

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM COURSE TITLE: AUTO ELECTRICAL SYSTEM DIAGNOSIS AND TESTING (COURSE CODE:3360203)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	Sixth

1. RATIONALE

Automotive electrical system is the most important feature of any modern vehicle. This course will help the students in understanding the troubles occurring in Automobile electrical system, their possible causes and remedial measures. The student will also develop the ability to use the instrument to check the performance of electrical units, identify the fault and rectify it.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire the following competency:

- **Remedy automotive electrical system parts and subassemblies based on diagnosis and testing using suitable instruments and tools.**

3. COURSE OUTCOMES (Cos)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain so that they can demonstrate the following course outcomes: .

- i. Identify various auto-electrical faults/troubles and their causes.
- ii. Analyse and rectify various auto-electrical troubles with the help of troubleshooting charts
- iii. Use standard acceptance test with the help of service manuals.
- iv. Use suitable instrument and tools for diagnosis and testing of automotive electrical system.
- v. Follow safety rules for repair and maintenance of various automotive electrical systems and units.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
4	0	2	6	70	30	20	30	150

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P - Practical; C – Credit;; ESE - End Semester Examination; PA - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Automobile Battery	1a.Explain different tests carried out on battery. 1b.Identify various troubles & its causes & remedies. 1c. Explain charging of the battery.	1.1 Different troubles Causes and remedies of the battery 1.2 Symptoms and effects of various battery failures 1.3 Different battery tests 1.4 Determination of battery condition and serviceability 1.5 Battery charging 1.6 Method of using battery tester 1.7 Periodical checking of the automobile battery
Unit – II Ignition System	2a.Explain tests carried out on the component of the ignition system. 2b.Identify various ignition failure, its causes & remedies. 2c.Explain servicing & adjustment of the ignition system timing & components. 2d. Explain method of using various tester	2.1 Different ignition failures, their causes and remedies 2.2 Quick checking of ignition system 2.3 Ignition service 2.4 Testing of different ignition system components by using different types of testing equipments (ignition coil tester, condenser tester, distributor tester, cam angle and RPM tester, ignition timing device) 2.5 Procedure of checking and setting of ignition timing 2.6 Use of oscilloscope ignition tester for diagnosis of ignition trouble 2.7 Testing of the transistorized ignition system and their components 2.8 Servicing testing and adjustment of the fly wheel magneto ignition system 2.9 Periodical checking of the automobile ignition system
Unit– III Starter Motor and Its Circuits	3a.Explain various starter motor failure, causes & remedies. 3b.Explain various tests on the starter motor. 3c.Describe maintenance & reconditioning of the starter motor.	3.1 Common troubles Causes and remedies in starter motor and its drive mechanism 3.2 Maintenance of the starter motor and its circuits 3.3 Reconditioning of the starter motor 3.4 Different starter tests and interpretation of the results 3.5 Testing of the starter switches 3.6 Method of using growler for starters
Unit– IV Alternator and Regulators	4a.Explain various tests on the alternator & regulator. 4b.Explain various regulator & alternator failure,	4.1 Different troubles in alternator, their causes and remedies 4.2 Testing procedure of alternator components

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	causes & remedies. 4c. Describe maintenance & reconditioning of the alternator.	4.3 Testing procedure of regulator 4.4 Precautions to be observed in the use of alternator and regulator 4.5 Maintenance of alternator and regulator 4.6 Periodical checking of the automobile alternator
Unit- V Indicating and Warning Devices	5a. Describe Procedure of testing the various indicating & warning devices. 5b. Describe troubles & ways for service of the various warning & indicating devices in the automobiles.	5.1 Troubles Causes and remedies in fuel level gauge and its circuits 5.2 Procedure of testing gauge and tank units 5.3 Troubles shooting of water temperature gauge 5.4 Troubles shooting of oil pressure gauge 5.5 Common troubles Causes and remedies in speedometer and odometer 5.6 Troubles, causes and remedies in flasher unit 5.7 Periodical checking of indicating and warning devices
Unit- VI Wiring - Installation and Lighting & Miscellaneous Electrical Equipment	6a. Identify various problems in the wiring & repair it. 6b. Describe testing Procedure of various electrical equipment. 6c. Describe troubles & service of the various lighting & electrical equipment.	6.1 Troubles Causes and remedies in auto vehicle wiring 6.2 Testing of broken cable 6.3 Types of deterioration of cables, its causes and their remedies 6.4 Faults in the Automobile lighting circuits 6.5 Causes and remedies for various troubles 6.6 Method of focussing the head light 6.7 Troubles Possible causes and remedies in wind shield wiper and its circuit 6.8 Troubles Probable causes and remedies in electric horn (high frequency) relay and its circuit 6.9 Method of replacement of the horn components 6.10 Troubles shooting of electric fuel pumps 6.11 Troubles, causes and remedies in power window operating system

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I.	Automobile battery	10	2	6	6	14
II.	Ignition system	10	3	5	6	14
III.	Starter motor and its circuits	07	0	3	4	07
IV.	Alternator and regulators	08	2	3	5	10
V.	Indicating and warning devices	07	2	2	5	09
VI.	Wiring – Installation and Lighting & miscellaneous electrical equipments	14	4	5	7	16
	Total	56	13	24	33	70

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No.	Unit No.	Practical Exercises (Any Seven) (Outcomes in Psychomotor Domain)	Hours (Total 28 hrs)
1	I	Test an automobile battery for its serviceability.	4
2	II	Test ignition coil, condenser, dwell angle, etc.	4
3	II	Set and check ignition timing of S.I. engine.	4
4	III	Test starter motor and its circuit for voltage drop, no-load and torque.	4
5	III	Test starter motor component.	4
6	IV	Test alternator and its components.	4
7	IV	Test output of alternator.	4
8	V	Test various indicating and warning devices.	4
9	V	Set and adjust head light of the automotive vehicle.	4
10	V	Set and adjust high frequency electric horn with its relay.	4

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

To prepare Charts, Models. Seminars using power point presentations and Group discussion based on various probable troubles, its causes and how to rectify them for various automobile electrical system and its components.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Case studies of typical maintenance problems in different makes of automobiles and problem based learning
- ii. Arrange expert lectures of maintenance executives of different automobile companies
- iii. Visit of authorized workshop of two and four wheeler.
- iv. Collection of animation or video clips and presentation using same.
- v. Internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects etc.

10. SUGGESTED LEARNING RESOURCES

A) List of Books

Sr.No	Author	Title of Books	Publication
1	P. L. Kholi	Automobile Electrical Equipments	Tata McGraw Hill
2	C. P. Nakra	Auto Electrical Systems	Dhanpat Rai Publication
3	R. B. Gupta	Automobile Engineering	Satya Prakashan.
4	W.H.Crouse & D.L. Anglin	Automotive Electrical equipment	Tata McGraw Hill
5	Jain and Astana	Automobile Engineering (6 th Edition 2013)	Tata Mc-Graw Hill Publishing Co. Ltd.-New Delhi
6	Tom Denton	Automobile Electrical & Electronic system	Elsevier Butterworth-Heinemann
7	A. W. Judge	Automotive Electrical maintenance	Sir Isaac Pitman & Sons
8	J A Johnson	Automotive diagnosis And Tune up	Tata McGraw Hill

B) List of Major Equipment/ Instrument

1. Hydrometer
2. Battery load tester
3. Ignition coil tester
4. Auto electrical test bench

C) List of Software/Learning Websites

Sr. No	Name of Topic	Sample Video URL Address
1	Battery load testing	http://www.youtube.com/watch?v=3QiKyjWWiRo
		https://www.youtube.com/watch?v=1FQMajuQ6j4&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=9
2	Ignition coil testing	http://www.youtube.com/watch?v=c1zhgsnyZWw
		https://www.youtube.com/watch?v=vG3Lzr-lSYg&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=1
3	Setting ignition timing	http://www.youtube.com/watch?v=Wwp9rtTPPjc
		https://www.youtube.com/watch?v=slrZafT8yNg&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=8
4	Setting of ignition timing	http://www.youtube.com/watch?v=wifTHbb06_I
		https://www.youtube.com/watch?v=skT2u6kmSP8&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=7
5	Testing of starter motor	http://www.youtube.com/watch?v=UnmnWuuLfzE
		https://www.youtube.com/watch?v=FBUvYi-zlQ4&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=6
6	Starter motor test	http://www.youtube.com/watch?v=9PWG6Il_ZJI
		https://www.youtube.com/watch?v=V-2LSJYQkeU&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=4
7	Alternator voltage test	http://www.youtube.com/watch?v=Bzz7P3qNHcE
		https://www.youtube.com/watch?v=uelF_CjtJ5g&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=5
8	Starter and voltage regulator	http://www.youtube.com/watch?v=-a0szYkjo9k
		https://www.youtube.com/watch?v=xoBXdGAgqTk&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=3
9	Head light aligner	http://www.youtube.com/watch?v=ni6-NhH6uAE
		https://www.youtube.com/watch?v=EAqfAzAKYYU&list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&index=2
OR		
Complete Video Play-list available on below single URL address		
https://www.youtube.com/playlist?list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj		

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof M.J.Pathak**, H.O.D., Automobile Department, Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- **Prof S.V. Trivedi**, H.O.D., Automobile Department, Parul Institute of Technology, Waghodia, Vadodara.
- **Prof. D. J. Gohel**, Lecturer, Automobile Department, C.U.Shah Polytechnic, Surendranagar
- **Prof. Sulay Patel**, H.O.D., Automobile Department, L.J. Polytechnic, Ahmadabad.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K.K. Jain**, Professor, Department of Mechanical engineering
- **Dr. C.K. Chugh**, Professor, Department of Mechanical engineering