

**GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**  
**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**  
**Semester -VI**  
**Course Title: Automobile Professional Practice-2**  
**(Course Code: 4360206)**

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Automobile Engineering	6th

### **1. RATIONALE**

This comprehensive course is designed to equip students with essential knowledge and skills in three key areas. Firstly, participants will delve into automotive safety, emergency response, and efficient handling of hazardous materials. Through practical learning, students will master the use of automotive service manuals and diagnostic tools to systematically diagnose and address issues, ensuring a safe working environment. Moving on to agricultural machinery, the course offers a deep understanding of various tractor types and common farm equipment components, with a specific emphasis on powertrain and PTO shaft. Participants will gain insights into the intricacies of agricultural machinery, enabling them to navigate and operate these tools effectively. Lastly, this course covers project management fundamentals, guiding students through market surveys, project identification, team assembly, and resource management. Participants will learn to execute projects efficiently, make necessary adjustments based on testing outcomes, and critically evaluate and document project success. This holistic approach prepares students for diverse challenges in automotive, agriculture, and project management domains. Join us on this educational journey to enhance your skills and knowledge across these dynamic fields.

### **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.

- **Effectively diagnose and address real-world challenges in the automotive by integrating safety protocols, technical proficiency, and the practical application of engineering principles.**

### **3. COURSE OUTCOMES (COs)**

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

- a) Students will demonstrate a comprehensive understanding of safety measures, emergency response protocols, proper disposal of hazardous materials, and effective use of automotive service manuals and diagnostic tools to diagnose and address issues systematically and safely.
- b) Students will possess a comprehensive understanding of agricultural machinery, including various types of tractors and common farm equipment with a focus on powertrain and PTO shaft.
- c) Students will demonstrate project management, from conducting market surveys and project identification to assembling skilled teams and resources, executing projects, making

necessary adjustments based on testing results, and evaluating and documenting project work effectively.

#### 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		
			C	CA	ESE	CA	ESE	
0	0	6	3	00	00	50*	50	100

(\*): Weightage of marks for each unit is defined in teaching scheme and it is same for CA and ESE components of practical marks.

**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. As this is the subjects of practical only PrOs and UOs are same. Project work should be governed in such a way that task sheets reflect step by step progress of project work.

Sr. No	Practical Outcomes (PrOs)	CO	Unit No.	Approx. Hrs. required
1	Demonstrate a comprehensive understanding of safety features and precautions associated with major tools and machinery used in automotive workshop.	1	1	04
2	Prevent and effectively handle workshop accidents	1		04
3	Implement proper procedures for the storage and disposal of hazardous materials	1		02
4	Navigate and use automotive service manuals and diagnostic tools to diagnose and rectify the given problem. (Faculty can give any one automobile system problem)	1		04
5	Identify and explain the key components of a tractor, including the engine, transmission, and PTO (Power Take-Off).	2	2	04
6	Provide an overview of different tractor types, including utility tractors, row-crop tractors, and specialty tractors.	2		04
7	Identify and explain function of different types of farm equipment such as Plows, Harrows, and Cultivators, Seeders and Planters and Harvesters.	2		04
8	Demonstrate the correct procedure for attaching and detaching implements to the tractor with safety precautions.	2		02
9	Project work (With all stage wise task sheets and final report)	3	3	56
	<b>Total Hrs.</b>			<b>84</b>

#### Note

- 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.
- Care must be taken in assigning and assessing study report as it is a 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 Practical's	Weightage in %
1	Knowledge of assigned work in detail.	25
2	Procedure and safety followed to complete the work.	25
3	Use of correct resources.	25
4	Timely submission.	25
<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.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Automotive PPE Kit - safety helmets, gloves, eyeglasses, earplugs, full-body suits, vests, hard hats, safety footwear, and Respiratory protective equipment (RPE).	1 to 4 & 9
2	Common automotive chemicals such as brake fluid, engine oil, transmission oil, grease, coolant and additives.	1 to 4 & 9
3	Common Hand Tools and Power tools used in Automotive workshops. Allen Key set of 12 pieces, Centre Punch, Dividers, Screwdriver Spanner D.E. set of 12 pieces, Spanner ring set of 12 metric sizes Steel tool box with lock and key (folding type)	1 to 4 & 9
4	Adequate workstations with power supplies for hands-on practice and demonstration. Digital multimeter, Assorted jumper wires, Automotive battery tester, High-quality test leads and probes etc.	1 to 4 & 9
5	Demonstration chart of tractor components.	5
6	Demonstration chart of different types of tractor.	6
7	Demonstration chart of Farm Equipment	7
8	Demonstration Chart of P.T.O . operated equipment	8
9	Angle Grinder	1 to 4 & 9
10	Metal arc welding machine	1 to 4 & 9
11	Drilling machine	1 to 4 & 9
12	Hand cutter	1 to 4 & 9
13	Floor jack	1 to 4

## 7. AFFECTIVE DOMAIN OUTCOMES

The following **sample** Affective Domain Outcomes (ADOs) are embedded in each of the above-mentioned COs. 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 environmentally friendly methods and processes. (Environment related)**

The ADOs are best developed through the field based exercises/project work. 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. As this is a course having practical only, above listed PrOs are based on UOs. If required, more such higher level UOs and PrOs 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 Safe Practices while working in Automotive Workshop</b>	1.a Demonstrate a comprehensive understanding of safety features and precautions associated with major tools and machinery used in automotive work. 1.b Prevent and effectively handle workshop accidents. 1.c Implement proper procedures for the storage and disposal of hazardous materials. 1.d Utilize automotive service manuals proficiently. 1.e Utilize a combination of service manuals and diagnostic tools to diagnose and troubleshoot automotive problems accurately	1.1 Emphasize safety features and precautions While working with; Vehicle Lifts, Welding Equipment, Compressed Air System, Battery Charging Stations, Power Tools, Paint Booths, Grinding Equipment, Pressurized Oil Systems & Diagnostic Equipment. 1.2 Preventing and Effectively Handling workshop accidents such as Fire, Electric Short- Circuits, Mild to Fatal injuries. 1.3 Proper disposal of hazardous materials; Storage and Handling of Automotive Chemicals 1.4 Emphasizing proper grounding and insulation while working on Electrical Testing Equipment. 1.5 Provide hands-on training on how to navigate and use automotive service manuals. 1.6 Use a combination of service manuals and diagnostic tools to diagnose and fix the problems.
<b>Unit II Tractors and Farm Equipment</b>	2.a Understand agriculture machinery. 2.b Acquire knowledge about tractor basic, types and components. 2.c Acquire knowledge about common farm equipment.	2.1 Introduction to Agricultural Machinery; Types of agricultural Machinery 2.2 Tractor Basics; Types of Tractors (e.g., utility tractors, row-crop

	2.d Understand working of tractor powertrain and PTO shaft.	tractors, specialty tractors) and Components of a Tractor 2.3 Common Farm Equipment such as Plows, Harrows, and Cultivators, Seeders and Planters and Harvesters. 2.4 Tractor Systems and Technology; Powertrain and PTO Shaft.
<b>Unit III Project</b>	3.a Task Sheet 1 -Define the project: Clearly understand the project's objectives, scope, and desired outcomes. Identify the key stakeholders and understand their requirements and expectations. 3.b Task Sheet 2-Assign roles and responsibilities to team members based on their strengths. 3.c Task Sheet 3- Collect all relevant information and conduct research to gain a comprehensive understanding of the project's subject matter. 3.d Task sheet 4- Develop a detailed project plan that outlines the tasks, timelines, and resources required. 3.e Task sheet 5- Monitor the project closely and address any issues or obstacles that arise. Identify potential risks and develop a risk management plan. 3.f Task sheet 6- (if applicable) conduct testing and quality assurance activities to ensure that the project deliverables meet the required standards and specifications. 3.g Draft report stage wise having all information in detail and with diagrams/ figures which ever and where ever required. Make and present PowerPoint presentation effectively.	3.1 Market survey, project identification, targeted market and their requirement and expectations 3.2 Identify and gather a team of individuals with the necessary skills and expertise to execute the project effectively. 3.3 Conduct research and gather information 3.4 Plan the project: Break down the project into smaller, manageable components and establish a project schedule and manage the schedule effectively. 3.5 Execute the project Communicate regularly with the project team to ensure everyone is aware of their responsibilities and progress. Continuously track the project's progress against the planned schedule and budget. Make adjustments as needed to keep the project on track. Manage risks. 3.6 Make necessary adjustments and refinements based on the testing results. 3.7 Evaluate and document: Once the project is complete, evaluate its overall success against the defined objectives. Document lessons learned, including what worked well and areas for improvement.

*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 NOT APPLICABLE.

## 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 on any topic given by concern faculty after visit of garage/tractor repairing unit.
- 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) Detail task sheets according to the type of project work should be prepared and maintained by students.

### 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**

### 12. SUGGESTED MICRO-PROJECTS

*As this course is having one big project as a part of curriculum, no other micro-project is required to plan under this course.*

### 13. SUGGESTED LEARNING RESOURCES

Sr. 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 Technology	James Halderman	Pearson Publication ISBN-10: 0-13-254261-7 ISBN-13: 978-0-13-254261-6
3	Automobile Electrical and Electronic System	Tom Denton	Elsevier Butterworth-Heinemann ISBN-10: 0-7506-62190
4	Automotive Computer Codes: Electronic Engine Management Systems	John Harold Haynes	Haynes Tech-books ISBN: 1563922320 ISBN13: 9781563922329
5	Solid and Liquid Waste Management	Rajaram Vasudevan	PHI Learning ISBN: 9788120352452, 9788120352452

6	Vehicle Maintenance and Garage Practice	Jigar A. Doshi, Dhruv U. Panchal, Jayesh P. Maniar	Prentice Hall India Learning Private Limited ISBN-10: 8120349822 ISBN-13: 978-8120349827
7	Elements of Agricultural Engineering	Dr. Jagdishwar Sahay	Standard Publisher Distributors, Nai Sarak, Delhi-110006
8	Farm Machines & Equipment	C. P. Nakra	Dhanpat Rai & Sons , ISBN 818743323X, 9788187433231
9	Farm Tractors Maintenance & repairs	S.C. Jain & C.R. Rai	Standard Publishers and Distributors ISBN 9788180142055 ISBN10: 8180142051
10	Basics of project management.	Made Easy Team	Made Easy Publication ISBN 13: 9788119100033
11	Fundamentals of project management.	Joseph Heagney	AMACON ASIN : B01A2O4R70

#### 14. SOFTWARE/LEARNING WEBSITES

- a) <https://www.howacarworks.com>
- b) <https://swayam.gov.in>
- c) <https://auto.howstuffworks.com>
- d) <https://nptel.ac.in>
- e) NPTEL :: Agriculture - NOC:Farm Machinery
- f) <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=126234>
- g) <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=126225>
- h) <http://www.alltractormanuals.com/>
- i) <https://truckmanualshub.com/mahindra-tractors-workshop-service-and-part-manuals-pdf/>
- j) <https://www.un-csam.org/sites/default/files/2021-01/Tractor%20Industry%20in%20India%20%E2%80%93%20Present%20and%20Future%20%28Presentation%29.pdf>
- k) [https://www.researchgate.net/publication/275642331\\_Farm\\_Tractor\\_Systems\\_Operations\\_and\\_Maintenance/link/55464b190cf234bdb21d8c55/download](https://www.researchgate.net/publication/275642331_Farm_Tractor_Systems_Operations_and_Maintenance/link/55464b190cf234bdb21d8c55/download)

### 15. PO-COMPETENCY-CO MAPPING

Semester VI	Automobile Professional Practice-2 (4360206)						
	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
<ul style="list-style-type: none"> <li>Effectively diagnose and address real-world challenges in the automotive by integrating safety protocols, technical proficiency, and the practical application of engineering principles.</li> </ul>	3	3	3	3	3	3	3
CO1: Students will demonstrate a comprehensive understanding of safety measures, emergency response protocols, proper disposal of hazardous materials, and effective use of automotive service manuals and diagnostic tools to diagnose and address issues systematically and safely.	3	3	3	3	3	3	3
CO2: Students will possess a comprehensive understanding of agricultural machinery, including various types of tractors and common farm equipment with a focus on powertrain and PTO shaft.	3	1		2	2	1	3
CO3: Students will demonstrate project management, from conducting market surveys and project identification to assembling skilled teams and resources, executing projects, making necessary adjustments based on testing results, and evaluating and documenting project work effectively.	3	3	3	3	3	3	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	Mr. D. A. Dave (Retd. HOD Automobile)	Sir B.P.T.I, Bhavnagar	9427182407	<a href="mailto:deven_a_dave@yahoo.co.in">deven_a_dave@yahoo.co.in</a>
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3	Mr. H. L. Jadav Lect. Automobile	Sir B.P.T.I, Bhavnagar	9033040291	<a href="mailto:hlj.auto@gmail.com">hlj.auto@gmail.com</a>
4	Mr. B. B. Chauhan Lect. Automobile	Sir B.P.T.I, Bhavnagar	9427233866	<a href="mailto:bbcautodept@gmail.com">bbcautodept@gmail.com</a>
5	Mr. J. V. Bhalani Lect. Automobile	C. U. Shah Polytechnic Surendranagar	9033836585	<a href="mailto:jenishbhalani@gmail.com">jenishbhalani@gmail.com</a>

**GTU BOS and Branch Co-ordinator Persons**

Sr. No	Name and Designation	Institute	Contact No.	Email
1	Mr. Shyam Varghese HOD Automobile Branch Co-ordinator	Sir B.P.T.I, Bhavnagar	9426396640	<a href="mailto:shyamvarghese@gmail.com">shyamvarghese@gmail.com</a>
2	Mr. A. K. Nanavati, HOD Automobile	Govt. Polytechnic, Ahmedabad	9426674409	<a href="mailto:aknanavati@gmail.com">aknanavati@gmail.com</a>