

## GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

### Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)

I– Semester

Course Title: **Auto Trade Practice**

(Course Code: 4310201)

Diploma programme in which this course is offered	Semester in which offered
Automobile Engineering	First

### 1. RATIONALE

Due to the rapid growth of auto component manufacturers and automobile industries, there is a great demand for Automobile Engineers. Automotive sector offers wide range of job prospects to automobile engineering pass outs from manufacturing, marketing and service to survey and insurance. The automotive industry is addressing pressing environmental issues of carbon dioxide emissions, waste, and fossil fuel dependence. This course is prepared to familiarize students with vehicle, their work and responsibility in actual field as well as to prepare them for sustainable development. Overview of **automotive waste management and energy saving**/efficient methods are also incorporated in this course.

The content of this course is purely practical base and designed in such a way that student be acquainted with latest trade practices in automobile sector and associated knowledge will also help the student to start workshop or work in authorized auto workshop.

### 2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency.

- **Apply standard auto trade practices for sustainable growth of an automobile workshop.**

### 3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

- a) Identify various components of assemblies /systems, materials, fasteners etc., used in a vehicle with their broad specification.
- b) Demonstrate various types of roles and responsibilities one has to perform in different field of automotive sector
- c) Use common hand tools, testing equipment's and measuring instruments related to automobile workshop /garage.
- d) Prepare a study report after collection and analysis of field data.
- e) **Perform task with due consideration to safety rules, energy saving and waste management methods in automotive industry.**

#### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
0	0	4	C	CA	ESE	CA	ESE	50
			2	00	00	25*	25	

(\*):For this practical only course, 25 marks under the practical CA has two components i.e. the assessment of micro-project, which will be done out of 10 marks and the remaining 15 marks are for the assessment of practical. This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, CA - Continuous Assessment; ESE - End Semester Examination.

#### 5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) that are the sub-components of the COs. These PrOs need to be attained to achieve the Cos.

S. No	Practical Outcomes (PrOs)	Unit No.		Approx. Hrs. required
1	Identify various parts/ components of an automobile engine.	I		04
2	Identify various parts/ components of an automobile transmission system.	I		04
3	Identify various parts/ components of an automobile electrical system.	I		04
4	Identify various fasteners and other hardware used in making an automobile. (Make charts of fasteners and other hardware with picture)	I	Any one	04
5	List various materials used in vehicle with giving (two to three) reasons for using them for particular application.(Make charts of component with material and picture)	I		04
6	Visit any one automobile garage or manufacturing unit to understand role of automobile engineer in field then prepare a report.	II	Any three	04
7	Expert lecture from RTO-inspector/ vehicle surveyor /sales and marketing person of automobile industry to understand role of automobile engineer in field then prepare a note on it.	II		04
8	List work/ responsibilities of a junior automotive engineer working in government/ defense sector.	II		04
9	List work/ responsibilities of an automobile engineer as an engineer in private transport companies or as a garage owner.	II		04
10	Demonstrate features and use of various types of common hand tools used in automobile garage with safety measures.	III		04
11	Demonstrate features and use of various types of common power tools used in automobile garage with safety measures.	III		04

	Suggested list for hands on practice are as follows (1) Practice on using different jacks to remove wheels from vehicle  (2) Practice on High pressure washing technic / method of different vehicles.  (3) Practice on removal of tyre from wheel disc and mending the punctured tubes using hot patch and cold patch.			
12	Demonstrate features and use of various types of common measuring instruments used in automobile garage with safety measures. Suggested list for hands on practice are as follows (1) Measuring the wheel base, wheel track and ground clearance of LMV/available vehicle in the workshop. (2)Practice on cleaning and adjustment of spark plug gap	III		04
13	Demonstrate features and use of various types of common testing equipment's used in automobile garage with safety.	III		04
14	Prepare and present study report on <b>energy saving methods</b> in automotive sector. (eg. At manufacturing unit / at garage / at office / during transportation)	IV		04
15	Prepare and present study report on <b>waste management methods in automotive sector.</b> (e.g. At manufacturing unit / at garage / at office)	IV		04
16	Prepare and present study report on actual data collection and analysis of any item related to vehicle. (e.g. Fuel, lubricant, component of vehicle, labor cost for doing given work, hardware items)	IV		04
<b>Total Hrs.</b>				<b>56</b>

**Note**

- i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.
- ii. Care must be taken in assigning and assessing study report as it is a first year study report. Study report, data collection and analysis report must be assigned in a group. Teacher has to discuss about type of data (which and why) before group start their market survey.
- iii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	Identification of various parts of given vehicle.(Practical 1 to 5)	
1	Name the part.	20
2	Explain its location.	40
3	Explain its main function.	40
<b>Total</b>		<b>100</b>

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	Understand type of work and responsibilities in various roles in automobile industry. (Practical 6 to 9)	
1	List the types of role one can perform in automobile sector as an automobile engineer.	20
2	Explain responsibilities of roles which are covered in practical sessions.	80
<b>Total</b>		<b>100</b>

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	Demonstrate features and use of various types hand tools, power tools, measuring instruments and testing equipment's. (Practical 10 to 13)	
1	Identify hand tools, power tools, measuring instruments and testing equipment's.	20
2	Select hand tools, power tools, measuring instruments and testing equipment's for given work.	10
3	Use hand tools, power tools, measuring instruments and testing equipment's for given work with safety measures.	70
<b>Total</b>		<b>100</b>

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	Prepare and present study report. (Practical 14 to 16)	
1	Coverage of points in study report.	10
2	Correlate study report with actual field work.	25
3	Presentation of study.	25
4	Findings and conclusions (student's understanding about usefulness of study.)	40
<b>Total</b>		<b>100</b>

## 6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practical in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Tool kits include Screwdrivers, Wrenches (spanners), Pullers, Surface tables, Hammers, Pliers, Bench vice	Pr 10
2	Hydraulic jack Head Capacity (Ton)1 Lifting Capacity (min.) (Ton)3 Working Pressure (bar)700-750 Lifting Stroke (mm)117	Pr 11

3	Vehicle lift Type of mounting Surface mounted Lift Type 2 Post Driver Type Electro-hydraulic Lifting capacity 3.5 tonne Lifting height with load (Maximum) 1800 millimeter	Pr 11
4	Lubricating equipment's like oil pan to drain oil, grease gun, grease/lubricant oil pump	Pr 11
5	Piston ring compressor Capacity, mm 53-175	Pr 10
6	Piston ring expander Size in mm 80-120 Nominal capacity (mm) 100-250	Pr 10
7	Measuring tools like Steel Rule, Dial Gauge, Calipers, Thickness gauge, Wire gauge, Micrometer, Vernier, Feeler Gauge	Pr 12
8	Battery load tester Unit for testing all size of vehicle batteries under operating condition and will analyse charging/starting circuits. These range voltmeter and ammeter and color-coded push button coded push button selection are mounted on it.	Pr 13
9	Engine Compression Gauge compression tester of 0-21 bar and 0-300 psi	Pr 13
10	various types of testing instruments and equipment like battery load tester, engine compression gauge, battery hydrometer set, brake tester, Plasti gauge, engine vacuum test gauge, nozzle tester	Pr 13

## 7. AFFECTIVE DOMAIN OUTCOMES

The following *sample* Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned COs and PrOs. More could be added to fulfil the development of this course competency.

- a) Work as a leader/a team member.
- b) Follow ethical practices.
- c) Practice environmental friendly methods and processes. (Environment related)

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- i. 'Valuing Level' in 1<sup>st</sup> year
- ii. 'Organization Level' in 2<sup>nd</sup> year.
- iii. 'Characterization Level' in 3<sup>rd</sup> year.

## 8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
<b>Unit – I</b> <b>Introduction to automobile.</b>	<p><b>1a.</b> Identify various assemblies, subassemblies and components of an automobile.</p> <p><b>1b.</b> Describe function of various assemblies, subassemblies and components of an automobile.</p> <p><b>1c.</b> State the types of material used in different components / parts of some common automotive vehicles.</p> <p><b>1d.</b> Identify various types of fasteners and hardware used in different parts /components of an automobile.</p>	<p><b>1.1</b> Types of automobile in general.</p> <p><b>1.2</b> Various assemblies, subassemblies and components of an automobile with their main function.</p> <p><b>1.3</b> Types of materials, fasteners and hardware used in automotive vehicles.</p>
<b>Unit –II</b> <b>Roles and responsibilities of automobile engineer.</b>	<p><b>2a.</b> List the general Job/ career opportunities available in the automotive sector.</p> <p><b>2b.</b> Identify various job responsibilities of an automobile engineer/ technician in different field of automotive sector.</p> <p><b>2c.</b> List type of skill required to run your own auto garage / workshop</p>	<p><b>2.1</b> Job/career opportunities available in auto and auto components sector.</p> <p><b>2.2</b> Types of job responsibilities and duties requirements in:</p> <ul style="list-style-type: none"> <li>● Auto and Auto components manufacturing plant,</li> <li>● Automobile garages,</li> <li>● Auto insurance,</li> <li>● Auto Finance,</li> <li>● Auto Dealership and RTO office</li> </ul> <p><b>2.3</b> Skill requirements as owner of an auto garage / workshop.</p>
<b>Unit– III</b> <b>Auto workshop tools, instruments and equipment</b>	<p><b>3a.</b> Use the given hand and power tools for assigned service work.</p> <p><b>3b.</b> Describe the procedure to use testing equipment's safely for assigned repair work.</p> <p><b>3c.</b> Use appropriate measuring instruments for assigned</p>	<p><b>3.1</b> Types of hand tools and power tools used in auto garage/ workshop.</p> <p><b>3.2</b> Types of testing equipment's used in auto garage /workshop.</p> <p><b>3.3</b> Common measuring tools used in auto garage /workshop.</p>

	service work. <b>3d.</b> Describe the procedure to maintain the given type of hand and power tools and testing equipment.	
<b>Unit– IV</b> <b>Sustainable management in Auto Industry</b>	<b>4a.</b> Follow safe practices and energy saving methods while driving a vehicle. <b>4b.</b> Describe standard methods to dispose automobile waste. <b>4c.</b> Demonstrate proper attitudes toward sustainable management in auto industry <b>4d.</b> Carry out market survey for data collection.	<b>4.1</b> General safe practices concerning driving of vehicles. <b>4.2</b> General energy saving method for driving of vehicles. <b>4.3</b> Sustainability and waste management: <ul style="list-style-type: none"> <li>● Concept of waste management</li> <li>● Methods to handle automobile waste</li> <li>● Disposal of automobile waste</li> </ul> <b>4.4</b> Methods for data collection.

**Note:** The UOs need to be formulated at the ‘Application Level’ and above of Revised Bloom’s Taxonomy’ to accelerate the attainment of the COs and the competency.

## 9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A	Total Marks
I	Introduction to automobile		<b>Not Applicable</b>			
II	Roles and responsibilities of automobile engineer					
III	Auto workshop tools, instruments and equipment					
IV	Sustainable management in Auto Industry					
<b>Total</b>						

**Legends:** R=Remember, U=Understand, A=Apply and above (Revised Bloom’s taxonomy)

**Note:** This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.

## 10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of each activity. They should also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- a) Charts can be prepared.
- b) Small report with actual parts/fasteners/hardware can be made by students.
- c) Small groups of students can be formed for assigned work. Assigned work should be such that it covers market survey, team work, presentation, time management, quality development.
- d) Visits, expert lecture, direct conversation related automobile with field person, group discussion and sharing of experiences can be arranged.

## 11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- a) Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.
- b) Guide student(s) in undertaking micro-projects.
- c) '*L*' in *section No. 4* means different types of teaching methods that are to be employed by teachers to develop the outcomes.
- d) About **20% of the topics/sub-topics** which are relatively simpler or descriptive in nature is to be given to the students for *self-learning*, but to be assessed using different assessment methods.
- e) With respect to *section No.10*, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.
- f) Guide students on how to address issues on environment and sustainability
- g) Guide students for using data manuals.

## 12. SUGGESTED MICRO-PROJECTS

*Only one micro-project* is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably being *individually* undertaken to build up the skill and confidence in every student to become problem solver so that she/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should *not exceed three*.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should be about **14 - 16 (fourteen to sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.



A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

<b>Project work on power saving methods.</b>
Project work on data collection from market on different items related to automobile. (It may include price/material of component, labor cost of servicing, lubricants etc.)
List data collection methods for market survey.
Select any one type of IC engine, search information on any system from website and prepare report for the same.
Observe the number of vehicle running on road and classify them according to different bases.
Collect the data of Indian motor vehicle manufactures and their products and write a report on it.
Collect the data of different types of tyres and write a report on it
Visit nearby authorized workshop and prepare a garage layout.
Visit nearby authorized workshop and make a list of hand tools, power tools, measuring instrument and testing equipment's.

### 13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Automobile Mechanics	William Crouse	Tata Mc-Graw Hill Publication ISBN-13:978-0-07-063435-0
2	Automotive engine Theory and servicing	James D Halderman	Pearson Education ISBN-13: 978-0134654003
3	Automobile Engg Vol-3	Anil Chhikara	Satya Prakasan ISBN: 81-7684-359-8
4	Automobile engineering	R B Gupta	Satya Prakashan, New Delhi ISBN: 9788176848589, 8176848581
5	Vehicle maintenance and garage practice	Jigar A Doshi Dhruv U Panchal Jayesh P Maniar	PHI Learning ASIN : B00LPGBTG2
6	Sustainable Management of Automobile Waste in developing countries	Forbid George Teke	VDM Verlag ISBN-13 : 978-3639254969
7	Automobile Engineering	Jain K K Asthana	McGraw Hill Education, New Delhi ISBN: 978-0-07-044529-1

**14. SOFTWARE/LEARNING WEBSITES**

- <https://www.howacarworks.com>
- <https://jameshalderman.com>
- <https://swayam.gov.in>
- <https://auto.howstuffworks.com>
- <https://www.instructables.com>
- <https://en.wikipedia.org>

**15. PO-COMPETENCY-CO MAPPING**

Semester I	Auto Trade Practice (Course Code: 4310201)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
<b>Competency</b> ● Apply standard auto trade practices for sustainable growth of an automobile workshop.	3	1	1	2	2	2	2
<b>Course Outcomes</b> CO a) Identify various types of components, materials, fasteners etc. used in a vehicle with their broad specification.	3	-	-	2	2	-	2
CO b) Demonstrate various types of roles and responsibilities one has to perform in different field of automotive sector	3	-	-	-	2	-	2
CO c) Use common hand tools, testing equipment's and measuring instruments, related to automobile workshop /garage.	3	-	-	3	-	-	2
CO d) Prepare a study report after collection and analysis of field data.	-	-	-	-	2	2	3
CO e) Perform task with due consideration to safety rules, energy saving and waste management in automotive industry.	2	1	1	-	3	2	3

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.

**16. COURSE CURRICULUM DEVELOPMENT COMMITTEE****GTU Resource Persons**

S. No	Name and Designation	Institute	Contact No.	Email
1	D.A.Dave Retd. HOD and I/C Principal	SIR BPTI, BHAVNAGAR	9427182407	deven_a_dave@yahoo.co.in

<b>S. No</b>	<b>Name and Designation</b>	<b>Institute</b>	<b>Contact No.</b>	<b>Email</b>
2	A.K.Nanavati, HOD	C.U.SHAH POLYTECHNIC, SURENDRANAGAR	9426674409	aknanavati@gmail.com
3	M.N.Vibhakar Sr. Lect.	C.U.SHAH POLYTECHNIC, SURENDRANAGAR	9428868859	mpp3668@hotmail.com
4	D.J.Gohel Lect.	C.U.SHAH POLYTECHNIC, SURENDRANAGAR	9879428562	djgohel80@gmail.com

### **NITTTR Resource Persons**

<b>S. No</b>	<b>Name and Designation</b>	<b>Department</b>	<b>Contact No.</b>	<b>Email</b>
1	Dr. K. K. Jain Professor	Mechanical Engg. Education, NITTTR, Bhopal	0755-261600*351	kkjain@nitttrbpl.ac.in
2	Dr. Sharad K. Pradhan Associate Professor	Mechanical Engg. Education, NITTTR, Bhopal	0755-261600*355	spradhan@nitttrbpl.ac.in