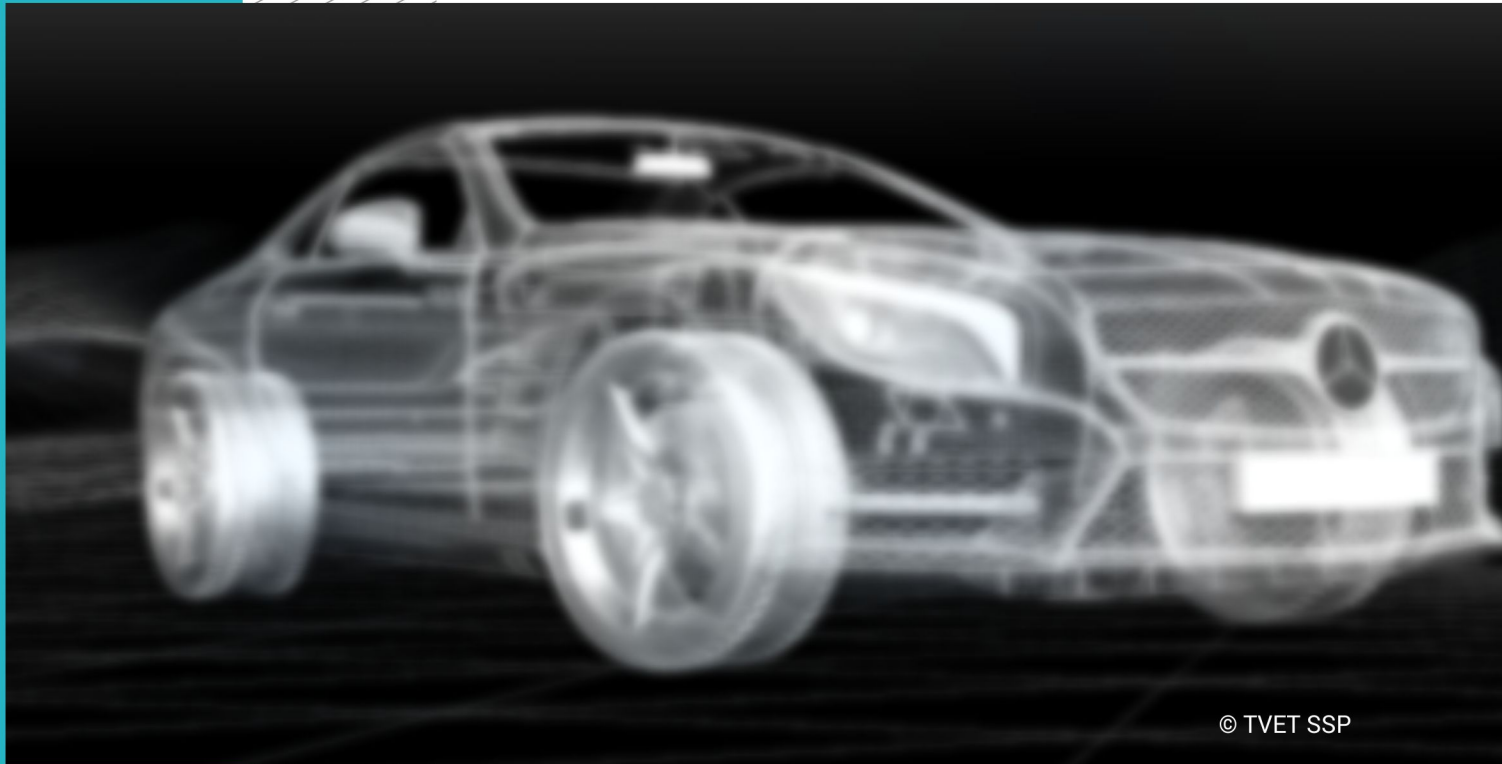
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# AUTOMOTIVE MECHATRONICS



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## CBT CURRICULUM

National Vocational Certificate Level 4

Version 1 - November, 2019



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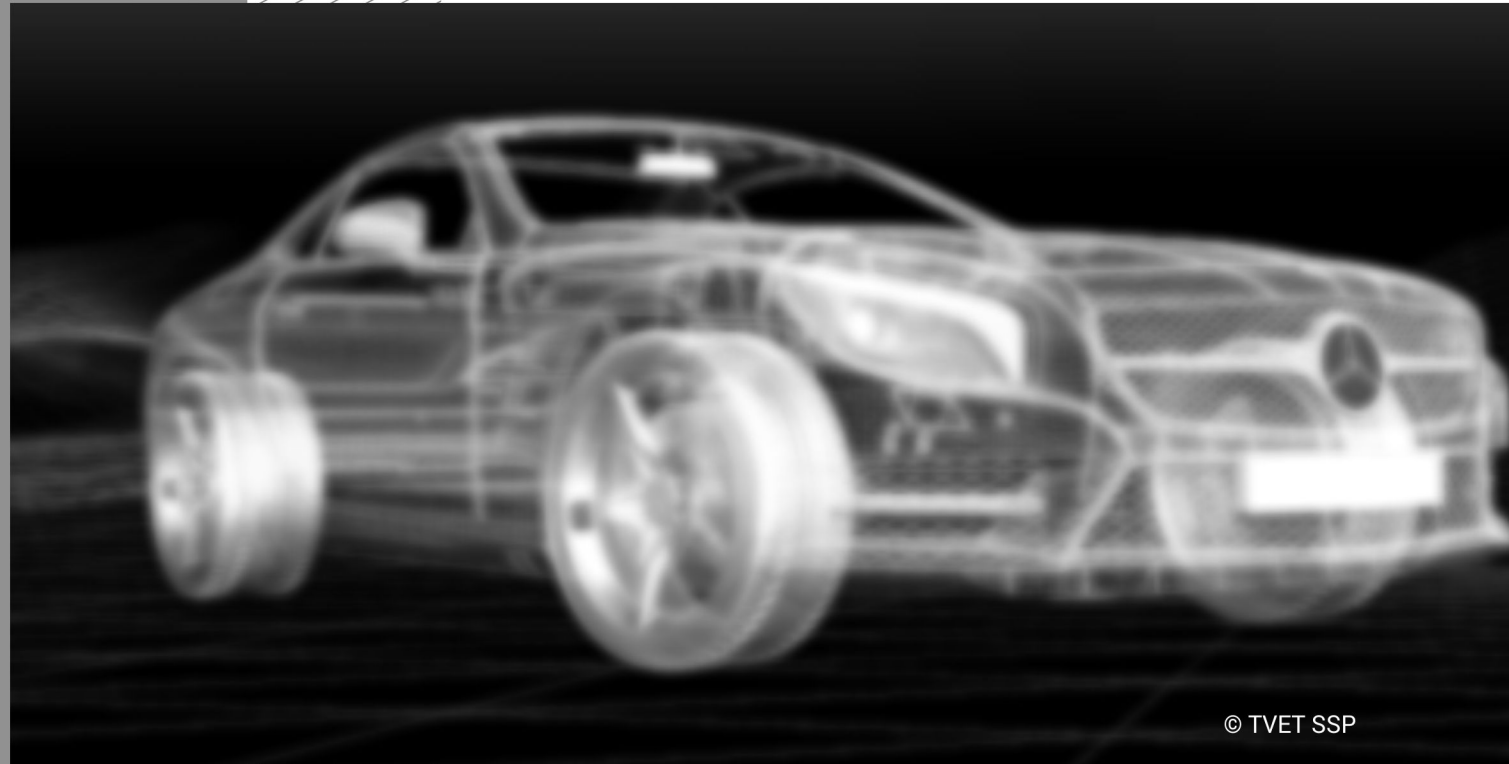
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**Islamabad, Pakistan**

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## **Introduction**

### **Definition/ Description of the training program for Automotive Mechatronics Lev-4**

Automotive Mechatronics field is in demand across the country and abroad. Mechatronics combines principles of mechanics, electronics and computing to improve technical systems and to create new equipment with built-in 'artificial intelligence'. In this qualification, trainees will maintain fuel control system, emission control system, conserve power transmission system and service comfort and safety system. Trainees will be learned to maintain controlled electrical & electronic system, network system and hybrid system. They will also be learned to establish & maintain the occupational health & safety system, perform advanced communication and perform remedial measures at work, by which they will be able to work in a safe & professional environment.

### **Purpose of the training program**

The purpose of the Automotive Mechatronics course is to engage young people with a program of development that will provide them with the knowledge, skills and understanding to start this career in Pakistan. Upon completion of this qualification, trainees will be ready to join the workforce with a healthy number of options in Automobile industry.

### **Overall objectives of training program**

The overall objectives of the Automotive Mechatronics program are:

- Managing an Automobile Workshop (technically and economically)
- Selecting tools and equipment used to maintain fuel control system, emission control system, service comfort & safety system and hybrid system
- Selecting tools, equipment's and consumables accurately according to Job specification
- Sequencing the different stages of preparation, diagnosis and maintenance
- Working safely and professionally

### **Competencies to be gained after completion of course**

At the end of the course, the trainee must have attained the following competencies:

1. Contribute to Work Related Health and Safety (WHS) Initiatives
2. Analyze Workplace Policy and Procedures
3. Perform Advanced Communication

4. Develop Advance Computer Application Skills
5. Manage Human Resource Services
6. Develop Entrepreneurial skills
7. Maintain Fuel Control System-II
8. Maintain Emission Control System
9. Conserve Power Transmission-II
10. Service Comfort and Safety System-II
11. Perpetuate Controlled Electrical & Electronics System-II
12. Maintain Network System
13. Maintain Hybrid System

### **Possible available job opportunities available immediately and later in the future**

After completing the Automotive Mechatronics course, the certified candidates are employed in automobile industry. Experienced technicians may advance through promotions with the same employer or by moving to more advanced positions with other employers. They can become:

- Automobile Technicians
- Spare Parts Dealers
- Supervisors
- Managers

Some experienced Automotive Mechatronics technicians achieve a highly respected level of salaries. There are good prospects for travel both within Pakistan and abroad. The employment outlook in this occupation will be influenced by a wide variety of factors including:

- Trends and events affecting overall employment (especially in the Automobile industry)
- Location in Pakistan
- Employment turnover(work opportunities generated by people leaving existing positions)
- Occupational growth (work opportunities resulting from the creation of new positions that never existed before)
- Size of the industry
- Flexibility of the applicant (concerning location and schedule of work).

### **Trainee entry level**

Entry for assessment for this qualification is open. However, entry into formal training institute for this qualification is that the person having National Vocational Certificate level 3, in “Automotive Mechatronics”.

### **Minimum qualification of trainer**

B-Tech (Hons) / B.Sc. Eng. Tech. with 3 years relevant experience; or

Diploma of Associate Engineer (DAE) with 8 years relevant work experience; or

He/she should hold or be working towards a formal teaching qualification.

Other formal qualifications in the automobile industry would be useful in addition to the above.

### **Recommended trainer: trainee ratio**

The recommended maximum trainer: trainee ratio for this program is 1 trainer for 20 trainees

### **Medium of instruction i.e. language of instruction**

Instructions will be in Urdu/English/Local language.

### **Duration of the course (Total time, Theory & Practical time)**

This curriculum comprises 13 modules. The recommended delivery time is 600 hours. Delivery of the course could therefore be full time, 5 days a week, for 6 months. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follows:



Module	Theory hours	Workplace hours	Total hours
Module 1: Contribute to Work Related Health and Safety (WHS) Initiatives			30
Module 2: Analyze Workplace Policy and Procedures			30
Module 3: Perform Advanced Communication			30
Module 4: Develop Advance Computer Application Skills			40
Module 5: Manage Human Resource Services			20
Module 6: Develop Entrepreneurial skills			30
Module 7: Maintain Fuel Control System-II	09	41	50
Module 8: Maintain Emission Control System	08	32	40
Module 9: Conserve Power Transmission-II	15	45	60
Module 10: Service Comfort & Safety System-II	06	34	40
Module 11: Perpetuate Controlled Electrical & Electronic System-II	12	48	60

Module	Theory hours	Workplace hours	Total hours
Module 12: Maintain Network System	10	40	50
Module 13: Maintain Hybrid System	06	44	50

### Sequence of the modules

This qualification is made up of 13 modules. A suggested distribution of these modules is presented overleaf. This is not prescriptive and training providers may modify this if they wish.

Module 7: Maintain Fuel Control System-II; covers various aspects related to maintain fuel control system for GDI, CRDI and eco-idle. Module 8: Maintain Emission Control System; is relating to a series of chemical reactions, sensors and vacuum control solenoids function. Module 9: Conserve Power Transmission-II; is regarding to perform diagnosis of CVT, maintain Continuous Variable Transmission (CVT) system and perform road test to check performance of CVT. Module 10: Service Comfort & Safety System-II; is relating to understand the parameters of cruise control system and supplemental restraint system (SRS). Module 11: Perpetuate Controlled Electrical & Electronic System-II; is about to analyze exhaust gas operation, Exhaust gas recirculation system adjustment and to perform regeneration process of diesel system. Module 12: Maintain Network System; covers to locate navigation CAN device, remove & refit LCD, usage of multi meter, usage of soldering iron. Module 13: Maintain Hybrid System; is regarding to maintain Series, Parallel, and Series-Parallel Hybrid vehicles including their sensors, power control module, generator motors, batteries and power split units.

6 modules are generic and need to be delivered in parallel. This is illustrated in the distribution table.

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the industrial demand of Pakistan that make this qualification unique to Pakistan's industry needs.

The distribution table is shown below:

<b>Module 1:</b>	<b>Module 7:</b>	<b>Module 11:</b>	<b>Module 4:</b>
Contribute to Work Related Health and Safety (WHS) Initiatives	Maintain Fuel Control System-II	Perpetuate Controlled Electrical & Electronic System-II	Develop Advance Computer Application Skills
	50 hours		40 hours
30 hours		60 hours	
<b>Module 2:</b>	<b>Module 8:</b>		<b>Module 5:</b>
Analysis Workplace Policy and Procedures	Maintain Emission Control System		Manage Human Resource Services
	40 hours		20 hours
30 hours			

**Module 9:**

Conserve Power  
Transmission-II

60 hours

**Module 10:**

Service Comfort  
& Safety  
System-II

40 hours

**Module 3:**

Perform  
Advanced  
Communication

30 hours

**Module 12:**

Maintain Network  
System

50 hours

**Module 13:**

Maintain Hybrid  
System

50 hours

**Module 6:**

Develop  
Entrepreneurial  
skills

30 hours

## Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 1 : Contribute to Work Related Health and Safety (WHS) Initiatives</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to contribute to work related health and safety (WHS) initiatives</p>	<p><b>LU 1:</b> Contribute to initiate work-related health and safety measures</p> <p><b>LU 2:</b> Contribute to establish work-related health and safety measures</p> <p><b>LU 3:</b> Contribute to ensure legal requirements of WHS measures</p> <p><b>LU 4:</b> Contribute to review WHS measures</p> <p><b>LU 5:</b> Evaluate the organization's WHS system</p>			30 Hrs
<p><b>Module 2 : Analyze workplace policy and procedures</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to analyze workplace policy and procedures</p>	<p><b>LU 1:</b> Manage work timeframes</p> <p><b>LU 2:</b> Manage to convene meeting</p> <p><b>LU 3:</b> Decision making at workplace</p> <p><b>LU 4:</b> Set and meet own work priorities at instant</p> <p><b>LU 5:</b> Develop and maintain professional competence</p> <p><b>LU 6:</b> Follow and implement work safety requirements</p>			30 Hrs
<p><b>Module 3 : Perform Advanced Communication</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to perform advanced communication</p>	<p><b>LU 1:</b> Demonstrate professional skills</p> <p><b>LU 2:</b> Plan and Organize work</p> <p><b>LU 3:</b> Provide trainings at workplace</p>			30 Hrs

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 4 : Develop Advance Computer Application Skills</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to develop advance computer application skills</p>	<p><b>LU 1:</b> Manage Information System to complete a task</p> <p><b>LU 2:</b> Prepare Presentation using computers</p> <p><b>LU 3:</b> Use Microsoft Access to manage database</p> <p><b>LU 4:</b> Develop graphics for Design</p>			40 Hrs
<p><b>Module 5 : Manage Human Resource Services</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to manage human resource services</p>	<p><b>LU 1:</b> Determine strategies for delivery of human resource services</p> <p><b>LU 2:</b> Manage the delivery of human resource services</p> <p><b>LU 3:</b> Evaluate human resource service delivery</p> <p><b>LU 4:</b> Manage integration of business ethics in human resource practices</p>			20 Hrs
<p><b>Module 6 : Develop Entrepreneurial Skills</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to Develop Entrepreneurial Skills</p>	<p><b>LU 1:</b> Develop a business plan</p> <p><b>LU 2:</b> Collect information regarding funding sources</p> <p><b>LU 3:</b> Develop a marketing plan</p> <p><b>LU 4:</b> Develop basic business communication skills</p>			30 Hrs

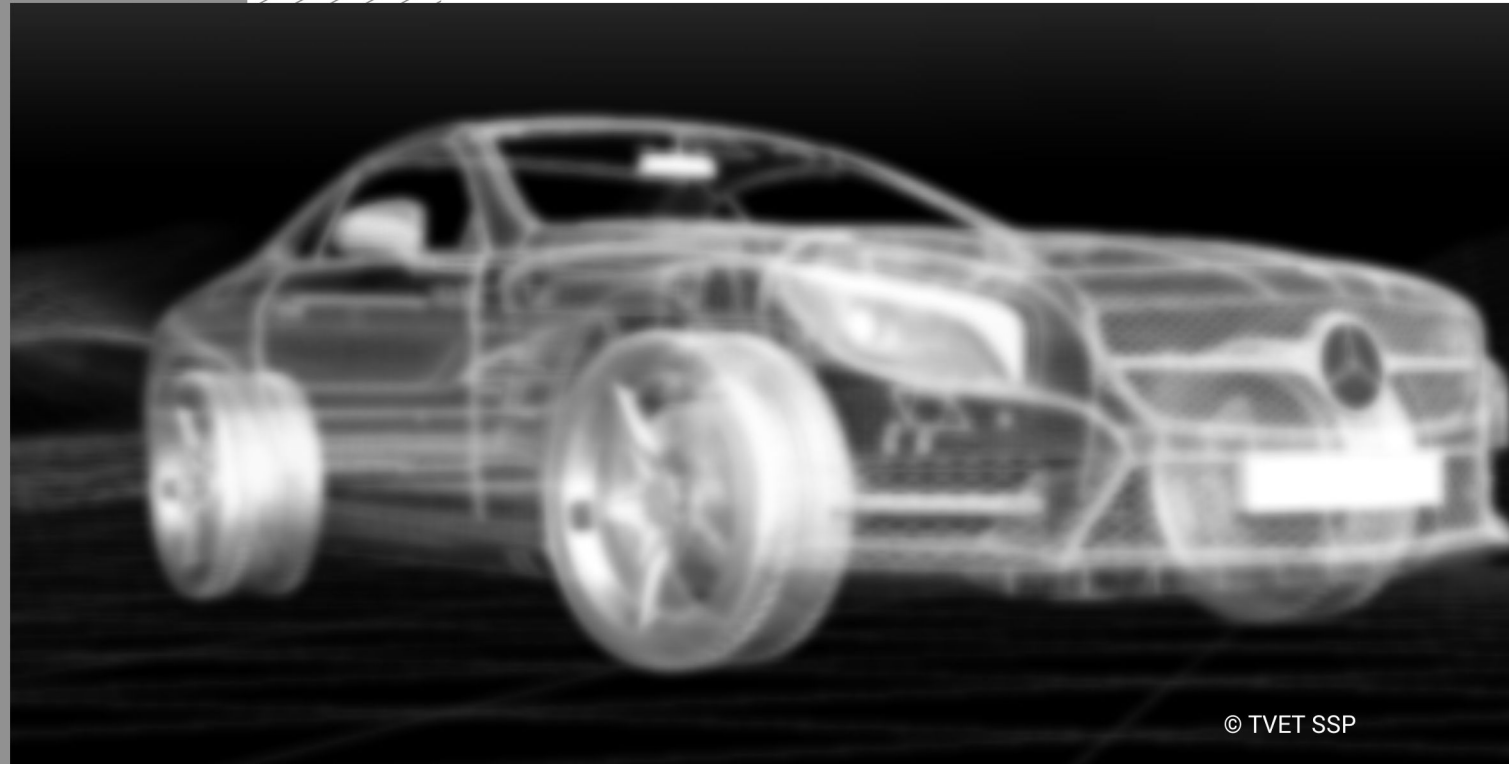
Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<b>Module 7: Maintain Fuel Control System-II</b>  <b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to maintain fuel control system	<b>LU 1:</b> Maintain Gasoline Direct Injection (GDI) <b>LU 2:</b> Maintain Common Rail Direct Injection (CRDI) <b>LU 3:</b> Maintain Eco-idle System	09 Hrs	41 Hrs	50 Hrs
<b>Module 8: Maintain Emission Control System</b>  <b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to maintain emission control system	<b>LU 1:</b> Analyze Exhaust Gas Operation <b>LU 2:</b> Adjust Exhaust Gas Recirculation (EGR) System <b>LU 3:</b> Perform Re-generation Process for Diesel System	08 Hrs	32 Hrs	40 Hrs
<b>Module 9: Conserve Power Transmission-II</b>  <b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to conserve power transmission	<b>LU 1:</b> Perform Diagnosis of CVT with OBD-II <b>LU 2:</b> Maintain Continuous Variable Transmission (CVT) system <b>LU 3:</b> Perform Road Test to check performance of CVT	15 Hrs	45 Hrs	60 Hrs

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<b>Module 10: Service Comfort &amp; Safety System-II</b>  <b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to service comfort & safety system	<b>LU 1:</b> Check Cruise Control System <b>LU 2:</b> Maintain Supplementary Restraint System (SRS)	06 Hrs	34 Hrs	40 Hrs
<b>Module 11: Perpetuate Controlled Electric &amp; Electronic System-II</b>  <b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to perpetuate controlled electric & electronic system	<b>LU 1:</b> Service Controlled Wiper & Washer System <b>LU 2:</b> Repair Electric Power Steering (EPS) System <b>LU 3:</b> Test Function of Sensors	12 Hrs	48 Hrs	60 Hrs
<b>Module 12: Maintain Network System</b>  <b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to maintain network system	<b>LU 1:</b> Verify Navigation System <b>LU 2:</b> Maintain Control Area Network (CAN) System <b>LU 3:</b> Verify electric Parking System	10 Hrs	40 Hrs	50 Hrs



Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 13: Maintain Hybrid System</b></p> <p><b>Aim:</b> The aim of this module is to develop advanced knowledge, skills and understanding to maintain hybrid system</p>	<p><b>LU 1:</b> Maintain Series Hybrid  <b>LU 2:</b> Maintain Parallel Hybrid  <b>LU 3:</b> Maintain Combined Hybrid System</p>	06 Hrs	44 Hrs	50 Hrs

# AUTOMOTIVE MECHATRONICS



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Module-1  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Modules

### Module 1: Contribute to Work Related Health and Safety (WHS) Initiatives

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to contribute to work related health and safety (WHS) Initiatives.

**Duration:** 30 Hrs      **Theory:** Hrs      **Practical:** Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Contribute to initiate work-related health and safety measures	<b>The trainee will be able to:</b> Compile database on work-related health and safety Identify measures that address legal obligations. Consult with individuals/parties to formulate measures and initiatives Consult with individuals/parties to identify factors impacting on work-related health and safety Participate in consultative				

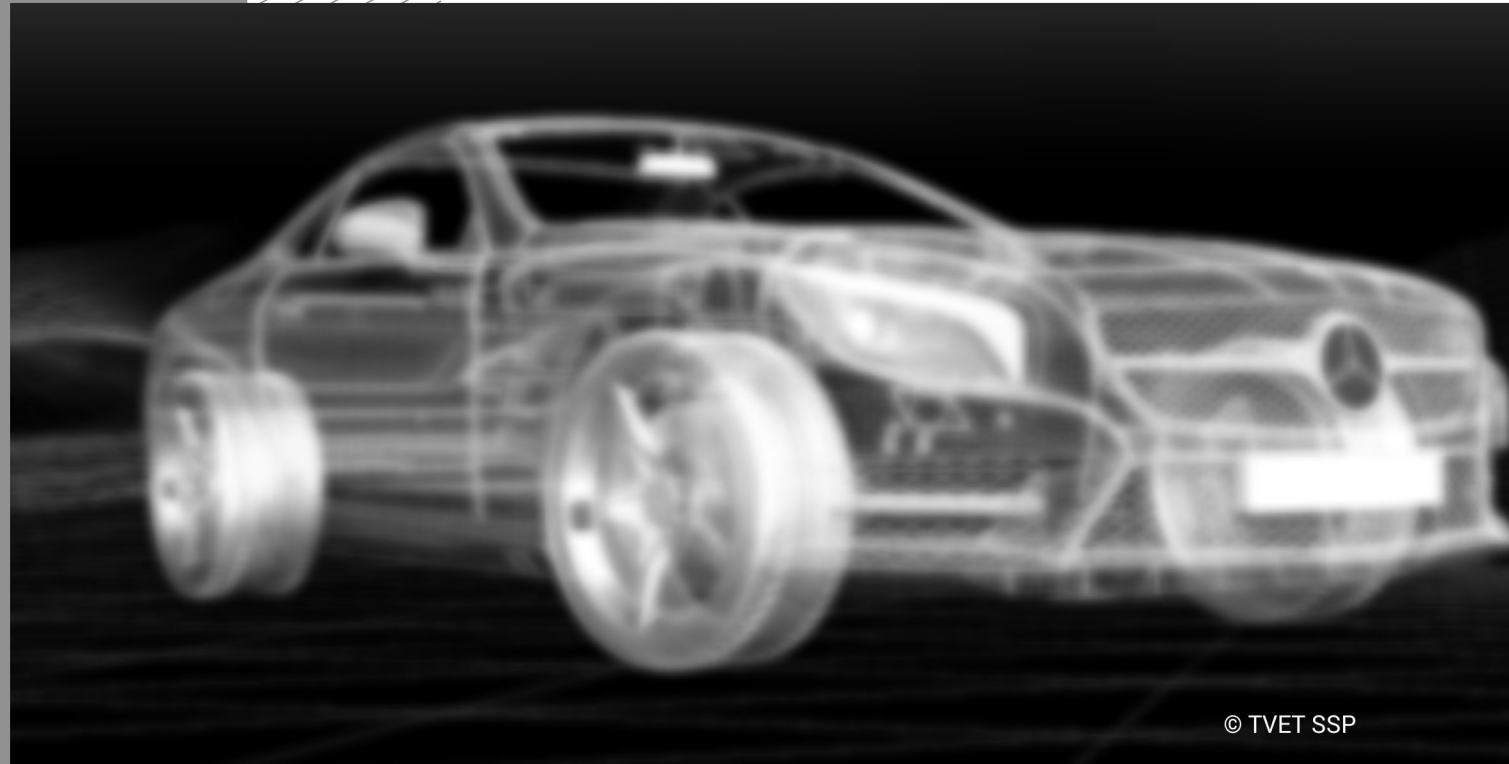
	meetings.				
<b>LU 2:</b> Contribute to establish work-related health and safety measures	<p><b>The trainee will be able to:</b></p> <p>Assist in planning of work-related health and safety measures</p> <p>Contribute to the development of work-related health and safety measures</p> <p>Identify to implement work-related health and safety measures i.e.</p> <ul style="list-style-type: none"> <li>• resourcing requirements,</li> <li>• timelines</li> <li>• responsibilities</li> </ul> <p>Assist to implement work-related health and safety measures and initiatives i.e.</p> <ul style="list-style-type: none"> <li>• scheduling</li> <li>• liaison</li> </ul>				

	<ul style="list-style-type: none"> <li>administering resources communication</li> </ul>				
<b>LU 3:</b> Contribute to ensure legal requirements of WHS measures	<p><b>The trainee will be able to:</b></p> <p>Identify WHS legal requirements</p> <p>Apply knowledge of all aspects of WHS measures to</p> <ul style="list-style-type: none"> <li>Consultation</li> <li>workplace policies</li> <li>participation processes</li> </ul> <p>Ensure, WHS measures are in accordance with legal requirements</p>				
<b>LU 4:</b> Contribute to review WHS measures	<p><b>The trainee will be able to:</b></p> <p>Develop effective practices to review work-related health and safety measures</p>				

	<p>Assist individuals and parties related to WHS measures in following activities</p> <ul style="list-style-type: none"> <li>• preparing reports</li> <li>• communicating review</li> </ul> <p>evaluating outcomes</p>				
<p><b>LU 5:</b> Evaluate the organization's WHS system</p>	<p><b>The trainee will be able to:</b></p> <p>Assess ongoing compliance with OHS (Occupational Health and safety)</p> <p>Take feedback from concerned persons regarding WHS measures.</p> <p>Assess the overall effectiveness of WHS management practices</p> <p>Assist the development process of WHS measures in following ways</p>				

	<ul style="list-style-type: none"><li>• Suggest amendments</li><li>• Document amendments</li><li>• Implement amendments</li></ul> <p>Take feedback from concerned persons regarding WHS measures.</p> <p>Communicate improvements in WHS Measures</p>				
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Module-2  
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## Module 2: Analyze Workplace Policy and Procedures

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to analyze workplace policy and procedures.

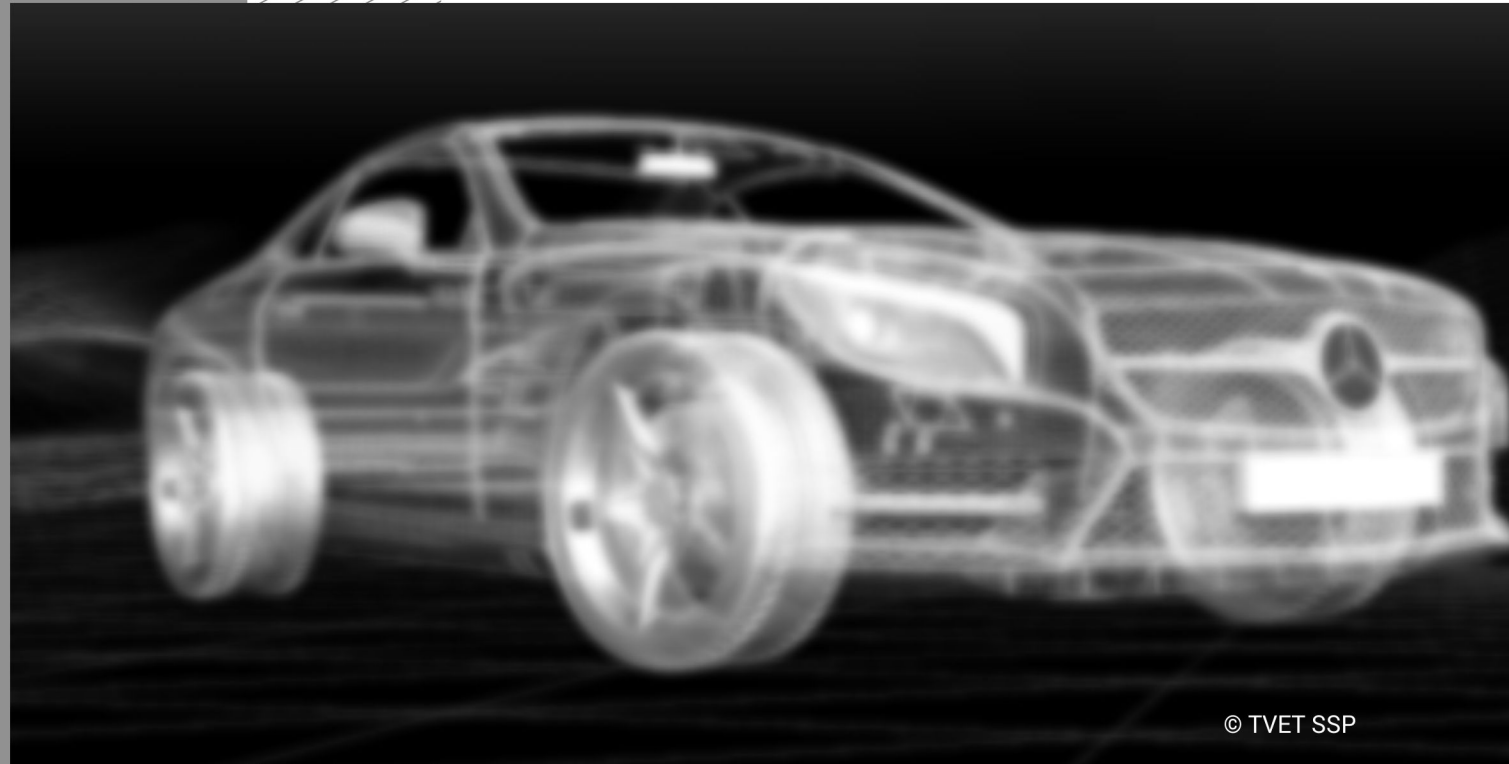
**Duration:** 30 Hrs      **Theory:** Hrs      **Practical:** Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Manage work timeframes	<p><b>The trainee will be able to:</b></p> <p>Complete work tasks within deadlines in according to order of priority</p> <p>Supervisors are informed of any delays in work times or projects</p>				
<b>LU 2:</b> Manage to convene meeting	<p><b>The trainee will be able to:</b></p> <p>Develop agenda in line with meeting purpose</p> <p>Select participants and notify them accordingly</p> <p>Carryout meeting arrangements according</p>				

	to the time Record the minutes of the meeting				
<b>LU 3:</b> Decision making at workplace					
<b>LU 4:</b> Set and meet own work priorities at instant	<b>The trainee will be able to:</b> Take initiative to prioritize and facilitate competing demands to achieve organizational goals and objectives Use technology efficiently and effectively to manage work priorities and commitments Maintain appropriate work-life balance				
<b>LU 5:</b> Develop and maintain professional competence	<b>The trainee will be able to:</b> Assess personal knowledge and skills against competency				

	<p>Participate in networks to enhance personal knowledge, skills and work relationships</p> <p>Seek feedback from employees, clients and colleagues to develop and improve competence</p>				
<p><b>LU 6:</b> Follow and implement work safety requirements</p>	<p><b>The trainee will be able to:</b></p> <p>Identify and report emergency incidents</p> <p>Practice organizational policy and procedures for responding to emergency incidents</p> <p>Identify and implement workplace procedures and work instructions for controlling risks</p>				

# AUTOMOTIVE MECHATRONICS



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Module-3

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### Module 3: Perform Advanced Communication

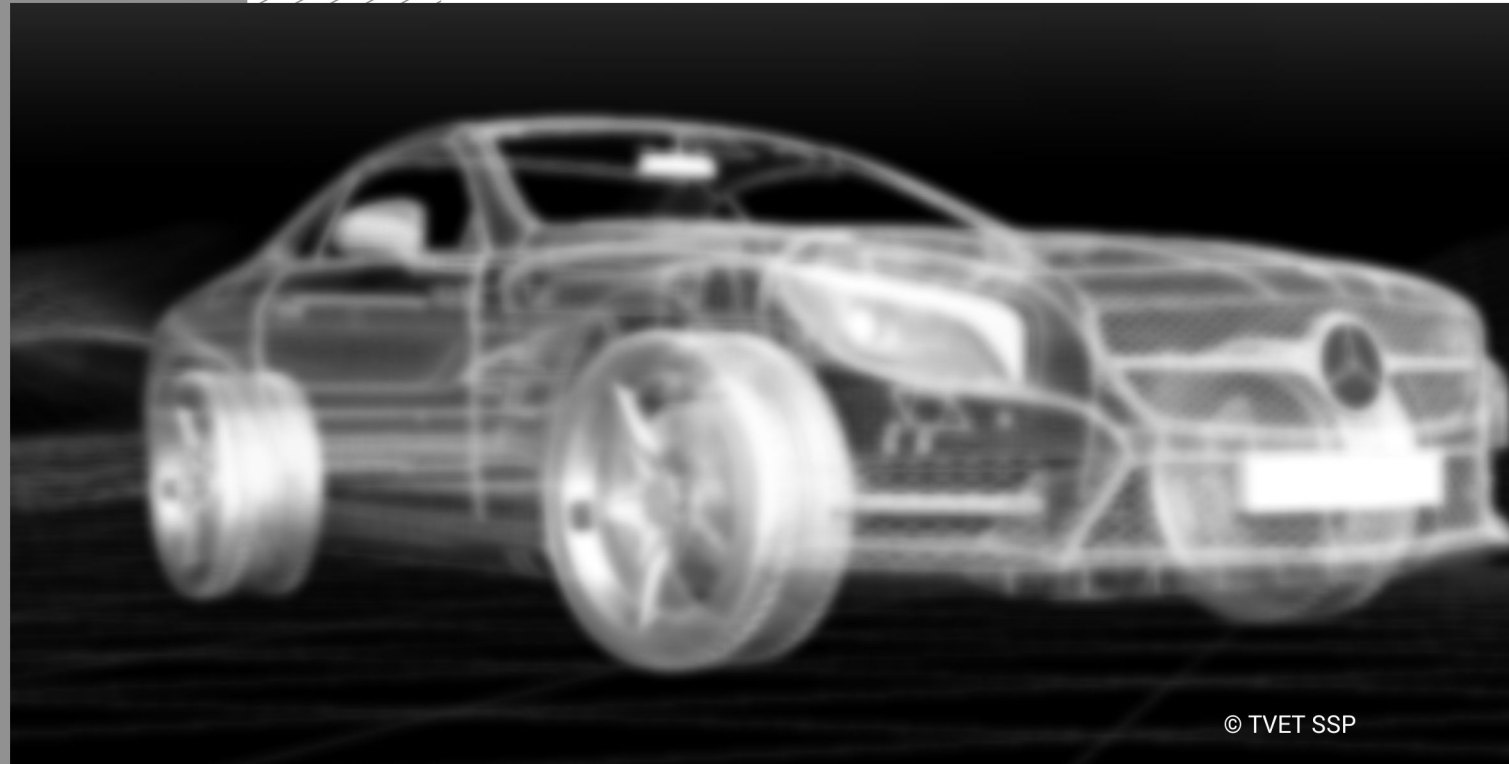
**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to perform advanced communication.

**Duration:** 30 Hrs      **Theory:** Hrs      **Practical:** Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Demonstrate professional skills	<p><b>The trainee will be able to:</b></p> <p>Use different modes of communication to communicate</p> <ul style="list-style-type: none"> <li>• Speaking</li> <li>• Reading</li> <li>• Writing</li> <li>• Listening</li> <li>• Presentation</li> <li>• Visual representation etc.</li> </ul> <p>Develop CV Skills according requirements</p> <p>Upgrade professional skills by attending trainings, webinars, conferences etc.</p> <p>Perform Continuous professional development as required at</p>				

	workplace Develop interview skills				
<b>LU 2:</b> Plan and Organize work	<b>The trainee will be able to:</b> Identify task requirements. Plan steps to complete tasks. Review planning and organizing process. Organize work.				
<b>LU 3:</b> Provide trainings at workplace	<b>The trainee will be able to:</b> Assess the need for training Prepare trainees for the learning experience Present training session Support trainees in managing their own learning Facilitate group learning Provide opportunity for practice Provide feedback on progress on trainees Review delivery experience				

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Module-4  
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## Module 4: Develop Advance Computer Application Skills

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to develop advance computer application skills

**Duration:** 40 Hrs                      **Theory:** Hrs                      **Practical:** Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1: Manage Information System to complete a task	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Perform Data Entry in MS office</li> <li>Manage File/folder in MS office</li> <li>Perform Scanning of document</li> <li>Maintain Office Record in drives</li> <li>Perform Printing of document</li> <li>Search required Files/Folders</li> <li>Convert Files in required format.</li> </ul>				



	Manage sizes of Files/Folders <ul style="list-style-type: none"> <li>• Compress</li> </ul> Zip /Unzip				
<b>LU 2:</b> Prepare Presentation using computers	<b>The trainee will be able to:</b> Prepare presentation as per requirements, i.e. <ul style="list-style-type: none"> <li>• Open blank presentation and add text / graphics</li> <li>• Create a simple design for a presentation</li> <li>• Apply existing styles within a presentation</li> <li>• Use presentation template and slides to create a presentation</li> </ul>				

	<ul style="list-style-type: none"> <li>• Use various tools to improve the look of the presentation</li> <li>• Save presentation to the appropriate storage device and folder with required name</li> </ul> <p>Customize basic settings to meet user requirements</p> <p>Format presentation as require</p> <ul style="list-style-type: none"> <li>• Develop organizational charts</li> <li>• Add objects and manipulate to meet presentation purposes</li> </ul>				
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	<ul style="list-style-type: none"><li>• Modify slide layout, including text and colours, to meet presentation requirements</li><li>• Save presentation in another format</li><li>• Save to storage device and close presentation</li></ul> <p>Add slide show effect into presentation as required to enhance the presentation</p> <ul style="list-style-type: none"><li>• Incorporate pre-set Animation</li><li>• Apply Multimedia effects</li><li>• Record Narration</li></ul>				
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	<ul style="list-style-type: none"><li>• Apply hyperlink</li><li>• Apply video</li><li>• Rehearse Timings</li><li>• Test presentation for overall effect</li></ul> <p>Print the presentation</p> <ul style="list-style-type: none"><li>• Select appropriate print format for presentation</li><li>• Select preferred slide orientation</li><li>• Add notes and slide numbers</li><li>• Preview slides and run spell check before presentation</li><li>• Print selected slides and submit</li></ul>				
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	<p>presentation to appropriate person for feedback</p> <p>Practice verbal presentation</p> <p>Practice presentation through AV Aids</p>				
<p><b>LU 3:</b> Use Microsoft Access to manage database</p>	<p><b>The trainee will be able to:</b></p> <p>Collect the data using a standard data base package.</p> <p>Start access to manage database .i.e.</p> <ul style="list-style-type: none"> <li>• identify problem statement of Data</li> <li>• Develop a table with fields /attributes according to database usage/</li> </ul>				

	<p>user requirements</p> <ul style="list-style-type: none"><li>• Create a primary key and establish an index for each table</li><li>• Modify table layout and field attributes as required</li><li>• Create a relationship between the two tables</li><li>• Add data in a table according to information requirements</li><li>• Add records as required</li><li>• delete records as required</li></ul>				
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	<ul style="list-style-type: none"><li>• Save database to storage area</li><li>• close down database to storage area</li><li>• Apply criteria in the following Query</li><li>• SQL view of Query</li><li>• Wildcards of query</li><li>• Query Criteria</li></ul> <p>Customize basic settings:</p> <ul style="list-style-type: none"><li>• Adjust page layout to meet user requirements</li><li>• Open and view different toolbars</li><li>• Format font as appropriate for</li></ul>				
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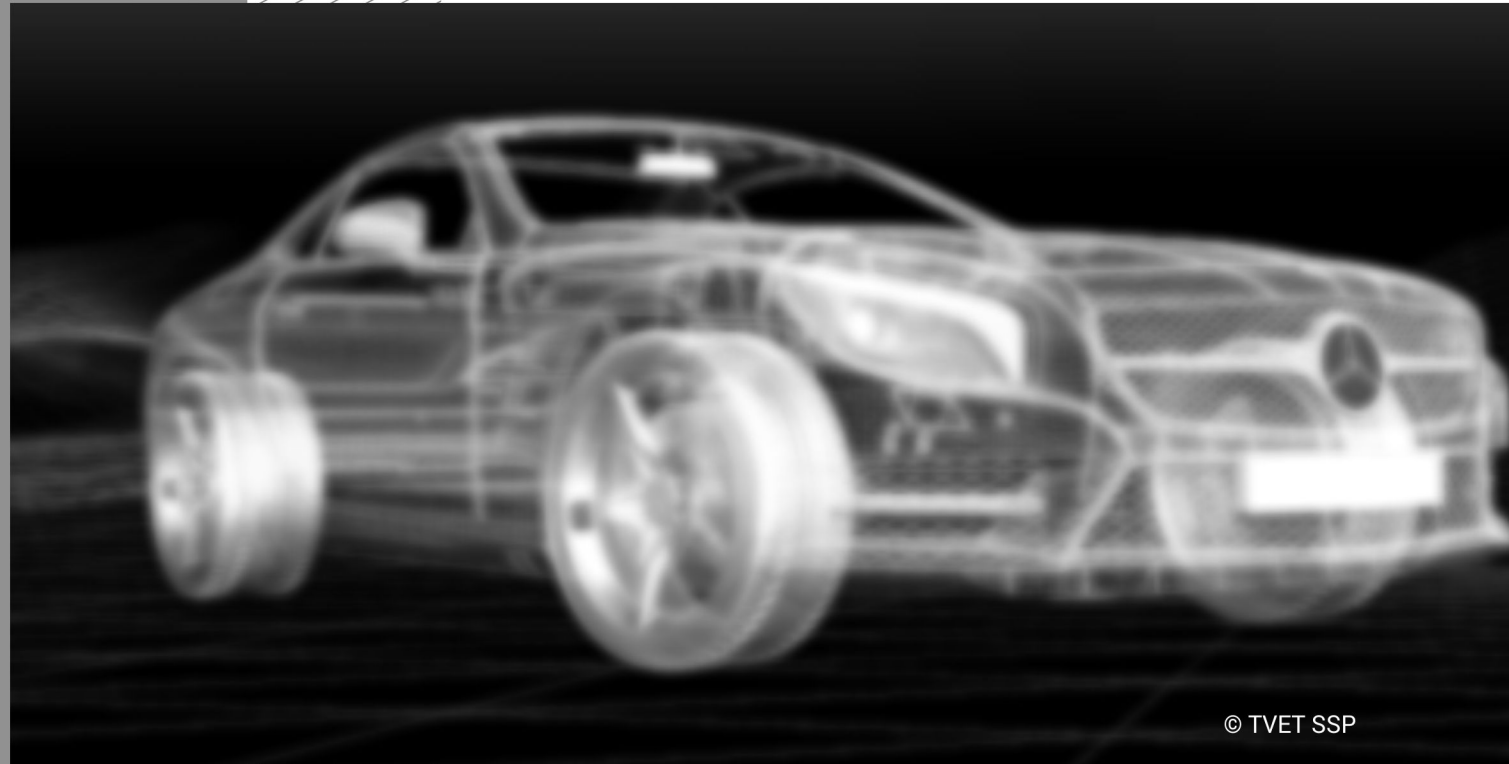
	<p>the purpose of the database entries</p> <ul style="list-style-type: none"> <li>• Create reports</li> <li>• Design reports to present data in a logical sequence</li> <li>• Modify reports to include or exclude additional requirements</li> <li>• Distribute reports to appropriate person in a suitable format</li> </ul> <p>Create forms</p> <ul style="list-style-type: none"> <li>• Use a wizard to create a simple form</li> <li>• Open existing</li> </ul>				
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	<p>database and modify records through a simple form</p> <p>Rearrange objects within the form to accommodate information requirements</p>				
<p><b>LU 4:</b> Develop graphics for Design</p>	<p><b>The trainee will be able to:</b></p> <p>Develop graphic design concepts based on a thorough understanding of the communication need</p> <p>Use design techniques confidently to produce designs</p> <p>Integrate design tools skillfully to produce designs</p> <p>Evaluate the success of completed designs to meet objectives</p>				

	evaluate feedback from client / peers				
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# AUTOMOTIVE MECHATRONICS



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Module-5  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 5: Manage Human Resource Services

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to manage human resource services.

**Duration:** 20 Hrs      **Theory:** Hrs      **Practical:** Hrs

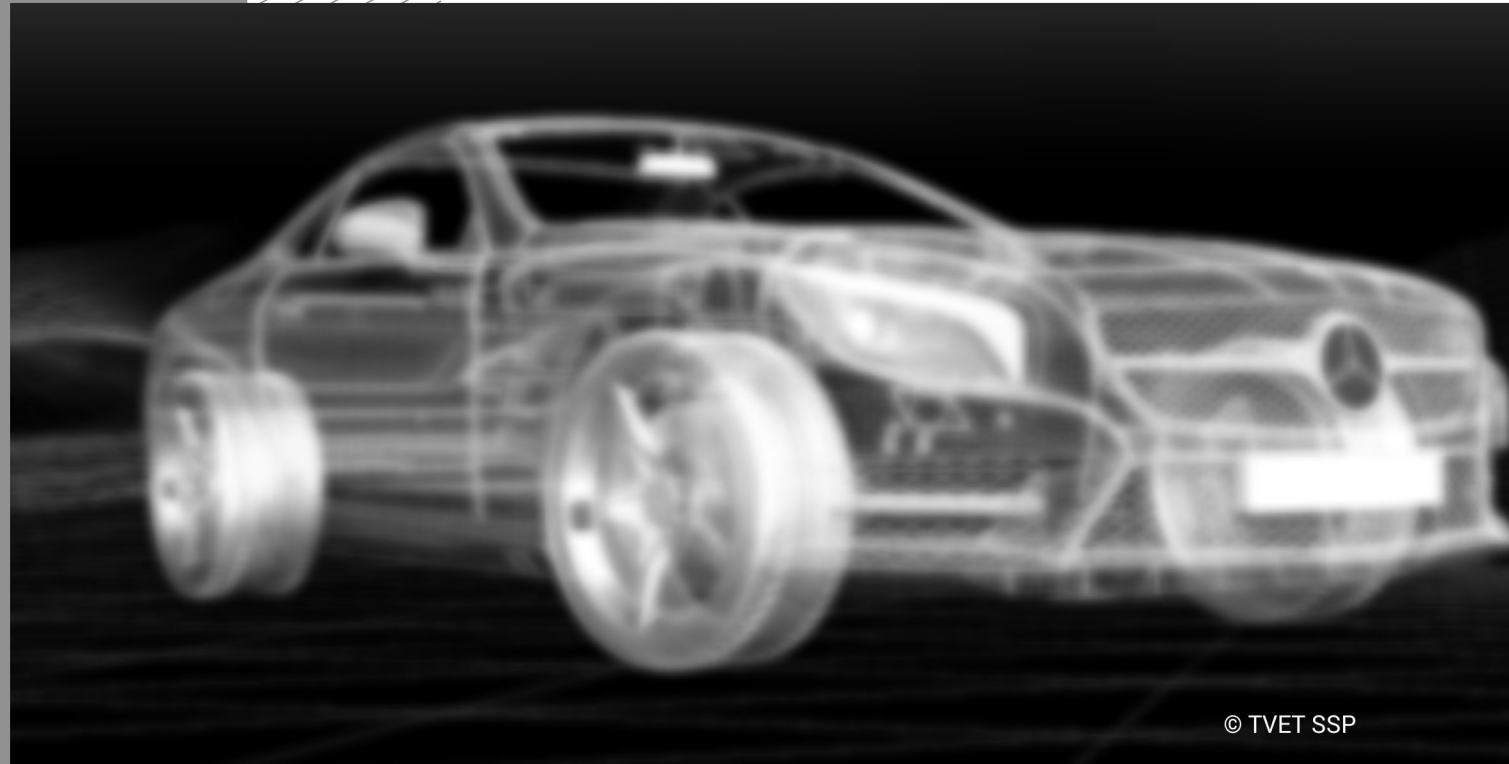
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Determine strategies for delivery of human resource services	<b>The trainee will be able to:</b> Analyze business strategy and operational plans to determine human resource requirements Review external business environment that likely impact on organization's human resource requirements Consult line and senior managers to identify human resource needs in their areas Review organization's requirements for diversity in the workforce Deliver human resource services that comply with				

	<p>business goals</p> <p>Develop strategic action plan for delivery of human resource services</p> <p>Develop roles and responsibilities of human resource team</p> <p>Develop quality assurance policy</p>				
<p><b>LU 2:</b> Manage the delivery of human resource services</p>	<p><b>The trainee will be able to:</b></p> <p>Communicate human resource strategies and services to internal and external stakeholders</p> <p>Develop and negotiate service agreements between</p> <ul style="list-style-type: none"> <li>• The human resource team,</li> <li>• Service providers</li> <li>• Client groups</li> </ul> <p>Document service specifications, performance standards and timeframes</p>				

	<p>Document /communicate service</p> <ul style="list-style-type: none"> <li>• Specifications,</li> <li>• Performance standards</li> <li>• Timeframes</li> </ul> <p>Monitor Quality assurance processes</p> <p>Ensure that services are delivered by appropriate providers, according to service agreements and operational plans</p> <p>Identify underperformance of human resource team or service providers</p>				
<p><b>LU 3:</b> Evaluate human resource service delivery</p>	<p><b>The trainee will be able to:</b></p> <p>Establish Management information system for human resource services</p> <p>Conduct survey to determine level of satisfaction</p>				

	<p>Analyze feedback of survey</p> <p>Recommend changes to service delivery</p> <p>Support agreed change processes across the organization</p>				
<p><b>LU 4:</b> Manage integration of business ethics in human resource practices</p>	<p><b>The trainee will be able to:</b></p> <p>Ensure ethics in personal behavior</p> <p>Ensure code of conduct is observed across the organization,</p> <p>Observe confidentiality requirements in dealing with all human resource information</p> <p>Deal promptly with unethical behavior</p> <p>Ensure all persons responsible for human resource functions understand requirements regarding their ethical behavior</p>				

# AUTOMOTIVE MECHATRONICS



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Module-6  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019



## Module 6: Develop Entrepreneurial Skills

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to develop entrepreneurial skills.

**Duration:** 30 Hrs      **Theory:** Hrs      **Practical:** Hrs

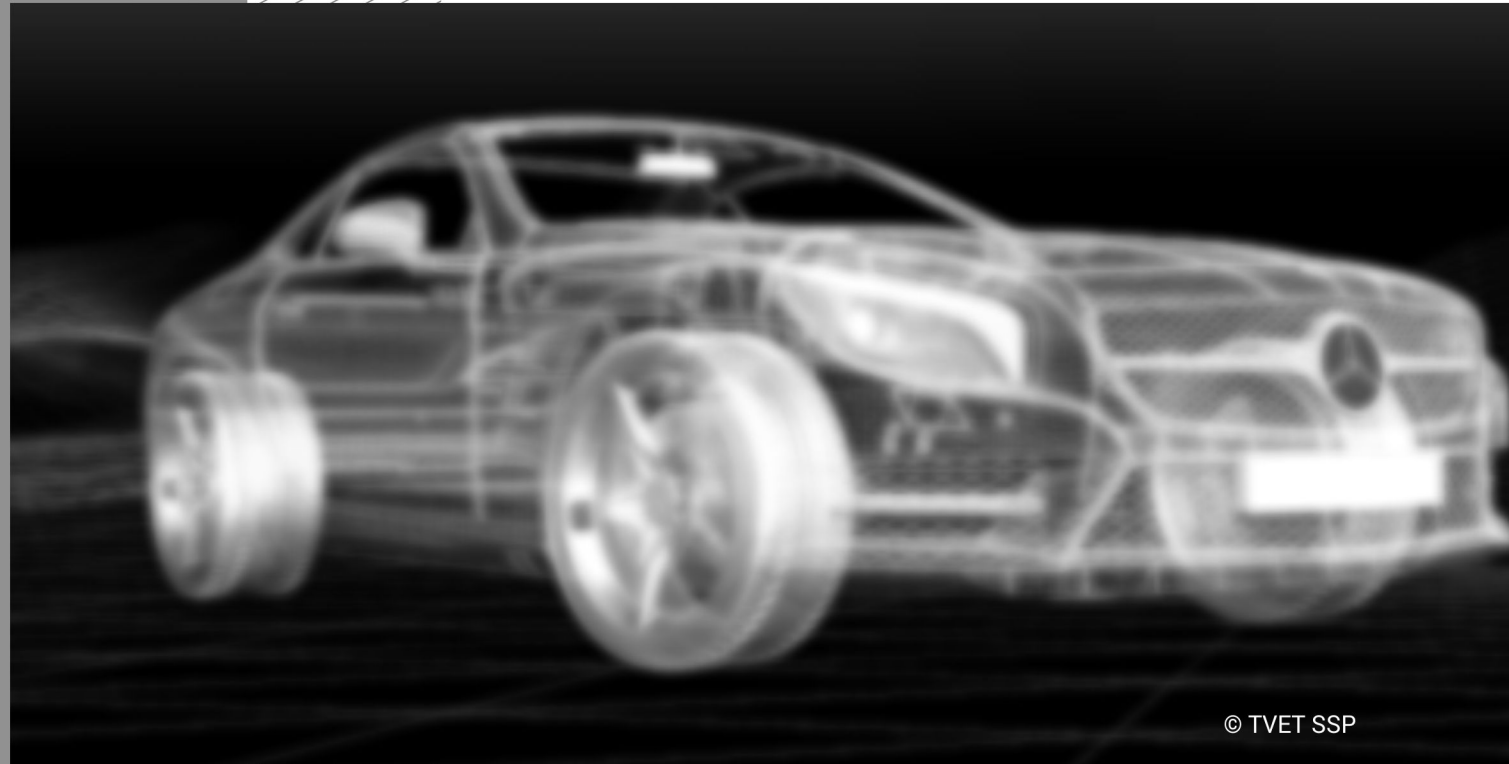
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1: Develop a business plan	<p><b>The trainee will be able to:</b></p> <p>Conduct a market survey to collect following information</p> <ul style="list-style-type: none"> <li>• Customer /demand</li> <li>• Tools, equipment, machinery and furniture with rates</li> <li>• Raw material</li> <li>• Supplier</li> <li>• Credit / funding sources</li> <li>• Marketing</li> </ul>				

	<p>strategy</p> <ul style="list-style-type: none"> <li>• Market trends</li> <li>• Overall expenses</li> <li>• Profit margin</li> </ul> <p>Select the best option in terms of cost, service, quality, sales, profit margin, overall expenses  Compile the information collected through the market survey, in the business plan format</p>				
<p><b>LU 2:</b> Collect information regarding funding sources</p>	<p><b>The trainee will be able to:</b></p> <p>Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate</p> <p>Choose the best available option</p>				

	<p>according to investment requirement</p> <p>Prepare documents according to the loan agreement requirement</p> <p>Include the information of funding sources in the business plan</p>				
<b>LU 3:</b> Develop a marketing plan	<p><b>The trainee will be able to:</b></p> <p>Make a marketing plan for the business including product, price, placement, promotion, people, packaging and positioning</p> <p>Include the information of marketing plan in the business plan</p>				
<b>LU 4:</b> Develop basic business communication skills	<p><b>The trainee will be able to:</b></p> <p>Communicate with internal customers e.g.: labor, partners and</p>				

	<p>external customers e.g.: suppliers, customers etc., using effective communication skills</p> <p>Use different modes of communication to communicate internally and externally e.g.: presentation, speaking, writing, listening, visual representation, reading etc.</p> <p>Use specific business terms used in the market</p>				
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# AUTOMOTIVE MECHATRONICS



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Module-7  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 7: 071400959 Maintain Fuel Control System-II

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to Maintain Fuel Control System.

**Duration:** 50 Hrs      **Theory:** 09 Hrs      **Practical:** 41 Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Maintain Gasoline Direct Injection (GDI)	<p><b>The trainee will be able to:</b></p> <p>Select appropriate Tools and equipment.</p> <p>Ensure work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines.</p> <p>Connect the Scanner and select engine parameters.</p> <p>Monitor fuel pressure sensor during Key on Engine Off (KOEO) position</p> <p>Monitor desired &amp; actual fuel Pressure with engine parameters during Key On Engine Running (KOER) position.</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Describing Gasoline Direct Injection (GDI) System and its advantages, function, and structure</p> <p>Explaining working principle of pressure control circuit of Gasoline Direct Injection (GDI) system</p> <p>Defining components of Gasoline Direct Injection (GDI) System, their location and function for better understanding</p> <p>Defining pressure controlled circuit and its working principle</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 17 Hrs</p> <p><b>Theory:</b> 03 Hrs</p> <p><b>Practical:</b> 14 Hrs</p>	<p>Appropriate PPEs</p> <p>Scanner OBD-II</p> <p>Repair Manual</p> <p>Socket Set</p> <p>Screwdriver Set</p> <p>Combination Spanner Set/ Spanner set</p> <p>Pressure Gauge</p> <p>Digital Multimeter</p> <p>WD 40</p> <p>Petrol</p> <p>Kerosene Oil</p> <p>Grease</p> <p>Cotton Rug</p> <p>Fender Covers</p> <p>Floor Mats</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

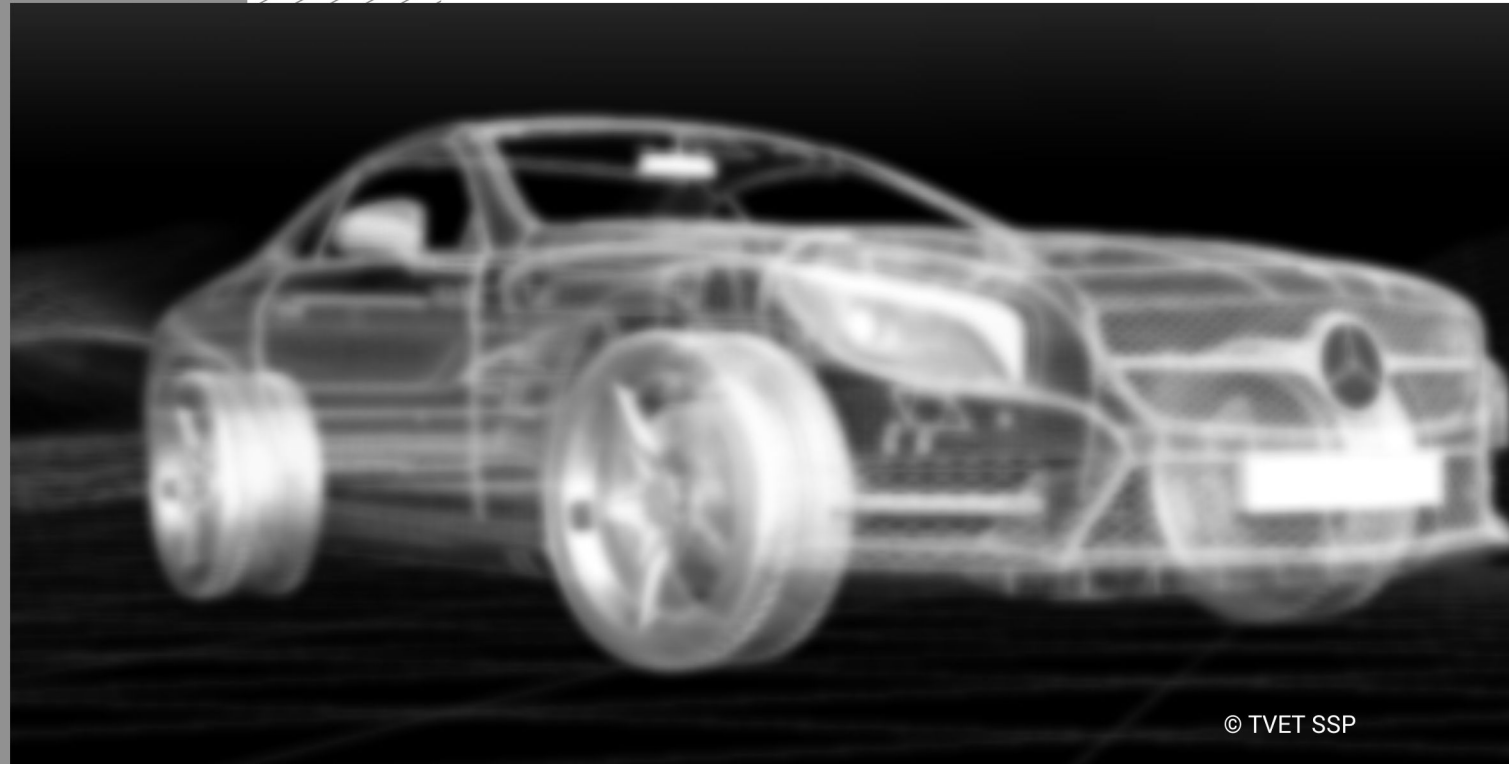
	<p>Monitor low pressure pump or high pressure pump control circuit.</p> <p>Ensure housekeeping after completion of task</p>			<p>Creeper Trolley</p> <p>Tool Trolley</p> <p>Lamp</p>	
<p><b>LU 2:</b> Maintain Common Rail Direct Injection (CRDI)</p>	<p><b>The trainee will be able to:</b></p> <p>Select appropriate Tools and equipment.</p> <p>Ensure work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines.</p> <p>Check Low Pump Pressure Test Ports using Pressure Gauge</p> <p>Check High Pump Pressure Test Ports using Pressure Gauge</p> <p>Check Pressure Control Valve</p> <p>Ensure housekeeping after completion of task</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining common rail direct injection system (CRDI) to better understanding of its function, structure and method</p> <p>Describing components of common rail direct injection system (CRDI), their location and function</p> <p>Working principle of pressure control valve</p> <p>Servicing and replacement procedure of pressure control valve</p> <p>Importance of housekeeping</p>	<p><b>Total</b></p> <p>17 Hrs</p> <p><b>Theory:</b></p> <p>03 Hrs</p> <p><b>Practical:</b></p> <p>14 Hrs</p>	<p>Appropriate PPEs</p> <p>Scanner OBD-II</p> <p>Repair Manual</p> <p>Socket Set</p> <p>Screwdriver Set</p> <p>Combination Spanner Set/ Spanner set</p> <p>Pressure Gauge</p> <p>Digital Multimeter</p> <p>WD40</p> <p>Diesel</p> <p>Kerosene Oil</p> <p>Grease</p> <p>Cotton Rag</p> <p>Fender Covers</p> <p>Floor Mats</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

				Creeper Trolley Tool Trolley Lamp	
<b>LU 3:</b> Maintain Eco-idle system	<p><b>The trainee will be able to:</b></p> <p>Select appropriate Tools and equipment.</p> <p>Ensure work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines.</p> <p>Check Start/Stop function and ensure ECO symbol display.</p> <p>Ensure all given parameters (Battery, Temperature, Starter Motor , Coolant, etc.) are correct before operating Start/Stop ECO system</p> <p>Check performance of all running modes of ECO system (Start/Stop, Crossing, Slope Assist, Traffic Jam, and Parking</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining eco-idle system and its components (i.e. gasoline engine, electric starter/ generator, battery etc.)</p> <p>Describing working parameters of eco-idle system's components and their location</p> <p>Diagnosing eco-idle system with the help of OBD – II scanner for troubleshooting</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 16 Hrs</p> <p><b>Theory:</b> 03 Hrs</p> <p><b>Practical:</b> 13 Hrs</p>	<p>Appropriate PPEs</p> <p>Scanner OBD-II</p> <p>Repair Manual</p> <p>Socket Set</p> <p>Screwdriver Set</p> <p>Combination Spanner Set/ Spanner set</p> <p>Pressure Gauge</p> <p>Digital Multimeter</p> <p>WD40</p> <p>Petrol</p> <p>Kerosene Oil</p> <p>Grease</p> <p>Cotton Rag</p> <p>Fender Covers</p> <p>Floor Mats</p> <p>Creeper Trolley</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>



	System). Ensure housekeeping after completion of task			Tool Trolley Lamp	
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# AUTOMOTIVE MECHATRONICS



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Module-8  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 8: 071400960 Maintain Emission Control System

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to maintain emission control system.

**Duration:** 40 Hrs      **Theory:** 08 Hrs      **Practical:** 32 Hrs

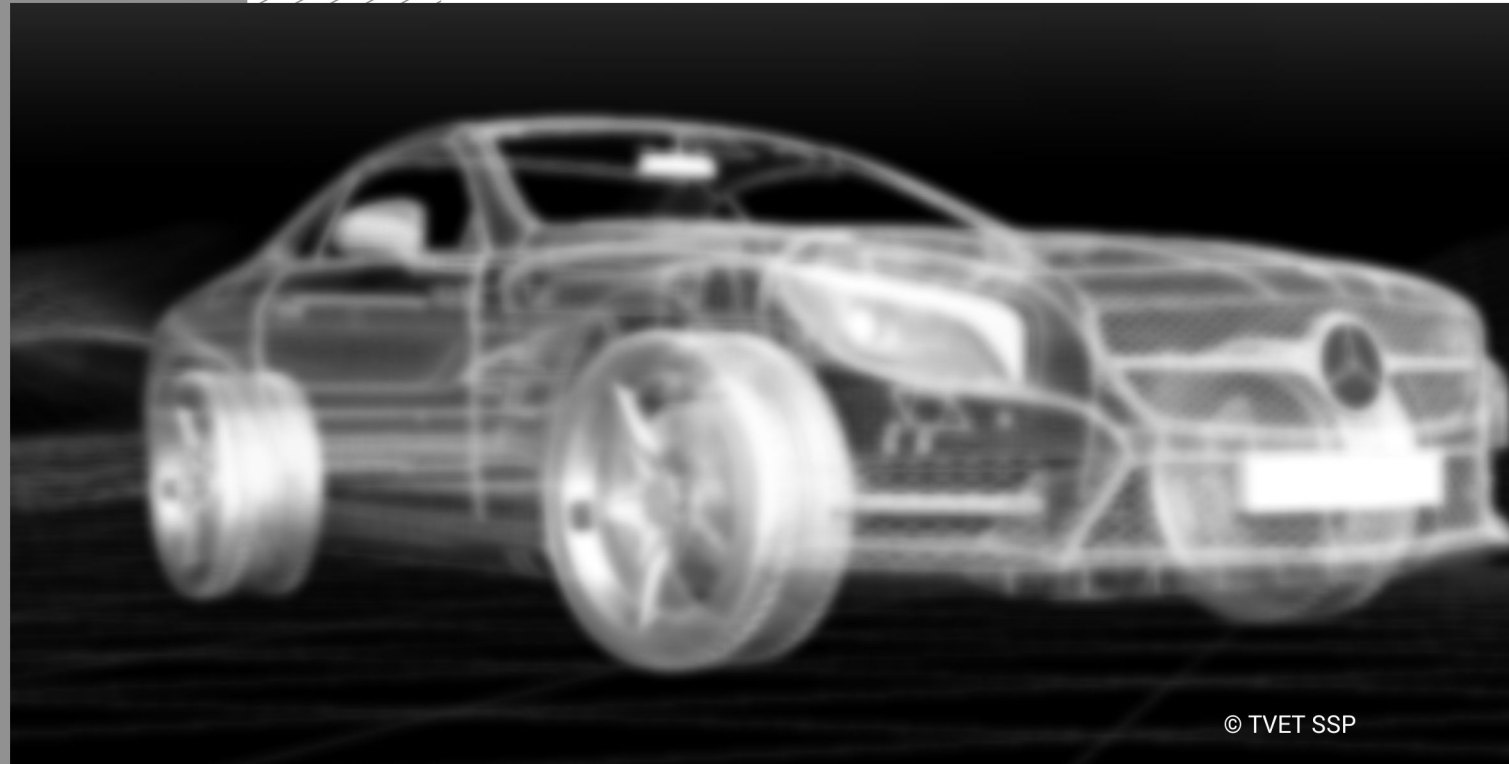
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Analyse Exhaust Gas Operation	<p><b>The trainee will be able to:</b></p> <p>Select the tool and equipment according to the job requirement</p> <p>Ensure safety precaution</p> <p>Test vehicle for exhaust gas analyses</p> <p>Inspect Catalytic convertor for damages</p> <p>Inspect Charcoal canister &amp; Purge valve for secure connection</p> <p>Check Positive crankcase ventilation (PCV) valve</p> <p>Check Fuel tank &amp; lid gasket for proper sealing</p> <p>Check Exhaust gas recirculation (EGR) valve</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Defining main components of emission control system (e.g. catalytic converter, EGR valve, and charcoal canister and purge valve, PCV valve), their location and functions</p> <p>Explaining how to use tools and equipment for servicing emission control system i.e. catalytic converter, EGR valve</p> <p>Describing the chemistry of toxic gases (e.g. nitrogen oxide, carbon mono oxide, nitrogen di oxide, carbon di oxide) in exhaust system.</p> <p>Describing how to reduce these toxic gases, soot particles, and noise in exhaust system</p> <p>Describe how to reduce fuel consumption in gasoline engine/ GDI</p> <p>Inspecting catalytic converter for damages</p>	<p><b>Total</b> 15 Hrs</p> <p><b>Theory:</b> 03 Hrs</p> <p><b>Practical:</b> 12 Hrs</p>	<p>Appropriate PPEs</p> <p>Scanner OBD-II</p> <p>Digital Multimeter</p> <p>Wheel skids wooden</p> <p>Jack/ trolley jack</p> <p>Jack stands different size/height</p> <p>Ratchet and Sockets Set</p> <p>Screwdriver Set</p> <p>Pliers</p> <p>Hammer</p> <p>Ramps</p> <p>Hand Cleaner</p> <p>Exhaust Gas Analyser</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

	<p>by vacuum gauge</p> <p>Check Heated oxygen sensors (O<sub>2</sub> Sensor)</p> <p>Ensure housekeeping after completion of task</p>	<p>to understand its faults</p> <p>Describing the function of catalytic convertor</p> <p>Explaining the cleaning method of catalytic converter with a cat cleaner</p> <p>Importance of housekeeping</p>		<p>Combination Spanner Set/ Spanner set</p> <p>Fire extinguisher</p> <p>WD 40</p> <p>Petrol</p> <p>Kerosene Oil</p> <p>Grease</p> <p>Cotton Rug</p> <p>Creeper Trolley</p> <p>Tool Trolley</p> <p>Lamp</p>	
<p><b>LU 2:</b> Adjust Exhaust Gas Recirculation (EGR) System</p>	<p><b>The trainee will be able to:</b></p> <p>Select the tool and equipment according to the job requirement</p> <p>Ensure safety precaution</p> <p>Check vacuum-controlled EGR valves on gasoline engines</p> <p>Check EGR valves with a potentiometer</p> <p>Check mechanical</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Describing the function and location of exhaust gas recirculation (EGR) valve</p> <p>Defining the types of EGR valve (for example vacuum controlled valve) for better knowledge</p> <p>Explaining the cleaning method EGR valve</p> <p>Diagnosing the faults of (EGR) valve with the help of OBD – II scanner</p>	<p><b>Total</b></p> <p>13 Hrs</p> <p><b>Theory:</b></p> <p>03 Hrs</p> <p><b>Practical:</b></p> <p>10 Hrs</p>	<p>Appropriate PPEs</p> <p>Scanner OBD-II</p> <p>Digital Multimeter</p> <p>Wheel skids wooden</p> <p>Ratchet and Sockets Set</p> <p>Screwdriver Set</p> <p>Pliers</p> <p>Hand Cleaner</p> <p>Potentiometer</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

	<p>pressure transducers</p> <p>Check electro-pneumatic pressure transducers</p> <p>Check electrical pressure transducers</p> <p>Check electric change-over valves</p> <p>Check thermo valves</p> <p>Check the EGR system with OBD-II Scanner</p> <p>Ensure housekeeping after completion of task</p>	Importance of housekeeping		<p>Combination Spanner Set/ Spanner set</p> <p>WD40</p> <p>Petrol</p> <p>Kerosene Oil</p> <p>Cotton Rag</p> <p>Tool Trolley</p> <p>Lamp</p>	
<p><b>LU 3:</b> Perform Re-generation Process for Diesel System</p>	<p><b>The trainee will be able to:</b></p> <p>Select the tool and equipment according to the job requirement</p> <p>Ensure safety precaution</p> <p>Prepare vehicle/engine for regeneration process</p> <p>Connect OBD-II Scanner</p> <p>Perform Regeneration process in Diesel EFI System</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining Ad-blue chemical for neutralizing the toxic gases of diesel engines with their functions.</p> <p>Explaining the importance, function and location of diesel particulate filters (DPF) in diesel engines</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 12 Hrs</p> <p><b>Theory:</b> 02 Hrs</p> <p><b>Practical:</b> 10 Hrs</p>	<p>Appropriate PPEs</p> <p>Scanner OBD-II</p> <p>Repair Manual</p> <p>Digital Multimeter</p> <p>Ad-blue</p> <p>Diesel</p> <p>Cotton Rag</p> <p>Fender Covers</p> <p>Tool Trolley</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

	Ensure housekeeping after completion of task			Lamp	
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# AUTOMOTIVE MECHATRONICS



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Module-9  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 9: 071400961 Conserve Power Transmission-II

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to conserve power transmission-II.

**Duration:** 60 Hrs      **Theory:** 15 Hrs      **Practical:** 45 Hrs

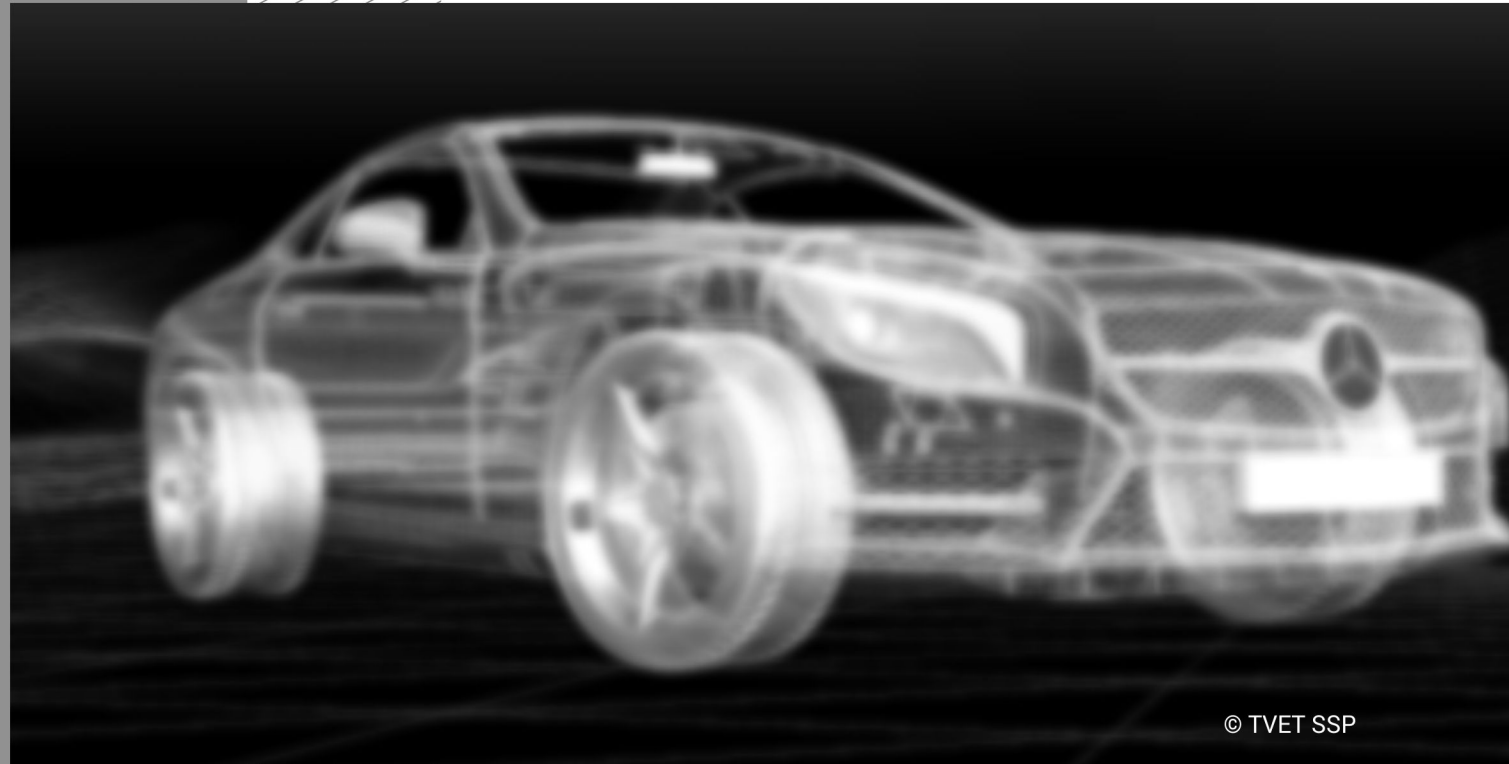
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Perform Diagnosis of CVT with OBD-II	<p><b>The trainee will be able to:</b></p> <p>Select tools and equipment according to job requirement</p> <p>Observe occupational health and safety precautions at all times</p> <p>Connect OBD-II Scanner</p> <p>Monitor function of all sensors.</p> <p>Replace the faulty sensor</p> <p>Ensure housekeeping after completion of task</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining the components of continuous variable transmission (CVT) (i.e. steel belt, planetary gear assembly, forward clutch, reverse brake, start clutch, fly wheel, ATF pump, hydraulic control unit and electronic control unit)</p> <p>Defining bodies used in continuous variable transmission (CVT) (Manual, Governor, Main)</p> <p>Defining different types of Clutches in CVT</p> <p>Describing working, location and fault diagnosing of clutch in continuous variable transmission (CVT)</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 25 Hrs</p> <p><b>Theory:</b> 06 Hrs</p> <p><b>Practical:</b> 19 Hrs</p>	<p>Scanner OBD-II</p> <p>Digital Multimeter</p> <p>Wheel skids wooden</p> <p>Jack/ trolley jack</p> <p>Jack stands different size/height</p> <p>Ratchet and Sockets Set</p> <p>Screwdriver Set</p> <p>Pliers</p> <p>Hammer</p> <p>Ramps</p> <p>Hand Cleaner</p> <p>Combination Spanner Set/ Spanner set</p>	<p>Class or demonstration room</p> <p>Workshop/Lab</p> <p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>



				WD.40 Petrol Kerosene Oil Grease Cotton Rug Creeper Trolley Tool Trolley Lamp Appropriate PPEs	
<b>LU 2:</b> Maintain Continuous Variable Transmission (CVT) system	<b>The trainee will be able to:</b>  Select tools and equipment according to job requirement  Observe occupational health and safety precautions at all times  Test CVT oil pressure  Check & Replace vehicle speed sensor  Check & Replace Input shaft sensor  Check & Replace Output shaft sensor	Understanding of appropriate tools and equipment  Explaining the safety precautions regarding personal health and workplace  Describing working of pulleys in continuous variable transmission (CVT)  Explaining different types of sensors in continuous variable transmission (CVT) (i.e. drive shaft sensor, driven shaft sensor, clutch control solenoid valve, Vehicle speed sensor (VSS)).  Defining the function of planetary gear system (i.e. Working principle, troubleshooting)  Importance of housekeeping	<b>Total</b> 25 Hrs  <b>Theory:</b> 06 Hrs  <b>Practical:</b> 19 Hrs	Scanner OBD-II  Digital Multimeter  Wheel skids wooden  Jack/ trolley jack  Jack stands different size/height  Oil pressure gauge  Ratchet and Sockets Set  Screwdriver Set  Pliers	Class room with multimedia aid and flip charts  Or  Access to an Automobile Workshop with required tools and equipment

	<p>Check &amp; Replace CVT oil</p> <p>Check &amp; Replace CVT belt</p> <p>Check &amp; Replace Transmission oil seal</p> <p>Check primary, secondary and manual valve body</p> <p>Check &amp; Replace multi-plate clutches</p> <p>Replace shaft bearings, if required</p> <p>Ensure housekeeping after completion of task</p>			<p>Hammer</p> <p>Ramps</p> <p>Hand Cleaner</p> <p>Combination Spanner Set/ Spanner set</p> <p>WD.40</p> <p>Petrol</p> <p>Kerosene Oil</p> <p>Grease</p> <p>Cotton Rag</p> <p>Creeper Trolley</p> <p>Tool Trolley</p> <p>Lamp</p> <p>Appropriate PPEs</p>	
<p><b>LU 3:</b> Perform Road Test to check performance of CVT</p>	<p><b>The trainee will be able to:</b></p> <p>Perform final road test</p> <p>Accelerate the engine to check noise</p> <p>Check the performance of CVT during driving</p> <p>Ensure housekeeping</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining the final inspection of the continuous variable transmission (CVT) for noise, performance by the road test.</p> <p>Importance of housekeeping</p>	<p><b>Total</b></p> <p>10 Hrs</p> <p><b>Theory:</b></p> <p>03 Hrs</p> <p><b>Practical:</b></p> <p>07 Hrs</p>	<p>Petrol</p> <p>Scanner OBD-II</p> <p>Digital Multimeter</p> <p>Appropriate PPEs</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>
	<p>after completion of task</p>				

# AUTOMOTIVE MECHATRONICS



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Module-10  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 10: 071400962 Service Comfort & Safety System-II

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to service comfort & safety system-II.

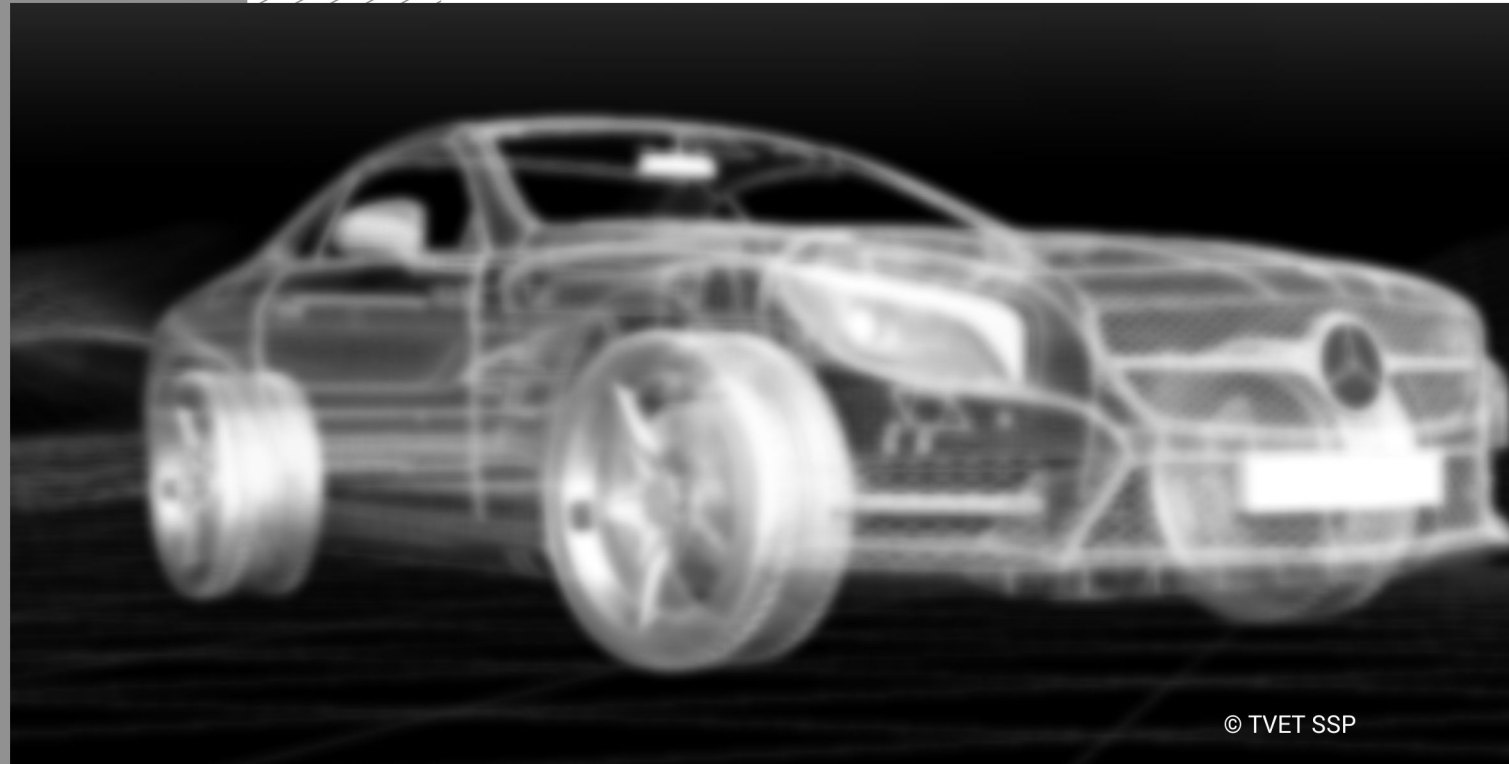
**Duration:** 40                      **Theory:** 06                      **Practical:** 34

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Check Cruise Control System	<p><b>The trainee will be able to:</b></p> <p>Select appropriate tools and equipment.</p> <p>Ensure work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines. Check supply in ECU assembly.</p> <p>Check wiring harness, fuses and relays</p> <p>Inspect Cruise Control Main Switch Assembly.</p> <p>Inspect Cruise Control Actuator Assembly.</p> <p>Check Vacuum leakage in line at servo unit</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining principal of cruise control system</p> <p>Explaining components of cruise control system (i.e. main relay, panel switch, cruise motor throttle body and wiring harness)</p> <p>Explaining fault diagnosing with the help of OBD – II scanner (i.e. location of components, repair and maintenance)</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 20 Hrs</p> <p><b>Theory:</b> 03 Hrs</p> <p><b>Practical:</b> 17 Hrs</p>	<p>Scanner OBD-II</p> <p>Digital Multimeter</p> <p>Screwdriver Set</p> <p>Socket Spanner Set</p> <p>Repair Manual</p> <p>Combination Plier</p> <p>Allen Keys set</p> <p>Star Keys set</p> <p>Hand Cleaner</p> <p>Combination Spanner Set/ Spanner set</p> <p>Ratchet and Sockets Set</p> <p>WD.40</p> <p>Kerosene Oil</p> <p>Grease</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

	<p>Adjust throttle linkage to maintain engine speed.</p> <p>Ensure housekeeping after completion of task</p>			<p>Cotton Rug</p> <p>Tool Trolley</p> <p>Lamp</p> <p>Appropriate PPEs</p>	
<p><b>LU 2:</b> Maintain Supplementary Restraint System (SRS)</p>	<p><b>The trainee will be able to:</b></p> <p>Select appropriate tools and equipment</p> <p>Ensure work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines.</p> <p>Check supply in ECU assembly.</p> <p>Check wiring harness, fuses and relays.</p> <p>Maintain Supplementary Restraint System (SRS)</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Explaining working principles of supplementary Restraint system (SRS).</p> <p>Describing components of supplementary Restraint system (SRS) (i.e. crash sensor, air bags, seat belts, inflator units, ECU) and their location</p> <p>Defining function of components of supplementary Restraint system (SRS)</p> <p>Describing installing procedure of seat belts and Air Bag Module assembly</p>	<p><b>Total</b></p> <p>20 Hrs</p> <p><b>Theory:</b></p> <p>03 Hrs</p> <p><b>Practical:</b></p> <p>17 Hrs</p>	<p>Scanner OBD-II</p> <p>Digital Multimeter</p> <p>Screwdriver Set</p> <p>Socket Spanner Set</p> <p>Repair Manual</p> <p>Combination Plier</p> <p>Allen Keys set</p> <p>Star Keys set</p> <p>Hand Cleaner</p> <p>Combination Spanner Set/</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

	<p>Ensure housekeeping after completion of task</p>	<p>Explaining procedure of supplementary Restraint system (SRS) troubleshooting</p> <p>Explaining safety legal precautions of supplementary Restraint system (SRS) (i.e. operation and repair maintenance)</p> <p>Importance of housekeeping</p>		<p>Spanner set</p> <p>Ratchet and Sockets Set</p> <p>WD.40</p> <p>Kerosene Oil</p> <p>Grease</p> <p>Cotton Rag</p> <p>Tool Trolley</p> <p>Lamp</p> <p>Appropriate PPEs</p>	
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# AUTOMOTIVE MECHATRONICS



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Module-11  
CBT CURRICULUM  
National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 11: 071400963 Perpetuate Controlled Electric & Electronic System-II

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to perpetuate controlled electric & electronic system.

**Duration:** 60      **Theory:** 12      **Practical:** 48

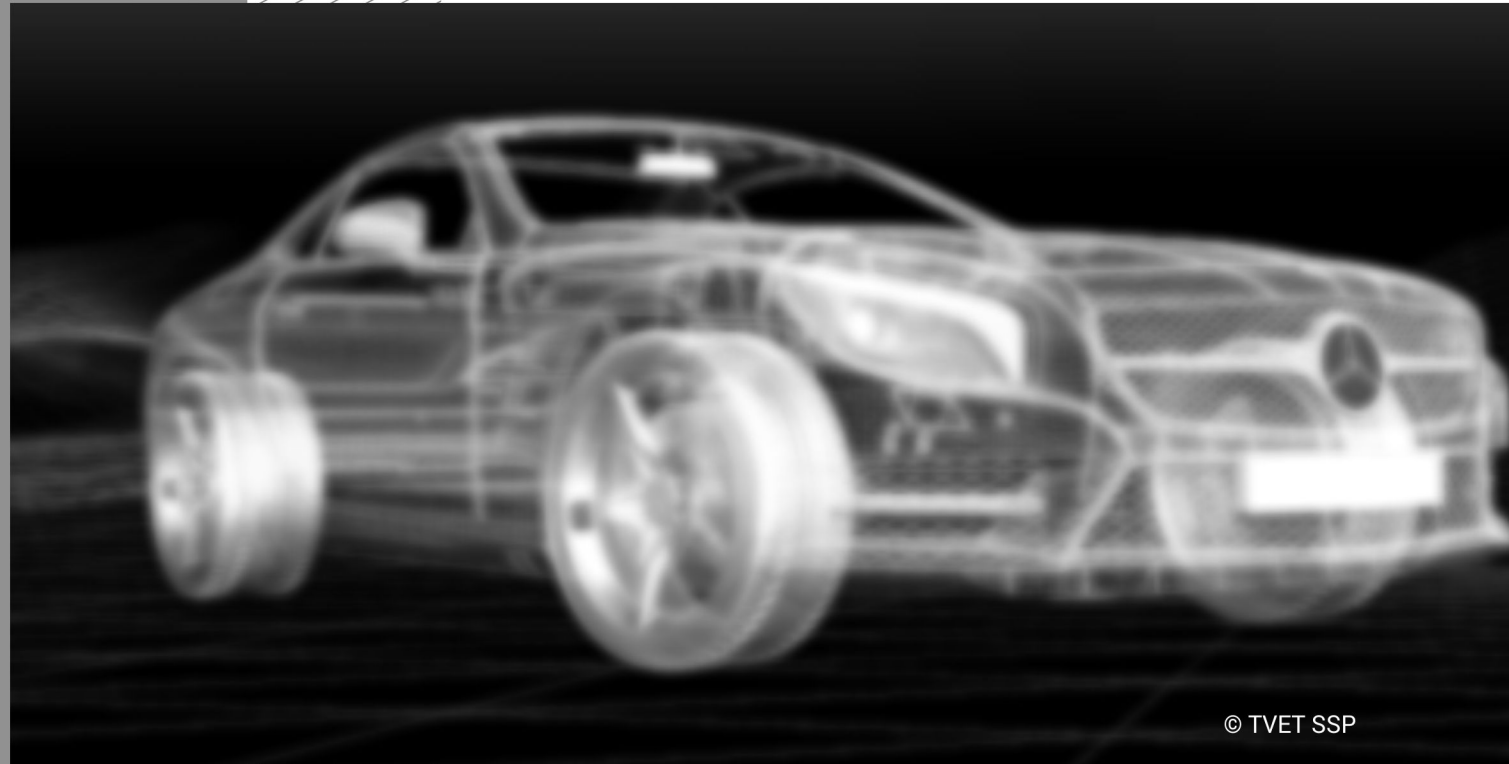
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1: Service Controlled Wiper &amp; Washer System</b>	<p><b>The trainee will be able to:</b></p> <p>Select tools and equipment according to job requirement</p> <p>Observe occupational health and safety precautions at all times</p> <p>Test function of rain sensor.</p> <p>Check operation of wiper motors and arms.</p> <p>Check wiper motor connector and fuse.</p> <p>Check washer tank and washer motor.</p> <p>Inspect washer lines and nozzles.</p> <p>Remove, Service or refit of wiper motor.</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognize and use proper PPEs for the activity</p> <p>Defining rain sensor system and calibration.</p> <p>Explaining wiper controlled system, including the washer system with the service requirement.</p> <p>Describing wind screen washer system and service requirement.</p> <p>Explaining the procedure of wiper motor service.</p> <p>Understanding of dismantling of wiper &amp; washer system</p> <p>Explaining function of combination switch</p> <p>Describing how to keep the work area clean during and after the activity</p> <p>Importance of housekeeping</p>	<p><b>Total</b></p> <p>18 Hrs</p> <p><b>Theory:</b></p> <p>03 Hrs</p> <p><b>Practical:</b></p> <p>15 Hrs</p>	<p>Appropriate PPEs</p> <p>Fender cover</p> <p>WD-40</p> <p>Cotton Rug</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p> <p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>



	<p>Check and replace combination control switch.</p> <p>Ensure housekeeping after completion of task</p>			<p>Car Jack</p> <p>Wheel Spanner</p> <p>Service creeper</p> <p>Tool Trolley</p>	
<p><b>LU 2: Repair Electric Power Steering (EPS) System</b></p>	<p><b>The trainee will be able to:</b></p> <p>Select tools and equipment according to job requirement</p> <p>Observe occupational health and safety precautions at all times</p> <p>Find faults in electric power steering system using OBD-II scanner</p> <p>Check fuse, relays of electric power steering system.</p> <p>Check wiring harness and connectors of electric power steering system.</p> <p>Remove, service and refit of electric power steering system motor.</p> <p>Ensure housekeeping after completion of task</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognizing and using proper PPEs for the activity</p> <p>Defining electrical power steering system and its maintenance procedure</p> <p>Defining electrical power steering system's performance and system examination parameters</p> <p>Maintaining electrical power steering system</p> <p>Repairing electrical power steering system</p> <p>Performing work area cleans during and after the activity.</p> <p>Importance of housekeeping</p>	<p><b>Total</b></p> <p>18 Hrs</p> <p><b>Theory:</b></p> <p>03 Hrs</p> <p><b>Practical:</b></p> <p>15 Hrs</p>	<p>Appropriate PPEs</p> <p>Fender cover</p> <p>WD-40</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p> <p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p> <p>Car Jack</p> <p>Wheel Spanner</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

				Service creeper Tool Trolley	
<b>LU 3: Test Function of Sensors</b>	<p><b>The trainee will be able to:</b></p> <p>Select tools and equipment according to job requirement</p> <p>Observe occupational health and safety precautions at all times</p> <p>Check/replace oxygen sensor.</p> <p>Check/replace crank position sensor.</p> <p>Check/replace cam sensor.</p> <p>Check/replace Throttle position sensor. Check/replace Intake air temperature sensor.</p> <p>Check/replace Intake air flow sensor</p> <p>Check/replace of knock sensor.</p> <p>Ensure housekeeping</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognizing and use proper PPEs for the activity</p> <p>Describing different types of sensors in electric &amp; electronic system</p> <p>Describing function of oxygen sensor</p> <p>Explaining function of crank positioning sensor</p> <p>Defining function of cam scanner</p> <p>Checking and replacing procedure of throttle position sensor</p> <p>Describing function of mass air flow and air pressure sensor</p> <p>Explaining function of mass intake air temperature sensor</p> <p>Performing work area cleaning during and after the activity</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 24 Hrs</p> <p><b>Theory:</b> 06 Hrs</p> <p><b>Practical:</b> 18 Hrs</p>	<p>Appropriate PPEs</p> <p>Fender cover</p> <p>WD-40</p> <p>Cotton Rug</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p> <p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p> <p>Car Jack</p> <p>Wheel Spanner</p> <p>Service creeper</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>
	after completion of task			Tool Trolley	

# AUTOMOTIVE MECHATRONICS



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Module-13

CBT CURRICULUM

National Vocational Certificate Level 4

Version 1 - November, 2019

## Module 12: 071400964 Maintain Network System

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to maintain network system.

**Duration:** 50 Hrs      **Theory:** 10 Hrs      **Practical:** 40 Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1: Verify Navigation System</b>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Arrange Tools &amp; equipment</li> <li>Ensure HSE requirements and fulfilled for the given task</li> <li>Locate navigation device</li> <li>Check electric connection of device</li> <li>Check connection of Antenna</li> <li>Remove LCD from Vehicle dashboard</li> <li>Check Navigation card</li> <li>Ensure housekeeping after completion of task</li> </ul>	<ul style="list-style-type: none"> <li>Understanding of appropriate tools and equipment</li> <li>Explaining the safety precautions regarding personal health and workplace</li> <li>Recognizing and use proper PPEs for the activity</li> <li>Defining navigation system</li> <li>Explaining global positioning system (GPS)</li> <li>Describing navigation programming</li> <li>Performing work area cleaning during and after the activity</li> <li>Importance of housekeeping</li> </ul>	<p><b>Total</b> 15 Hrs</p> <p><b>Theory:</b> 03 Hrs</p> <p><b>Practical:</b> 12 Hrs</p>	<ul style="list-style-type: none"> <li>Fender cover</li> <li>WD-40</li> <li>OBD-II Scanner</li> <li>Multi meter</li> <li>Repair Manual</li> <li>Wire cutter</li> <li>Combination Plier</li> <li>Combination spanner set</li> <li>Small socket set</li> <li>Screw driver set</li> <li>Needle nose pliers</li> <li>Car lifting equipment</li> <li>Car Jack</li> <li>Wheel Spanner</li> </ul>	<ul style="list-style-type: none"> <li>Class room with multimedia aid and flip charts</li> <li>Or</li> <li>Access to an Automobile Workshop with required tools and equipment</li> </ul>

				Service creeper Appropriate PPEs	
<b>LU 2:</b> Maintain Control Area Network (CAN) System	<p><b>The trainee will be able to:</b></p> <p>Select appropriate tools/material as per SOP</p> <p>Follow safety rules</p> <p>Locate CAN connector</p> <p>Remove and service of connector</p> <p>Refit the CAN connector at its location</p> <p>Ensure housekeeping after completion of task</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognizing and use proper PPEs for the activity</p> <p>Explaining Control Area Network (CAN)</p> <p>Describing location of CAN connector</p> <p>Servicing and refitting CAN connector</p> <p>Performing work area cleaning during and after the activity</p> <p>Importance of housekeeping</p>	<p><b>Total</b> 15 Hrs</p> <p><b>Theory:</b> 03 Hrs</p> <p><b>Practical:</b> 12 Hrs</p>	<p>Fender cover</p> <p>WD-40</p> <p>Cotton Rug</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p> <p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p> <p>Car Jack</p> <p>Wheel panner</p> <p>Service creeper</p> <p>Appropriate PPEs</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

<b>LU 3:</b> Verify Electric Parking System	<p><b>The trainee will be able to:</b></p> <p>Select appropriate tools/material as per SOP</p> <p>Check Diagnostic Trouble Codes (DTC)</p> <p>Check/ replace parking switch</p> <p>Check wiring harness and fuses</p> <p>Check function of electric parking motors</p> <p>Check Hill Assist system</p> <p>Check ABS Modulator</p> <p>Ensure housekeeping after completion of task</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognizing and using proper PPEs for the activity</p> <p>Recognizing and use proper PPEs for the activity</p> <p>Understanding DTC for ABS System</p> <p>Verifying procedure of different component of electric parking system (e.g. parking switch, wiring harness, fuses)</p> <p>Explaining Hill Assist System and its functioning</p> <p>Describing ABS Modulator system and its verification method</p> <p>Performing work area cleans during and after the activity</p> <p>Importance of housekeeping</p>	<p><b>Total</b></p> <p>20 Hrs</p> <p><b>Theory:</b></p> <p>04 Hrs</p> <p><b>Practical:</b></p> <p>16 Hrs</p>	<p>Fender cover</p> <p>WD-40</p> <p>Cotton Rug</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p> <p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p> <p>Car Jack</p> <p>Wheel Spanner</p> <p>Service creeper</p> <p>Tool Trolley</p> <p>Appropriate PPEs</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

### Module 13: 071400965 Maintain Hybrid System

**Objective of the module:** The aim of this module is to develop advanced knowledge, skills and understanding to maintain hybrid system.

**Duration:** 50 Hrs      **Theory:** 06 Hrs      **Practical:** 44 Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU 1:</b> Maintain Series Hybrid	<b>The trainee will be able to:</b>	Understanding of appropriate tools and equipment	<b>Total</b>	Fender cover	Class room with multimedia aid and flip charts  Or Access to an Automobile Workshop with required tools and equipment
	Select tools and equipment according to job requirement	Explaining the safety precautions regarding personal health and workplace	18 Hrs	WD-40	
	Observe occupational health and safety precautions at all times	Recognizing and use proper PPEs for the activity	<b>Theory:</b> 02 Hrs	Cotton Rag	
	Check function of engine	Explaining Hybrid System and its types (series, parallel and combined)	<b>Practical:</b> 16 Hrs	OBD-II Scanner	
	Check function of generator/alternator in series hybrid system	Describing series hybrid system (electric hybrid) and its functioning procedure.		Multi meter	
	Check function of inverter in series hybrid system	Describing the procedure of series hybrid system maintenance.		Repair Manual	
	Check function of battery in series hybrid system	Describing the functions of high tension cables in hybrid system		Wire cutter	
	Check function of drive motor in series hybrid system	Describing the function of Inverters in hybrid system		Combination Plier	
Check function of	Describing the function of Power Split Unit		Combination spanner set		
	Describing various sensors used in Hybrid vehicles		Small socket set		
			Screw driver set		
			Needle nose pliers		
			Car lifting equipment		
			Car Jack		

	<p>Powertrain Control Module (PCM) in series hybrid system</p> <p>Check function of sensors in series hybrid system</p> <p>Check function of hybrid breaker in series hybrid system</p> <p>Ensure housekeeping after completion of task</p>	<p>Performing inspection of various sensors used in Hybrid vehicles</p> <p>Describing types of batteries in Hybrid vehicle (Lead acid battery, Nickel-metal-Hydride battery, Lithium-ion battery)</p> <p>Describing the function AC-DC Converter in hybrid system</p> <p>Describing the function of PCM in hybrid system</p> <p>Performing work area cleans during and after the activity</p> <p>Importance of housekeeping</p>		<p>Wheel Spanner</p> <p>Service creeper</p> <p>Tool Trolley</p> <p>Appropriate PPEs</p>	
<b>LU 2: Maintain Parallel Hybrid</b>	<p><b>The trainee will be able to:</b></p> <p>Select tools and equipment according to job requirement</p> <p>Observe occupational health and safety precautions at all times</p> <p>Maintain engine in Parallel Hybrid system</p> <p>Maintain transmission in Parallel Hybrid system</p> <p>Maintain hybrid motor in Parallel Hybrid system</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognizing and use proper PPEs for the activity</p> <p>Explaining parallel hybrid system (mild extended hybrid) components and their functions</p> <p>Describing the maintenance in parallel hybrid system using OBD-II Scanner.</p> <p>Performing work area cleaning during and after the activity</p>	<p><b>Total</b></p> <p>16 Hrs</p> <p><b>Theory:</b></p> <p>02 Hrs</p> <p><b>Practical:</b></p> <p>14 Hrs</p>	<p>Fender cover</p> <p>WD-40</p> <p>Cotton Rag</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>



	<p>Maintain battery in Parallel Hybrid system</p> <p>Maintain Powertrain Control Module (PCM) in Parallel Hybrid system</p> <p>Perform sensors maintenance in Parallel Hybrid system</p> <p>Perform hybrid breaker maintenance in Parallel Hybrid system</p> <p>Ensure housekeeping after completion of task</p>	Importance of housekeeping		<p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p> <p>Car Jack</p> <p>Wheel Spanner</p> <p>Service creeper</p> <p>Tool Trolley</p> <p>Appropriate PPEs</p>	
<b>LU 3:</b> Maintain Combined Hybrid System	<p><b>The trainee will be able to:</b></p> <p>Select tools and equipment according to job requirement</p> <p>Observe occupational health and safety precautions at all times</p> <p>Check engine performance</p> <p>Check Generator/Alternator performance</p> <p>Check inverter</p>	<p>Understanding of appropriate tools and equipment</p> <p>Explaining the safety precautions regarding personal health and workplace</p> <p>Recognizing and use proper PPEs for the activity</p> <p>Describing the components and their components of Series- Parallel or Combined Hybrid (Active Hybrid) system. Explaining the fault diagnosing procedure using OBD-II Scanner.</p> <p>Performing work area cleans during and after the activity</p> <p>Importance of housekeeping</p>	<p><b>Total</b></p> <p>16 Hrs</p> <p><b>Theory:</b></p> <p>02 Hrs</p> <p><b>Practical:</b></p> <p>14 Hrs</p>	<p>Fender cover</p> <p>WD-40</p> <p>Cotton Rag</p> <p>OBD-II Scanner</p> <p>Multi meter</p> <p>Repair Manual</p> <p>Wire cutter</p> <p>Combination Plier</p> <p>Combination spanner set</p> <p>Small socket set</p>	<p>Class room with multimedia aid and flip charts</p> <p>Or</p> <p>Access to an Automobile Workshop with required tools and equipment</p>

	<p>performance</p> <p>Check battery performance</p> <p>Check hybrid motor performance</p> <p>Check power split device performance</p> <p>Check PCM performance</p> <p>Check sensor performance</p> <p>Perform hybrid breaker performance</p> <p>Ensure housekeeping after completion of task</p>			<p>Screw driver set</p> <p>Needle nose pliers</p> <p>Car lifting equipment</p> <p>Car Jack</p> <p>Wheel Spanner</p> <p>Service creeper</p> <p>Tool Trolley</p> <p>Appropriate PPEs</p>	
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## **General assessment guidance for *Automotive Mechatronics Lev-4***

Good practice in Pakistan makes, use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan, is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

**Sessional assessment** is going on all the time. Its purpose is to provide feedback on what students are learning:

- to the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

**Final assessment** is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

### **Methods of assessment**

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of an Automotive Mechatronics Lev-4 include:

- Work performances, for example service comfort & safety system with required standard procedure
- Demonstrations, for example verifying navigation system
- Direct questioning, for example, the assessor would ask the student about procedure of series hybrid system maintenance
- Paper-based tests, such as multiple choice or short questions answer.

Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of an Automotive Mechatronics Lev-4 include:

- Work products, such as a maintained network system
- Workplace documents, such as note book or practical activity journal

Indirect assessment should only be a second choice (in some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

### **Principles of assessment**

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess.

Reliability means that the assessment is consistent and reproducible.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a mishap during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

## **Assessment strategy for Automotive Mechatronics Lev-4 Curriculum**

This curriculum consists of 13 modules:

1. Contribute to Work Related Health and Safety (WHS) Initiatives
2. Analyze Workplace Policy and Procedures
3. Perform Advanced Communication
4. Develop Advance Computer Application Skills
5. Manage Human Resource Services
6. Develop Entrepreneurial skills
7. Maintain Fuel Control System-II
8. Maintain Emission Control System
9. Conserve Power Transmission-II
10. Service Comfort and Safety System-II
11. Perpetuate Controlled Electrical & Electronics System-II
12. Maintain Network System
13. Maintain Hybrid System

### **Sessional assessment**

The sessional assessment shall be conducted after completion of each module in two parts: theoretical assessment and practical assessment.

Theoretical assessment for all learning modules must consist of a written paper lasting at least 30 minutes per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

## **Final assessment**

Final assessment shall also be in two parts: theoretical assessment and practical assessment.

For the final practical assessment, each student shall be assessed over a period of 4-5 hours session. During this period, each student must be assessed on his ability to perform a complete job individually.

Generic modules shall be assessed comprising with other 7 modules at the time of final assessment. Practical work for these modules shall be assessed on sessional basis only.

## **The assessment team**

The number of assessors must meet the needs of the students and the training provider. For example, where two assessors are conducting the assessment, there must be a maximum of five students per assessor. In this example, a group of 20 students shall therefore require assessments to be carried out over a four-day period. For a group of only 10 students, assessments would be carried out over a two-day period only.

## **Planning for assessment**

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. Assessors can be prepared a tabular planner, and use it to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment program for each group of five students. Training providers must agree the dishes for practical assessments in advance.

## Complete list of tools and equipment

<b>S. No</b>	<b>Description</b>	<b>Quantity</b>
1	Cotton Gloves	20 pairs
2	Goggles	20 nos.
3	Safety mask	100 pcs
4	Safety Shoes	25 pairs
5	Ear plug / Ear Muff	25 pcs
6	Coverall	20 nos.
7	Allen Keys set	20 nos.
8	Brake Bleeding Equipment	10 nos.
9	Brake Drum Pullers	10 nos.
10	Brake Efficiency Tester	10 nos.
11	Brake fluid collector/container	10 nos.
12	Combination spanner set	10 nos.
13	Creeper Trolley	10 nos.
14	Digital Multimeter	10 nos.
15	Electric Tester	10 nos.
16	Electrical tool kit	6 nos.
17	Exhaust Gas Analyzer	5 nos.

18	Fender Covers	20 nos.
19	Fire extinguisher	05 nos.
20	Flare-nut wrench	10 nos.
21	Flaring Tool/Flare Tool for brake tubes repairing	10 nos.
22	Floor Mats	5 sets
23	Gas leak detector	10 nos.
24	Grip Plier	10 nos.
25	Hammer	06 nos.
26	Hex Wrench(Set)	06 nos.
27	Jack stands (different size/height)	06 nos.
28	Jack/ trolley jack	06 nos.
29	Lamp	06 nos.
30	Lifting Equipment (Service Pit)	06 nos.
31	Needle nose pliers	10 nos.
32	OBD-II Scanner	06 nos.
33	Oil pressure gauge	06 nos.
34	Pliers	10 nos.
35	Plug Spanner	10 nos.
36	Potentiometer	10 nos.
37	Pressure Gauge	10 nos.



38	Ramps	5 set
39	Ratchet and Sockets Set	10 nos.
40	Screwdriver Set	10 nos.
41	Service creeper	10 nos.
42	Socket Set	10 nos.
43	Socket Spanner Set	10 nos.
44	Spark plug cleaner	10 nos.
45	Special bleed valve tools (only for ABS use)	10 nos.
46	Special service tools	10 nos.
47	Special suction pump or vacuum bleeder	02 nos.
48	Star Keys set	05 nos.
49	Stethoscope	05 nos.
50	Test lamp	06 nos.
51	Thermometer	10 nos.
52	Tool Trolley	10 nos.
53	Torque Wrench	10 nos.
54	Tube Bender	10 nos.
55	Tyre Lever	06 nos.
56	Vernier caliper	06 nos.
57	Wet towel	06 nos.

58	Wheel alignment machine	10 nos.
59	Wheel balancing Machine	05 nos.
60	Wheel skids wooden	10 nos.
61	Wheel Spanner	10 nos.
62	Wire cutter	10 nos.
63		

## List of consumable supplies

1. Ad-blue
2. Battery
3. Brake Fluid
4. Carburetor cleaner (sensor safe)
5. Cleaning Equipment with Detergent
6. Cotton Rags
7. Diesel
8. Ducting Tape
9. Emery Paper
10. Grease
11. Hand Cleaner
12. Kerosene Oil
13. Petrol
14. Spark plug cleaner
15. Transmission Oil
16. Washer Fluid
17. WD 40
18. Wet towel
19. Wire Brush (Steel Wire)

## List of Stationary

1. Process SOPs
2. Equipment Maintenance Manuals
3. Log Book
4. Handbooks
5. Design Books/ Sheets
6. Pencils
7. Erasers
8. Pencil Sharpeners
9. Paper Cutter
10. Scissors
11. Color Pencils
12. White chart paper
13. Brown Sheets
14. White Board Markers (red, blue, green, black)
15. Permanent markers (black)
16. File covers

## Credit values

The credit value of the National Certificate Level 4 in Automotive Mechatronics is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines).

The credit values are as follows:

Competency Standard	Estimate of hours	Credit
1. Contribute to Work Related Health and Safety (WHS) Initiatives	30	03
2. Analyze Workplace Policy and Procedures	30	03
3. Perform Advanced Communication	30	03
4. Develop Advance Computer Application Skills	40	04
5. Manage Human Resource Services	20	02
6. Develop Entrepreneurial skills	30	03
7. Maintain Fuel Control System-II	50	05
8. Maintain Emission Control System	40	04
9. Conserve Power Transmission-II	60	06

Competency Standard	Estimate of hours	Credit
10. Service Comfort & Safety System-II	40	04
11. Perpetuate Controlled Electrical & Electronic System-II	60	06
12. Maintain Network System	50	05
13. Maintain Hybrid System	50	05

