FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Automobile Engineering)**

Semester: **VI**

Course Code: **202010602**

Course Title: **Automobile Electrical and Electronics**

Course Group: **Professional Core Course**

Course Objectives: The course aims to impart basic skills and understanding of Automotive Electrical and Electronic components, systems, and their working details. Application of electronic devices, Sensors, Transducers, Actuators and AI, ANN, Fuzzy Control Systems also included in this course.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
03	00	02	4	50 / 18	25 /9	50 / 17	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Automobile Electrical Systems:** Storage, Distribution systems & Generation of electric energy, Lighting system, 12 Volt & 24 Volt systems. Insulation and earth (negative and positive earthing) system, types of cables used, color codes, cable connectors, wiring, fuse system, circuit breakers, Relays, Switches. Layout and Wiring diagram for 2, 3 and 4-wheeler vehicles, Buses and Commercial vehicles. Wiper System and Trafficator, power windows, Central Locking system. Convertible Mechanism	08

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

2	**Batteries and Starting system:** Various types of Automotive batteries. Principle, Construction & working of lead acid battery, dry battery & Alkaline battery. Designation & Rating of Batteries. Performance tests: Battery Capacity, Efficiency, Gravimetric test and efficiency. Battery failures. Recharging: Electronic circuits, battery charging current, charging methodology & precautions. Principle of Starting system, starting torque, engine resistance torque, and power required for starting of engine. Starter motor and its circuit. Types of drive mechanisms: Bendix drive, pinion type, axial sliding armature starter. Slipping and overrunning of clutches, automatic switches for starting, cold starting devices: Glow plug & choke.	**08**
3	**Charging system and Lighting Auxiliaries:** Need of Charging circuit, Types of charging system: D.C. dynamo, AC dynamo, flywheel magneto charging system and Alternator, charging system controlling & regulator system: Relay/cut-out, voltage and current regulator, compensated voltage and current regulator, electronic regulator, regulator characteristics. Drive for Charging system. Lighting system of vehicle: head lamp, tail lamp, brake lamp, parking lamp etc, other types of lamps used. Reflector purpose and design, head lamp angle and position, fog lamp, side indicator lamp, warning lights and flashers, instrument panel lights, body interior lights. Safety indicator lights. Engine compartment & Rear boot lamps.	**08**
4	**Ignition Systems:** Introduction, Types of solid-state ignition systems and their principle of operation Contactless electronic ignition system, electronic spark timing control.	**05**
5	Autonomous Vehicles: Introduction, Concept of Self Driving Car, AI applications, ANN & Fuzzy Control System, Fundamental parts of computer, Principles of operation, Computer data, Computer interfaces, Computer memories, Adaptive operating strategy of the ECM. **Sensors and Actuators:** Introduction, basic sensor arrangement; types of sensors such as - oxygen sensors; Crank angle position sensors - Fuel metering /vehicle speed sensor and detonation sensor - Altitude sensor, flow sensor Throttle position sensors, solenoids, stepper motors, relays	**10**
6	**Horns-** A.C. & D.C. horns, wind tone horn/air horns, electronic horn, reverse horn. Horn relay. Warning buzzer. Instrument cluster panel, fuel gauges, oil temperature gauge, warning light sensors, coolant temperature gauge, speedometer, Odometer, tachometer, trip meter, oil level indicator, parking brake indictor, direction indicators.	**06**

List of Practicals / Tutorials:

1	Inspect, Test and Trouble shooting of Battery.
2	Test alternator in an auto electrical test bench along with overhauling.
3	Test starter in an auto electrical test bench and inspect, test, diagnose starting system
4	Trouble shooting in Ignition system and Overhauling & Testing Ignition system components.

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

5	Inspection and Diagnosis of Spark Plug with testing bench.
6	Testing and adjustment of Head light focusing and use of Luxmeter.
7	Performance test of Gasoline fuel injector.
8	Routine maintenance of terminal joints, wiring and renewal of damaged wires. Prepare wiring harness as per colour code.
9	**Diagnose and Testing of Temperature sensor, Pressure senor, potentiometer, magnetic** induction sensor, cam shaft sensor, crankshaft position sensor.
10	To understand and study of different actuators used in automobile.

Reference Books:

1	Automotive Computer Controlled Systems By Allan W. M. Bonnick, Butterworth-Heinemann A division of Reed Educational and Professional Publishing Ltd
2	Understanding Automotive Electronics By Willium B. Ribbens,-6th ed. Elsevier Science 2003
3	Automotive Electrical Equipments, by P. L. Kohli, Tata McGraw Hill Pub. Co. Ltd.
4	Automobile Electrical & Electronic Systems, by Tom Denton, Allied Publishers Pvt. ltd., Chennai.
5	Automobile Electrical and Electronics, by A. L. Statini, Delmar Publications
6	Automobile Electrical & Electronic Equipments, by Young, Griffithe, The English Language Book Co., London
7	Understanding Automotive Electronic, Bechtold., SAE, 1998.

Supplementary learning Material:	
1	NPTEL Resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment

Internal Evaluation :

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

15	25	20	15	15	10	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Describe the basic electrical systems and working of different electrical components used in automobiles.	**15**
CO-2	Evaluate, characteristics and maintenance of battery, lighting system, charging system and starting system.	**25**
CO-3	Categorize and select ignition system in automobile systems	**15**
CO-4	Understand autonomy of vehicles, Categorize and select various sensors and actuators used in Autonomous Vehicles.	**25**
CO-5	Appraise electronic control module and its peripherals used to control automotive systems.	**20**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2027

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in